

# Digital Technologies

## FOR INFORMATION

### AND

# Knowledge Management



**Editors:**

*Tom Kwanya, Joseph Kiplang'at, Justus Wamukoya, Dorothy Njiraine*



# DIGITAL TECHNOLOGIES FOR INFORMATION AND KNOWLEDGE MANAGEMENT

Editors:

Tom Kwanya, Joseph Kiplang'at, Justus Wamukoya, Dorothy Njiraine

*The Technical University of Kenya • Nairobi, Kenya*

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## Preface

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Technologies play a pivotal role in the management of information and knowledge. They leverage the creation, collection, processing, storage, sharing and perpetuation of individual, community or organisational knowledge. Technologies provide a set of transformative functionalities which enhance the knowledge management processes. These functionalities support communication, coordination, analysis, presentation and diffusion of knowledge cost-effectively, conveniently, interactively and promptly. This book is part of the discourse on how best to apply the increasingly ubiquitous digital technologies and media to manage information and knowledge in a way which enhances the effective identification, documentation, popularisation and application of strategic knowledge in the society. The chapters have been contributed by scholars from diverse contexts thereby creating a rich mash-up of perspectives.

The book presents pertinent discussions on digital technologies and media which are applied to manage information and knowledge in this era. The chapters are structured into eight (8) broad categories. The categories include Digital Libraries and Information Repositories; Citizen Media and Technologies; Big Data Systems; Learning Media and Technologies; Internet of Things and Emerging Technologies; Technology and Information Ethics; Management of Electronic Records; as well as Information and Knowledge Organisation.

All the chapters in this book have been subjected to an elaborate quality assurance process to leverage their contribution to the existing literature on information and knowledge management. As such, both the abstracts and full papers were subjected to double-blind peer review and professional copy editing. I am convinced that information and knowledge management scholars, students and practitioners will find valuable nuggets in the chapters and will use the same for theory development; policy formulation and implementation; and in their professional practice.

This book is a direct product of the 2<sup>nd</sup> International Conference on Information and Knowledge Management which was held on 21-14 August 2018 in Nairobi, Kenya. It would not have been possible to publish it without the support of the conference organisers, participants, and sponsors. We particularly acknowledge the support of Prof. Dr.-Ing. Francis W.O. Aduol, the Vice-Chancellor of the Technical University of Kenya, who opened the event and also shared tips on the future of information and knowledge management as a scholarly discipline.

On behalf of the organising committee and the three hosting institutions, I wish you an insightful reading of the chapters.

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**1<sup>st</sup> March, 2019**

## Foreword

### *Which Way Information and Knowledge Management Education and Research?*

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Knowledge management seems to be at a crossroads from its conceptualisation and contextualisation. We do not agree on a single definition, process, typology; whether it can actually be managed; whether it is a new discipline or part of an old one (its scope in relationship to other disciplines), how it is distinct from information management; or whether we call it knowledge management or information and knowledge management. As a result, we witness several approaches to knowledge management, tacit or explicit or both inclinations, from typology of knowledge point of view on one hand and orientation such as techno centric, social and general approaches on the other. Therefore, being at cross-roads means lack of identity or lack of focal point.

This brings us back to management of both tacit and explicit knowledge and the dilemma of admitting that tacit knowledge can actually be managed. The concept of knowledge can be approached in many ways. One could, for example, use the knowledge pyramid to explain the relationship between data, information, knowledge and wisdom. Knowledge can also be viewed from an ownership or property point of view as once defined by Daniel Bell, that is, whether it belongs to a community or individual or organisation. Therefore, to whom do we ascribe the intellectual property or social recognition? Should we classify it into tacit and explicit knowledge as pioneered by Michael Polanyi and argued in the seminal works of Ikujiro Nonaka and Hirotaka Takeuchi? Can we use core-periphery analysis to trace changes in the terminology of knowledge management overtime thereby determining the core focus of knowledge management at present as Bosire Onyancha and Dennis Ocholla argue? Do we use knowledge society concept – society that “generates, processes, shares and makes available to all members of the society knowledge that may be used to improve the human condition” as the World Summit on the Information Society (WSIS) notes to explain it? Do we turn to Charles Darwin’s theory of evolution where we view the journey to today’s knowledge society as being rooted in the transformation of societies from gatherers and hunters, through agrarian and industrial societies, to information and knowledge societies and the fourth industrial revolution? Each transformation epoch has been recognised with particular economic growth or output ranging from raw materials and agricultural products through to industrial products and the current knowledge products.

It would serve no point to discuss knowledge management without considering foundation or theory and frameworks. Such frameworks can be conceptualised and perhaps understood by, for example, referring to the pioneering work of Michael Polanyi on personal knowledge and tacit knowledge covered in several of his books and scholarly publications. Likewise, the seminal work of Ikujiro Nonaka and Hirotaka Takeuchi titled “The knowledge creating company” published in 1991, which reflects on “what is behind the success of Japanese companies in automotive and electronic industries” referring to the success of largely tacit knowledge management. Several subsequent related studies and publications by the two authors are important points of departure for knowledge management research. For example, their SECI model has received enormous recognition worldwide but not without criticism as well. Among others, Peter Senge’s “Fifth Discipline: The Arts and Practice of Learning Organisation” published in 1990 also provides a strong foundation for knowledge management in organisations which is increasingly popular. In addition, there are several knowledge management theories and models such as process models summed up in Mzwandile Shongwe’s article titled “An Analysis of Knowledge Management Lifecycle Frameworks: Towards a Unified Framework” published in the *Electronic Journal of Knowledge Management* in 2016. The common clusters of the theories and models include: process models, components/characteristics, techno-centric models, knowledge in organisations, knowledge sharing e.g. Community of Practice (CoP), knowledge creation, knowledge structure, and knowledge impact/influence. Contextual frameworks – which should not be ignored – are found largely within international (e.g. WSIS), national and institutional knowledge management legislations and policies. Also, knowledge of concepts and the ability to define them correctly is fundamental for understanding a construct or phenomenon. Without understanding a concept and its dimensions, it would be impossible to interpret and use it correctly and sufficiently. For instance, knowledge management has attracted many definitions found in most knowledge management literature. Most definitions are knowledge management process-oriented, focus on knowledge assets (which I presume are largely human and technology oriented), strategy, productivity and competition. The point I am making is that knowledge management research is pointless without considering theoretical foundation and frameworks for grounding research in the domain.

Research plays an important role in the development of a discipline. Knowledge of research methodology is fundamental for research success in general and in knowledge management for this case. We battle with a deeper understanding of the epistemology, ontology and methodology of knowledge management research and debate the research paradigms within the frameworks of positivism, pragmatism and interpretivism/constructivism paradigms and link them with quantitative, mixed and qualitative research approaches or methodologies. At the same time, we identify specific methods

or designs (survey, experiment, case study, bibliometrics, content analysis, or ethnographic) within the broad areas for effective research execution but not always quite successfully. We also battle with sampling and data collection and analysis appropriate to the paradigm, approach and method selected. The use of pragmatism or mixed methods research is appropriate for research triangulation yet still raises a lot of concern challenging the teaching and understanding of research methodology among researchers. Closer home (Africa), Patrick Ngulube's publication entitled "Trends in Research Methodological Procedures Used in Knowledge Management Studies" published in the *African Journal of Library, Archives and Information Science (AJLAIS)* in 2015, among others, does attempt to address this lacuna in knowledge management research and is worth noting for scholarly engagement.

While establishing the occurrence of knowledge and information management and information and communication technology in the EBSCO discovery database from 1998 to 2017, I found the occurrence of records on knowledge management followed by Information and Communication Technology (ICT) and information and knowledge management quite substantial (over 40%). This trend is also confirmed by how Library and Information Science (LIS) output is represented by subject domain in a study we reported in 2017 entitled "The changing library and information research landscape: An analysis of Library and Information Science Research in South Africa by LIS academics in the last decade (2007–2016)" at the Crimea Conference. A strong presence of ICT in knowledge and information management searches and vice versa suggests that a strong link exists between the two domains. Thus, knowledge management and ICT project a high level of interdependence. But would this make ICT define knowledge management?

Research collaboration is important and several publications dedicated to this domain in LIS are prevalent. In general, based on a study we reported at the Crimea Conference in 2017 referred to in the previous paragraph, we referred to growing publications on LIS research largely coming from South African researchers in Africa and concluded that "most LIS researchers publish collaboratively, while most collaboration occurs within the LIS departmental or inter-departmental within the same institutions. This includes institutional collaboration (e.g. within a department, or with other departments like library, computer science); national (with other South African universities); and international. Institutional collaborations are on the top of the list, followed by national collaboration. Some institutions (e.g. University of Pretoria) have a very strong international collaboration and further noted that "inter institutional and international collaboration is minimal". Studies reflected in this book do also confirm the same trend. Analysis of the reported research collaboration largely through co-authorship in knowledge management show minimal inter-institutional and international collaboration. In order to reap from the benefits of research collaboration in general and in knowledge management in particular, more work is required to accommodate the lacking collaboration orientation/trend to boost inter-institutional and international research partnership.

In 2006, Onyancha and Ocholla examined the nature, trends and patterns of knowledge management – including Information Management (IM) – research in South Africa using descriptive informetrics, analysing IM/KM documents from the Current and Completed Research (C&CR) and the Index to South African Periodicals (ISAP) databases from 1984 -2005. In their conclusion, they noted an increase in KM publications, represented in over 60 journals focusing on management, business administration, computer science and Information Science. At that point, the University of Johannesburg and University of Pretoria were topping the list on research and publications on KM. We also confirmed the multidisciplinary nature of KM involving Information Science, Business Administration, Computer Science, Public Administration, Library Science, Management, Technology and People. A related analysis I did in 2017 was based on IKM thesis and dissertations by South African Universities appearing in Union of Completed Thesis and Dissertation (UCTD) database from 2010 to 2017. I found 11 universities producing 140 theses and dissertations (T&D) in IKM with masters and doctoral qualifications largely in Business and Commerce followed by Information Science related qualifications with UNISA, University of Pretoria and University of Johannesburg topping the list. The multidisciplinary nature of IKM is again reflected in this case with more inclination towards business management. More theses and dissertations seem to be produced at UNISA and University of Johannesburg during the last four years (2014-2017).

LIS education is a growing field of research and has attracted several studies in Africa as reported recently by Jaya Raju, Dennis Ocholla and Mzwandile Shongwe, among others. Attempts have been made to determine LIS and KM knowledge, skills and attitude competency requirements largely through content analysis of popular newspapers advertisements and LIS employer and employee surveys in South Africa, Uganda, Kenya and Nigeria in Africa. We also represent and analyse the level and nature of KM content in LIS curriculum, whether they are stand-alone or autonomous courses, lead to specific KM qualifications, merged in other courses, offered at undergraduate or postgraduate or both levels. As noted earlier with the South African case study, most IKM qualifications are in business management suggesting that the qualifications are offered outside LIS/IKM disciplines. For example, gleaned such education from IKM/LIS perspective, University of South Africa, University of Johannesburg and the Technical University of Kenya could be producing more graduates in IKM in the region.

We note that competency seems to play a major role in determining the graduations or qualifications of an individual in all fields. In South Africa, such competencies are grouped in generic-attributes required beyond a single discipline

– core/professional competencies – normally specific to a particular profession or field (e.g. IKM for this matter), and personal/ functional competencies. While some studies are noted in this domain including a recent one by Tom Kwanya on IKM education in Kenya, Jaya Raju’s recent study (2017) entitled “LIS professional competency index for the higher education sector in South Africa” is drawing a great deal of interest as the generic and personal competencies highlighted in the study seem to fit in most professions. Core/professional competencies, though, would vary by professions/sector/disciplines such as IKM. For example, Tom Kwanya’s study published in 2017 entitled “A Review of Knowledge Management Education and Training in Kenya” concluded that access to knowledge management education and training programmes in Kenya has increased in the past five to seven years. Gaps in the scope, depth and delivery of the programmes were noted. He recommended that there is need to review the programmes to cover all the core skill areas besides using delivery models which build hands-on skills and that such interventions would enhance the potential of the courses in meeting the knowledge management capacity needs in Kenya.

In a nutshell, we note the multidisciplinary nature of IKM. We also note that IKM research and education is burgeoning but not necessarily within LIS/IKM disciplines/fields and attempts at curriculum review/revision are flourishing. Also, subject domain such as knowledge management, information management, information and communication technology, information searching and retrieval, among others form budding inter-linkages. While generic skills and personal attributes could be shared with those reported for LIS sector, core competency is still not clear. Similarly, we note that IKM shares theory, methodology and processes with other information disciplines, and job market in the domain is growing. Do we need an IKM competency checklist, further research on core competency in KM, subject analysis for IKM education curricula and competency, and a re-conceptualisation of the IKM model suggested during the conference?

**Prof. Dennis N. Ocholla**

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SECTION 1:  

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DIGITAL  
LIBRARIES AND  
INFORMATION  
REPOSITORIES  

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# Technostress among Technical University Librarians in Kenya

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## Abstract

*Technostress is the feeling of anxiety or mental pressure caused by working with multiple and rapidly changing computer systems, and mediating between these systems and the demands of one's organisation, staff, customers, and personal life. This study investigated the nature and extent of technostress among technical university librarians in Kenya; the factors causing technostress among the librarians; the effect of technostress on their professional and social lives; as well as how the technical university librarians in Kenya are coping with technostress. Primary data was collected from all professional librarians at the Technical University of Kenya and Technical University of Mombasa using semi-structured online questionnaires. Additional data was collected from secondary sources using documentary analysis. The data was analysed and presented using descriptive statistics. The findings reveal that technostress is widespread amongst technical university librarians in Kenya since all the respondents confirmed that they have experienced technostress; technical university librarians have experienced physical, cognitive, affective and behavioural forms of technostress; technostress is largely caused by technological dynamism and rapid change in their work environment; and that the effect of technostress on the personal and professional lives of the librarians is serious. These findings may be used by technical universities to develop strategies and policies which facilitate librarians to avoid, adapt to, or mitigate technostress.*

**Keywords:** *Technostress, information overload, librarians, technical university, technical university library, Kenya*

## 1 Introduction

Technical universities are best understood in the context of technical education which is aimed at empowering the learners to acquire the practical skills, knowhow and understanding necessary for employment in a particular occupation, trade or group of occupations (Atchoarena and Delluc, 2001). According to Nyerere (2009), technical education has arisen from globalisation, technological change, and increased competition due to liberalisation of economies. Consequently, he argues that technical education is the “master key” to the alleviation of poverty, promotion of peace, conservation of the environment, and overall improvement of the quality of life. Technical education is the vehicle for socioeconomic and technological transformation. Waterhouse (2002) explains that technical education is not simply practical but is about particular types of actions taken to make and manipulate physical things for the benefit of society.

The role of technical education in facilitating industrialisation and development has been identified by many governments. This has led to the growth in the number of institutions offering technical education, diversity of technical curricula, and the number of students enrolled in the technical training programmes. Nyerere (2009) explains that in Europe, at least 50% of the students in upper secondary education pursue some form of technical or vocational training. He adds that in China, India and Southeast Asia, 35-40% are engaged in technical training while in Africa, it is less than 20%. Nyerere (2009) further reports that Rwanda has the highest enrolment in technical education at the post-secondary school level in sub-Saharan Africa at 35%. It is followed by Tanzania (13%) and South Africa (5.8%). This indicates a wide gap between sub-Saharan Africa and other regions. This situation prevails in spite of the fact that sub-Saharan Africa needs more technical skilled manpower to realise their visions to become middle-income and industrialised countries in the next twenty or so years.

According to Kwanya, Hongo and Kiplang'at (2017), technical universities offer technical training in engineering, applied sciences and technology with the aim of imparting practical skills so as to prepare their graduates for the job market. Graduates of technical universities require less training when employed. According to the report of a committee on the conversion of polytechnics to technical universities in Ghana released in 2014 (Government of Ghana, 2014), there are certain unique characteristics which technical universities exhibit. The report avers that technical universities 1) provide education and training for the world of work as the students are trained to acquire high-level employable skills for wages or self-employment; 2) have strong links with the industry and the business sector; 3) support the existing and emerging productive sectors of the economy with technical expertise and research for development; 4) are focused on practical research activities, including industry and market-driven joint research projects; 5) offer programmes that are vocationally-oriented or career-focused; 6) provide skills training at all levels – certificate, diploma, degree, and postgraduate degree levels; 7) offer courses and programmes covering a wide range of economic activities; 8) place emphasis on innovation and application of new technologies, including ICTs; 9) provide skills training from the middle level to the highest level possible; 10) have practice-oriented with smaller classes to enhance teacher-learner interaction; and 11) recruit teaching staff with professional and industrial experience over and above the ordinary academic qualifications.

The report (Government of Ghana, 2014) further adds that the fact that technical universities emphasise a close engagement with the world of work does not mean disengagement from the basic academic orientation of higher

education institutions. Engagement with the industry means bringing the world of work into the classroom and placing practical knowledge and research results at the disposal of the industry. Blending academic pursuits with practical goals of promoting societal and economic wellbeing of the population is one of the hallmarks of universities of applied sciences. While the focus is on applied research, technical universities may contribute their expertise at any point along the product development chain from basic research to commercialisation in collaboration with traditional (research) universities.

The establishment of the technical universities is expected to lead to a more diversified higher education landscape with clear mission differentiations. Technical education is designed and structured towards the empowerment of students to become entrepreneurs, industrialists and leaders in the practical future. The technical university is therefore differentiated from the research university whose mandate is to teach, train and carry out research for theoretical purposes. A technical university is expected to provide technical and vocational education and training. Also, it strives to embrace originality and innovation in all areas of technical operations. A technical university is concerned with technological transformation in research and innovation activities. Its main objectives are to find solutions of national and international problems and issues in practical ways for research and development. A technical university also engages in technical knowledge and skills transfer. It does this through mentorship of lower technical institutions and technology transfer from motivation centres to the society to acquire practical experience. Table 1 presents a comparison between technical and research universities:

Table 1: Comparison between technical and research universities

Technical University	Research University
Focus on training	Focus on education
Practice-oriented	Theory and research oriented
Applied or strategic research with focus on solving practical problems and providing technology solutions that make production systems more efficient	Scientific research with a greater focus on the development on theory and formulation of policies for the sake scholarship
Skills-driven or acquisition of employable skills	Knowledge-driven or quest for new knowledge
Focus on technology development, innovation and technology transfer	Focus on fundamental research and cutting-edge technology development
Emphasis on what must be learnt to respond to industry needs and learner interests	Emphasis mainly on disciplinary approach to learning and promotion of scholarship

Source: Adapted from Government of Ghana (2014)

According to the Commission on University Education (CUE) (2014), a technical university should exhibit these characteristics: 1) at least two thirds (2/3) of the programmes on offer in a technical university are in the applied/technological sciences; 2) at least two thirds (2/3) of the students enrolled in a technical university are in applied/technological sciences; 3) not more than one third (1/3) of the programmes in a technical university are in other disciplines; 4) at least seventy percent (70%) of the programmes and students enrolled in applied/technological sciences in a technical university are in technological areas that lead to the production of technologist graduates.

From the foregoing, technical universities can be perceived as academic institutions which offer practical-oriented training in engineering, technology and applied sciences. Most of the technical universities were formerly established as vocational training institutions. In fact, Heita (2005) contends that most technical universities have emerged from an upgrading of polytechnics to become degree-awarding institutions. One of the world's first technical universities with tertiary-level education was a mining school founded in Banská Akadémia, Slovakia in 1735 to train specialists of silver and gold mining as well as metallurgy. Other prominent technical universities include Istanbul Technical University and Technical University of Berlin. Many others were established in different parts of the world to address technical knowledge gaps specific to their contexts. In East Africa, Makerere University, the first institution of higher education, was established as a technical college in 1922 to offer training in carpentry, mechanics and building construction. In Kenya, the University of Nairobi was originally established in 1956 as a royal technical training college. When these two institutions grew to become the first universities in the region, the role of providing technical education fell on the Kenya Polytechnic and Mombasa Polytechnic in Kenya. The Kenya Polytechnic was originally established as the Kenya Technical College in 1956 to offer technical training in architecture, engineering and sciences. It became The Technical University of Kenya when it was chartered as a public university in 2013. On its part, Mombasa Polytechnic was originally established in the late 1940s as Mombasa Institute of Muslim Education and transitioned over the years through Mombasa Technical Institute and in 2013 became the Technical University of Mombasa. These are the two official technical universities in Kenya.

## 2 Technical university libraries and librarians

Technical university libraries are found within their parent institutions which are technical universities. Just like the other academic libraries, they are established to meet the information needs of the institutional publics. They cater for the information needs of their users. Nonetheless, unlike typical academic libraries which are established to support teaching, learning, and research programmes to promote scholarship in the university, technical university libraries are

established to promote research as well as the transfer of practical skills and knowledge in technical disciplines so as to facilitate innovation, research and development. Thus, technical university libraries should provide information promptly to their users to keep up with emerging trends as well as acquaint them with technical job-related knowledge and skills to solve societal challenges practically. Technical university libraries can be classified as special academic libraries. They are academic libraries because they serve academic institutions; they are special because they serve not just any academic institutions but specifically technical universities.

Szebenyi-Sogmond (1959) argued that scientific and technical libraries should operate distinctly from the other academic libraries. She asserted that this distinction should be manifested in the operations and collections of these libraries. In keeping with this point of view, the authors reviewed literature on the characteristics of technical university libraries using three parameters: 1) services; 2) collection; and 3) staffing. According to Kent *et al.* (1980), there are three basic services offered by technical university libraries. These are 1) acquisition (selection and collection development); 2) organisation (classification and identification of materials); and 3) dissemination (presentation of library materials to users in diverse forms). Although these services are similar to those offered in other academic libraries, their focus is different in technical universities.

Kwanya, Hongo and Kiplang'at (2017) suggest that technical university libraries should allow the users to borrow more titles and for a longer period because they generally take more courses than their counterparts in traditional research universities. They further suggest that current awareness offered in technical university libraries should be customised to the needs of the users, for instance, by providing profession-specific information and alerts. In Kenya, professional associations such as the Engineers Board of Kenya and the Institute of Engineering Technologists and Technicians, among others, may partner with technical university libraries in this regard. The physical library premise may also be customised into specialised spaces such as studios, laboratories or mini workshops to be useful to students taking technical courses. Technical university library users are generally technically-oriented and rely more on being shown rather than being told. Tenopir and King (2004) argue that engineers, for instance, prefer interpersonal and informal than formal channels of communication. Therefore, they tend to seek information from human sources or machines than from literature. Kwanya, Hongo and Kiplang'at (2017) also explain that technical university library users require complex reprographic services to be able to produce or reproduce large cartographic maps, 3-dimensional prints of prototype parts, industrial drawings, plans and circuits, among others.

Tenopir and King (2004) argue that engineers use internally developed content more than the externally published sources. They conclude that the use of formally published scholarly materials such as journal articles is generally lower among engineers and technologists than professionals drawn from the other disciplines. Therefore, technical university libraries need to carefully select their collections so as to enhance their relevance to their users who are largely drawn from the science, technology and engineering fields. Kurtz (2004) suggests that collections of technical university libraries should be specific and should not consist of general reading resources. This corroborates the suggestion by Cveljo (1985) that technical university library collections should consist of non-traditional literature such as technical reports, government publications, as well as proceedings of conference and symposia. Other materials could include handbooks, charts, encyclopaedia, trade dictionaries, almanacs, how-to-do-it manuals, field guides and directories. Kwanya, Hongo and Kiplang'at (2017) also suggest that given that technical university libraries serve innovators and budding industrialists, the libraries should have information materials relating to patents. This could include information on existing patents as well as the patenting process. The collections should also hold materials which support entrepreneurship and innovation. The collections should also have information materials on engineering specifications and standards; trade catalogues, pamphlets, and manufacturers' literature; information materials from specific industry players such as factories, airlines, railway corporations and research institutions, among others; professional association journals and other publications; as well as non-print materials such as videos, databases and computer software used for specific technical purposes.

Although technical university librarians in Kenya do not possess specialised training, they offer specialised services. Working either as professional, paraprofessional or support staff, these people should create an information universe which is not only information-rich but also exciting to work from. Apart from the technical skills required for their respective positions, technical university librarians need superb personal and interpersonal competencies to serve their users effectively. Some of these personal traits include passion, enthusiasm, good grooming, "spark", resilience, curiosity, self-drive, and open-mindedness. Other attributes include independence, moral integrity, action-orientation, patience, diplomacy, sensitivity, personal commitment and customer-orientation (Myburgh 2003). The skills would be useful for creating a warm, friendly, safe, and healthy physical, social and virtual library environment that encourages the members of the community to use the library.

### 3 Literature review

The term technostress was introduced by Craig Brod in his book *Technostress: the human cost of the computer revolution* published in 1984 (Brod 1984; Kupersmith 1998). He argued that the computerisation of society can change people's



attitudes and norms via the socialisation process, since the computer is held in high esteem. He emphasised that people should be aware of the impact of machines so that they control the machines rather than the machines socialising them. He described technostress as a modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner. He explained that technostress manifests itself in two distinct and related ways: in the struggle to accept computer technology, and in the more specialised form of over-identification with computer technology. Kupersmith (1998) adds that technostress is part of the price the modern generation pays for living in a time of revolutionary and dramatic change.

Technostress has also been described as a feeling of anxiety or mental pressure from over-exposure or involvement with technology. It is any negative impact on attitudes, thoughts, behaviours, or body physiology that is caused either directly or indirectly by technology. One well-documented form of technostress is the escalating problem of information overload, colloquially called “data smog” (Kupersmith 2003). Technostress can also be associated with technology related performance anxiety (the feeling that one cannot use technology systems effectively or help others to do so), role conflicts (uncertainty about one’s role), and disparity between increasing demands and decreasing resources (Kupersmith 1998). Poor user interfaces, lack of standardisation, networking and security issues, hardware and ergonomic problems may also cause technostress (Kupersmith 2003). Technostress is people’s reaction to technology and its impact on them. It is becoming more prevalent with the increasing ubiquity of technology. Its impact permeates all spheres of life. Prabhakaran and Mishra (2012) also explain that technostress results from poor technological change management. They explain that technostress is manifested by multitasking madness (inability to multitask efficiently), burnout, fatigue, frustration, withdrawal, and information overload.

Several scholars have studied technostress in libraries. Ennis (1997) studied technostress in the reference environment of college and research libraries in the United States of America and concluded that the majority (51 percent) of reference librarians experienced technostress. A study by Kupersmith (2003) also revealed that 59 percent of librarians had experienced increased levels of technostress in the past five years prior to 2003. The study also found that 65 percent of those who had experienced increased technostress considered it a serious problem. Respondents to Kupersmith’s (2003) study also identified information overload, networking problems, security issues, computer hardware and ergonomics, and vendor-produced databases as some of the causes of technostress in their lives. Other causes of technostress were identified as new things to learn or monitor constantly; irrational patron expectations of technology; dealing with other people’s technostress; managing electronic subscription access; high volumes of spam; un-described, unannounced, uncontrolled changes; working around limitations in library catalogue systems; and migrating to a new library system. Bichteler (1986) explains that some librarians have reported a personality change as a result of being too technology-oriented. As a consequence, they have reported being more irritable and impatient when dealing with unorganised or illogical people. The librarians have also reported that they have increasingly lost their conversational capacity as a result of being more exposed to technology than human beings.

Prabhakaran and Mishra (2012) further explained that librarians have indeed experienced physical and emotional stress in their efforts to adapt to the emerging technologies resulting in higher levels of absenteeism and turnover. The situation has been exacerbated by the rapid pace of technological change (usually at the whims of vendors), lack of standards, expanding roles of librarians, rising costs of technology against dwindling library budgets, high expectations from users emanating from the belief that information is instantly available through technology, and information overload.

Isaacson (2006) argues that one way of dealing with technostress is by libraries seeking to only meet the needs of users, not their wants. There is contention, however, on who and how to determine library users’ needs and wants. Isaacson (2006) justifies his view by explaining that a library should not try to compete with “Barnes & Noble”<sup>1</sup>, which is interested in direct profits. He concludes that libraries should not experiment with populist ideologies and technologies but should be brave to tell the users that some questions need to be sifted, refined, checked in multiple sources, and perhaps even reframed before they can be answered adequately. He admits that there are occasions when the librarians may be wrong, but he also emphasises that the users cannot also always be right. He cautions that there is no need for “Wal-Mart greeters”<sup>2</sup> in libraries. Stephens (2006) also suggests that modern librarians should control technostress by not adopting technologies just because it is “cool” to do so.

Kupersmith (2003) explains that moderate stress can be beneficial and stimulating. However, he adds that severe and prolonged stress can have harmful physiological and psychological effects. It is also important to note that technostress is just one form of stress. In fact, it is rarely exhibited alone. It often synergises with other forms of stress to present compounded symptoms and effects. Therefore, managing technostress requires a holistic approach. Prabhakaran and Mishra (2012) assert that technostress management is critical to librarians since most of them are older and are prone and are exposed to more stress factors and psychological disorders.

1 An online bookstore

2 Workers stationed at the door of stores welcoming customers with warm greetings

#### 4 Rationale and methodology of study

From the foregoing, it is clear that technostress is real. It is also clear that it affects the personal and professional lives of librarians. Only one study on librarians in Kenya exists. Kwanya, Stilwell and Underwood (2012) investigated how academic librarians in Kenya and South Africa cope with the impact of technostress and technolust. In this study, they found that more than three quarters of librarians in the two countries experience technostress with more than half of them stating that it was increasing. This study considered all academic librarians. It does not mention technical university librarians because no technical university had been chartered in Kenya at the time of the study. As stated earlier, technical university librarians operate in unique environments created by unique users, collections and services. Given the higher use of technologies in their contexts, technical university librarians are more vulnerable to technostress than their counterparts in other library typologies. There is need to understand the prevalence and effect of technostress on technical university librarians in Kenya as a means of proactively managing it by sensitising the interested parties about it. The objectives of the current study were to investigate the nature and extent of technostress among technical university librarians in Kenya; the factors causing technostress among the librarians; the effect of technostress on their professional and social lives; as well as how the technical university librarians in Kenya are coping with technostress. The authors also recommend strategies which technical university librarians can use to prevent or adapt to technostress.

This study was designed as a descriptive study applying a cross-sectional survey research method. According to Fink (2012), a cross-sectional survey provides a snap-shot of the views of the respondents at a specific point in time. Luepker (2004) adds that cross-sectional surveys are useful to unravel associations and causal connections between variables. This study used this method to assess the opinions, thoughts and feelings of the technical university librarians in Kenya about the prevalence of technostress and how it affects their personal and professional lives. It relied on the perceptions of the participants to unravel the prevalence and effect of technostress in technical university settings in Kenya. Primary data was collected from all professional librarians in the two pioneering technical universities in Kenya – the Technical University of Kenya and the Technical University of Mombasa. The data was collected using semi-structured questionnaires. Additional data was collected from secondary sources using documentary analysis. The data was analysed and presented using descriptive statistics.

#### 5 Findings and discussions

A total of 15 professional librarians from both universities participated in the study. Of these eleven (11) were female while four (4) were male. This gender distribution upholds the perception that librarianship is a gendered profession which is dominated by ladies. However, there is need for further research on this before making an appropriate conclusion in this regard. In terms of education, the highest levels attained by the respondents at the time of the study were PhD (1), Master's (5) and Bachelor's (9). According to the guidelines of the Kenya Library Association (KLA), professional librarians need at least a Bachelor's level training. This implies that all the respondents were professional librarians according to KLA's definition. The fact that all the respondents were professional librarians also implies that they were expected to have both the professional and interpersonal competencies to work as librarians. All the librarians had served in their respective current stations for more than three years. Thus, they had the requisite experience to provide opinions on technostress in the context of their libraries. The other findings of the study are presented and discussed hereunder. Because of the low number of technical university librarians in Kenya, the authors were not interested in statistical but descriptive analysis of technostress.

##### 5.1 Extent of technostress

All the respondents confirmed that they have experienced technostress. They were also of the view that technostress is widespread, not just among technical university librarians but among other librarians. These findings indicate that technostress is a prevalent condition which is currently affecting many professional librarians in Kenya. However, a search on Google Scholar of publications on technostress amongst librarians using Harzing's "Publish or Perish" software yielded only eighteen (18) papers. The first paper was published in 1995 while the latest was published in 2016. This implies a dearth of publications on the subject. Nonetheless, the papers generally report a high prevalence of technostress among librarians. Yuvaraj and Singh (2015) investigated technostress among university librarians in Delhi and concluded that there exists a high level of technostress among library professionals engaged in university libraries in Delhi. Ahmad *et al.* (2009) conducted a study on technostress amongst academic librarians in Malaysia and reported high prevalence. Generally similar conclusions were made by Ofua and Pereware (2013), Ahmad *et al.* (2012), as well as Isiakpona and Adebayo (2011).

Yuvaraj and Singh (2015) argue that technostress is rampant among academic librarians because of their drive to excel and meet the dynamic needs of their users. This often leads them to embrace the tools the users embrace. Given the diverse interests and preferences of the users, this inevitably leads to technostress. Bichteler (1987) associates technostress among librarians to widespread automation as a means of meeting the needs of users and enhancing library

processes. She points out that technostress is not only experienced by the librarians but also by the users. She argues that technostress begins with users and then gets transferred to the librarians as a consequence of their efforts to satisfy the needs of the users. Given that the level of technology use in library environments is likely to increase in the future technical universities need to be conscious about technostress. Harper (2000) cautions that technostress has the potential to move beyond the individual employees and spread to all the employees.

These findings of the current research, however, contradict Poole and Emmett (2001) who reported that librarianship was ranked among the 25 least stressful occupations in the 1990s. This reinforced the publicly held image that librarianship is not a technological field. In fact, librarianship was listed alongside teaching and nursing as a comfortable career for ladies who were traditionally also meant to be homemakers. This view partially contributed to the high number of ladies in the profession compared to men. Saunders (1999), however, points out that many librarians are experiencing physical and emotional stress emanating from the struggle of adapting to the emerging information universe which is increasingly dominated by complex technologies.

## 5.2 Nature of technostress

The librarians indicated that they have experienced physical, cognitive, affective and behavioural forms of technostress. They said that they have experienced physical technostress symptomized by dry mouth and throat, physical exhaustion, tired eyes, headaches, and muscular tensions. Cognitive technostress has been evidenced by an inability to concentrate and mental fatigue while the symptoms of affective technostress were identified as anxiety, irritability, depression, nightmares and psychological fatigue. Behavioural technostress has occurred in the form of avoidance or withdrawal, impulsiveness, insomnia and lack of appetite. Other studies on technostress among librarians have also generated similar results and found that technostress is indicated by symptoms such as feelings of fear, headaches, mental fatigue, panic, intimidation, exhaustion, and frustration (Champion, 1988; Kupersmith, 1992; Van Fleet and Wallace, 2003). Roose (1986) averred that librarians using technology often complained of problems associated to eyes, head, back, neck, shoulders and wrists, especially eye strain, back pain and headaches. The findings of the current and cited studies demonstrate that technostress affects all the faculties of the person. Essentially, it affects the whole being. Thus, it has the potential of taking control of one's life and dictating thoughts and actions. Therefore, it should be taken seriously. Otherwise, academic librarians stand the risk of losing themselves in the midst of the rat race to catch up with technology. Librarians need to accept the fact that they cannot possibly meet the technological needs of all the users at all times. They also need to recognise that technologies however helpful are only tools supporting their professional work. They should not feel helpless or inadequate without technology. Similarly, they need to identify and strategically use only technology which augments their capacity to meet the needs of their uses and not just any technology in the marketplace.

## 5.3 Factors causing technostress

According to the respondents, technostress among them is mainly caused by technological dynamism and rapid change in their work environment. Thus, they are constantly playing catch-up as new technologies to monitor or use emerge daily. Other causes of technostress include feeling of inadequacy to handle technology (performance anxiety); inadequate ICT systems; feeling of insecurity in cyberspace due to unforeseen risks and threats; information overload; lack of standardisation of technologies; poor user interfaces; pressure from users to adopt technology (irrational expectations from users); and growing volumes of spam. These findings concur with Yuvaraj and Singh (2015) who posit that technostress is techno-centric. Ahmad *et al.* (2012) also point out that although technostress has historically been a part of libraries, the situation is now worse than ever before due to a growing ubiquity of current technologies exemplified by the Internet. Similar views are shared by Tiemo and Ofua (2010), Ennis (2005), and Harper (2000). Ahmad *et al.* (2012) posit that technostress is caused by techno-overload; techno-invasion; techno-uncertainty; techno-complexity and techno-insecurity.

The respondents also pointed out that another cause of technostress is poor ergonomics leading to physical fatigue thereby compounding the ICT-related challenges. Bichteler (1987) argued that poor ergonomics in the library work spaces may cause visual and musculoskeletal problems. Roose (1986) asserted that most of technostress problems are associated with the work space design which required librarians to remain in the same position for many hours. Bichteler (1987) recommends that library work spaces should accommodate a great variety of individual shapes and sizes. She also suggests that the workstation must be flexible and must take into account the integration of chair, terminal and work surface.

## 5.4 Effect of technostress

The librarians stated that technostress has affected their personal and professional lives by causing or aggravating burnout, demotivation, fatigue, indifference, personality change (irritable, illogical, impatient), poor decision making, poor performance, and social isolation. All except one of the respondents said that these effects are either very serious or serious. The other one respondent reported minimal effect of technostress on personal and professional life. These

findings demonstrate that technostress has a negative effect on the personal and professional lives of technical university librarians in Kenya. Kwanya, Kibe and Owiti (2016) conducted a study on the image of academic librarians in Kenya. They concluded that in the public psyche, a librarian is a person with either a timorous or an austere disposition; loves silence, likes books, and suffers people; does not laugh or is crotchety, withdrawn and fearsomely protective. The authors of the current study are of the view that technostress is one of the factors which contributes to and sustains the poor image of librarians. Yuvaraj and Singh (2015) concur and stress that technostress affects librarians' capacity to make right decisions and work. Harper (2000) avers that technostress causes absenteeism and staff turnover, higher cost for retaining new staff and an increase in litigation costs related to workplace stress.

### 5.5 Coping mechanisms

The librarians are coping with the effects of technostress through change management, citizen librarianship (involving users to support ICT in the library), ICT training, improving ICT infrastructure, modesty (moderation), planning for ICTs, reducing dependence on technology, reducing multi-tasking, role clarity, as well as time management and scheduling. These findings generally concur with Yuvaraj and Singh (2015) who suggested that librarians can cope with technostress through adopting user-friendly computer hardware and software; taking frequent breaks; meditation; cognitive or message therapy; equitable load distribution; slow down and concentration; using less addictive devices; breaking the cycle of being a "24x7" technology user; avoiding multi-tasking; blocking distractions; taking stress inoculation training; and establishing a balance between work and social life.

Kwanya, Stilwell and Underwood (2012) suggest that universities can support librarians can to cope with technostress by the libraries moving at the same pace with the development of systems in the market; considering staffing needs while implementing technology projects to ensure smooth deployment; keeping a record of passwords; providing continuous training of librarians to develop skills in the emerging technologies; embracing effective communication; developing and employing effective change management plans; realistic time scheduling to reduce attempts to accomplish different tasks at once; improving technological infrastructure; providing adequate resources to support technology projects in the libraries; providing ample time to learn and implement the new systems; establishing and using communities of practice to facilitate effective sharing of ideas and best practices; encouraging staff to attend only to the most relevant, personally useful and necessary emails and alerts on the various media and technological gadgets; as well as developing and maintaining comprehensive technology standards.

## 6 Conclusion

From the findings, the authors conclude that technostress is widespread amongst technical university librarians in Kenya since all the respondents confirmed that they have experienced technostress. It also emerged that the librarians have experienced physical, cognitive, affective and behavioural forms of technostress exemplified by dry mouth and throat, physical exhaustion, tired eyes, headaches, and muscular tensions; inability to concentrate; anxiety, irritability, depression, nightmares and psychological fatigue; avoidance or withdrawal, impulsiveness, insomnia and lack of appetite. Technostress among technical university librarians in Kenya is largely caused by technological dynamism and rapid change in their work environment. Nonetheless, poor ergonomics leading to physical fatigue thereby compounding ICT-related challenges can also cause technostress among technical university librarians in Kenya. It is also evident from the findings of the study that technostress has affected the personal and professional lives of technical university librarians by causing or aggravating burnout, demotivation, fatigue, indifference, personality change (irritable, illogical, impatient), poor decision making, poor performance, and social isolation. Given that the effect of technostress on the personal and professional lives of the librarians is serious, technical universities should mitigate them proactively so as to reduce its effect on the smooth running of the libraries.

## 7 Recommendations

The authors recommend the following strategies to help technical university librarians in Kenya to avoid or mitigate technostress:

1. Technical university libraries should develop comprehensive ICT plans. Such plans should clearly state their technological priorities. They should also put in place policies which discourage ad hoc uptake of technological devices and techniques outside the established plans.
2. Technical university librarians should be encouraged to understand that their profession is not only about technology and that technology is only one of the many tools which they can use to deliver services to their clientele. Although they should be open to using appropriate technology to make services more customisable and accessible, they should be sensitised to appreciate the fact that their profession is not completely dependent on technology. Professional associations as well as library schools can champion this campaign.

3. In the business realm, there is a perception that the customer is always right. In librarianship nothing can be further from the truth as this saying. Customers are only quasi-right. Therefore, librarians should be advised and facilitated to apply their discretion when deciding technologies to use in the libraries and how. Indeed, they are encouraged to solicit and consider user input but they should appraise this input and selectively deploy what is most appropriate. The librarians should be courteous in this process and commit to inform the users when their suggestions are either put aside or amended so as to fit in the overall library strategy and plans.
4. Technical university librarians should avoid peer pressure to keep pace with each other given that libraries are not in direct competition with one another. Consequently, they should not feel obligated to adopt the same technologies adopted by other libraries. Each library serves users with unique attributes in specific contexts. Therefore, librarians should not adopt technologies merely to look “cool” and acceptable. Each technological tool or approach should be assessed on its own merit and justified within the context of each technical university.
5. Technical university libraries should regulate the workloads librarians bear. This can be done through a comprehensive job analysis and evaluation. This way, the librarians will understand their roles relating to technology. Therefore, they will commit time and resources to understanding and applying the specific technology thereby avoiding being overwhelmed or intimidated by emerging or prevalent technologies. Furthermore, this will help the librarians to avoid the overbearing feeling of uncertainty about and fear of emerging technologies.

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# Utilisation of Online Public Access Catalogue (OPAC) at the International Health Sciences University Library, Uganda

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## Abstract

To ensure an enabling environment for studies and research, institutional libraries provide well-stocked current information resources for research and study. They also need professionally trained personnel to organise available information materials and assist users in accessing them. Libraries house thousands of different information sources and resources making their access and retrieval a complex issue to many users. To overcome this, libraries are adopting the use of information technology through automation of their systems and procedures. One of the ICT-based systems is the Online Public Access Catalogue (OPAC) which, among other functions, displays what is available in the library and where such materials can be obtained. This chapter examines the utilisation of the OPAC by undergraduate students at the International Health Sciences University (IHSU) in Uganda. A case study research design was adopted and 260 questionnaires administered to undergraduate students. The response rate was 88.8%. In addition, interviews were conducted with two library staff triangulated by observation for validity. The study revealed that 61% of undergraduate students utilised the OPAC citing reasons like checking for the availability of items (38%), identification of particular titles (18%) and identification of items based on subject (16%). The user satisfaction level of the OPAC was low and users identified the challenges faced. The authors recommend strategies to enhance the effective use of OPAC.

**Keywords:** Online Public Access Catalogues, library users, library automation, university libraries, Uganda

## 1 Introduction

To ensure an enabling environment for study and research, institutional libraries provide current information resources. They also provide professionally trained personnel to organise available information materials and assist users in accessing them from their collections. Onuoha, Umahi and Bamidele (2013) note that libraries house thousands of different information sources and resources making their access and retrieval a complex undertaking for many users. To overcome this, libraries are adopting the use of information technology through automation of their systems and procedures. One of the technological systems used is the Online Public Access Catalogue (OPAC), which to among other functions, enhance access to the library collection. OPAC is the most modern and efficient form of catalogue as it possesses all the advantages of other forms of catalogues due to its flexibility (Omoike & Oke, 2014). Since libraries contain millions of information carriers, users should use OPACs to identify and select documents they require. However, before the emergence of OPACs, users had to search physical card catalogues using various access points (for known items) to find relevant information about needed items from the library collection. Where the item was unknown, the subject catalogue was used. This made the searching procedure a rather cumbersome one, time consuming and usually slow (Adenike & Akin, 2014). OPACs deal with the storage of the bibliographic records of all the documents in a library collection on the computer memory disk and it is integrated with the total library system including acquisition, cataloguing, circulation and other auxiliary services (Onuoha, Umahi & Bamidele, 2013). This allows users to quickly search the computer-held files to identify and locate any relevant information resources from the collection in the most efficient way. With an OPAC, users can easily access such relevant information as item loan status, item location details, copies on particular title(s), and copies on particular subject(s) which eases information access and retrieval by the library users. On the other hand, when an OPAC is not used, users spend more time searching for information materials, and may end up not getting what they want, even when such materials exist in the collection.

Despite the benefits that come with OPACs in libraries, various studies have continued to record poor utilisation of OPACs by the users. A study by Fabunmi and Asubiojo (2013) on the use of OPAC by the students of Obafemi Awolowo University in Nigeria noted that although many students were aware of the OPAC, few of them made use of the tool. Similarly, the study by Sankari *et al.* (2013) on the use of OPAC noted that students made least use of OPAC search options due to some challenges faced.

## 2 International Health Sciences University Library

The current study focused on OPAC usage by undergraduate students at the International Health Sciences University, Uganda. The International Health Sciences University (IHSU) was established in 2008 and offers health-related courses both at undergraduate and graduate levels. Unlike undergraduate students who are fulltime at the university, the graduate

students are remote learners. The university library holds over 6000 print volumes of textbooks, journals, research reports, internship reports and audio-visual materials (IHSU, 2013). The library has also subscribed to a number of online databases offering access to electronic journals and textbooks. Each item within the library's print collection is labelled with an appropriate classification number (call number) on the spine and barcode number at the back. The sections within the library are also well labelled as Open Shelf Section, Reference Section, Reserve Section and Librarian's Office. This labelling supports quick access (identification, location and retrieval) of reading materials. Registered students can borrow books, renew and place holds among other services.

In 2009, the library automated its operations using Koha Integrated Library Management System and a web-based OPAC was provided to help users identify, locate and retrieve the needed materials from the collection with ease and also to ensure maximum use of the collection. The library was equipped with computers connected to both local area network and Internet facilities to support the use of OPAC. Additionally, the university has two laboratories with fully networked computers which also offer access to the OPAC. In 2013, IHSU Library performed a stock inventory. The statistics showed that over 600 volumes from a total collection of over 5000 hard copy information materials were never used from the time they were put on the shelves (IHSU, 2013) yet the OPAC was installed to promote use of the collection. Challenges in accessing information were reported as the reasons for this situation. This chapter assesses the utilisation of the OPAC of IHSU Library.

### 3 Problem Statement

With a fully functioning web-based OPAC in place, students at IHSU were expected to access the library resources using the OPAC, since it possesses all the advantages over the other forms of library catalogues (Onuoha *et al.*, 2013). For instance, OPAC enables library users to quickly and effectively search computer-held files in libraries as a means of getting to know the resources the library has. Students should therefore use it for the effective use of the library collection. Aina (2004) notes that when library users do not use OPAC, they spend more than the time required in searching for information materials and sometimes end up not getting what they want, even when such materials exist within the collection.

According to IHSU (2013) information access was reported to be the major challenge to the effective use of the library collection by the students. The report further noted an over-reliance on library staff by the users to identify, locate and obtain print textbooks and other information sources from the collection. And in instances where the staff were unable to help, users walked straight to browse the shelves to obtain the needed materials. Consequently, the users could not effectively utilise the collection since, in addition to spending more than the time required in obtaining needed textbooks and other materials for their assignments, they sometimes missed out on such materials even when they existed on the shelves.

This situation goes against Ranganathan's law of library science which calls upon libraries to operate in a way that saves the time of the reader (Ranganathan, 1931). According to Ranganathan, the library operations and functions in relation to its collection must be arranged and organised in an inviting, clear, and obvious way so as not to waste the time of the users as they search and retrieve materials they need. Saving the time of the reader means providing efficient and thorough access to reading materials. This chapter assesses the utilisation of OPAC at IHSU. The aim of the study on which this chapter is based was to examine the utilisation of the Online Public Access Catalogue (OPAC) by IHSU undergraduate students with a view of promoting effective access to information materials from the library. The specific objectives were to establish the state of utilisation of IHSU OPAC by undergraduate students; identify the benefits derived from using OPAC by IHSU undergraduate students; analyse the challenges faced by IHSU undergraduate students in using OPAC; and propose strategies to improve the use of OPAC by IHSU students.

### 4 Literature Review

Various studies about the subject have been carried out although none has specifically addressed issues related to OPAC utilisation at IHSU. Sankari *et al.* (2013) conducted a study on the use of OPAC by students and faculty members of Unnamalai Institute of Technology in Kovilpatti, India. The study revealed that 57.69% of the users consulted OPAC to establish the availability of the required document in the library; 14 (10.77%) to establish whether the required document was issued/checked out; and 41 (31.54%) to establish the location of the required documents. The study further revealed that 95.38% of the respondents approached the OPAC by author, 91.54% by title and 33.08% by subject, in addition to other access points that were rated low. When all approaches were compared, it was revealed that query approach through the author string was the most used followed by title, subject, series, and classification number and call number. Kumar (2011) argues that OPAC revolutionises access to bibliographic information through search capabilities such as keyword searching, searching by title, searching by author, searching by subject and Boolean searching. Some of these were not possible in the traditional catalogue. With all these search strategies, the user is always guided to get the most relevant resources from the library's collection. Aina (2004) explained that the use of OPAC plays a great role in



retrieving information resources from the library collection by allowing library users to quickly and effectively search the computer-held files of the library's collection. Where OPAC is not used, library users spend more than the time required in searching for information materials and end up not getting what they want, even when such materials do exist within the collection. Omoike and Oke (2014) argue that the major impact of OPAC tool is that it offers off-campus access to the collection, thereby allowing library users to search the library's collection from location outside the library walls in addition to offering timely access to the resources.

Scholars have also pointed to the various challenges that library users face while using the OPAC. For instance, Thanuskodi (2012), who studied the use of Online Public Access Catalogue at Annamalai University Library, established that 95% of the respondents lacked knowledge about how to use OPAC while 70% indicated that it was confusing to use. Other challenges pointed out by this study were lack of assistance from library staff, slow Internet speed and lack of computer systems. In addition, a study by Sankari *et al.* (2013) also revealed lack of knowledge about OPAC by respondents, complicated usage, lack of on-screen help, slow speed, and lack of computer systems. However, these challenges could not be generalised to IHSU without empirical evidence.

Onuoha *et al.* (2014) also identified challenges and recommended equipping library users with the necessary skills as a strategy of improving the use of OPAC. The study noted that since most of the challenges associated with the use of OPAC often have to do with lack of knowledge on how to utilise it. University libraries should ensure that students are adequately trained to maximise the use of the OPAC. The study emphasises that these user education programmes should be periodical to enable the users to acquire basic skills and cater for those students who might have missed a previous training. Thanuskodi (2012) also recommended education programmes and seminars on the use of different techniques and strategies in retrieving relevant information about the documents. These instructional programmes would equip library users with the relevant skills and enhance their knowledge for searching the OPAC. Similarly, a report by Mulla and Chandrashekar (2009) on the effective use of OPAC at the libraries of Engineering Colleges in Karnataka identified some of the measures that can be employed to improve the utilisation of OPACs by students. These included training users to acquire basic skills in searching, providing assistance to the users of OPAC by the library staff, and also putting in place user orientation programmes, keeping OPACs up-to date by adding new entries quickly and replacing the old entries, distributing up to-date library guides explaining how to use the OPAC, and also locating the OPAC closer to the book stack area so that users can use it conveniently (Mulla & Chandrashekar, 2009).

A review of the above studies, although about OPAC utilization, indicates that no such study has been conducted in an academic library in Uganda. What the literature reveals cannot be generalised to IHSU without empirical evidence, hence, the justification for this study.

## **5 Methodology**

This study leading to this chapter was carried out at IHSU, a privately-sponsored university located in Namuwongo, a Kampala suburb, in Uganda. The study adopted a case study research design and a mixed research approach employing both qualitative and quantitative methods. The population of the study comprised 740 undergraduate students registered with the library and six library staff. Simple random sampling was used to select 260 undergraduate students to whom questionnaires were administered. The sample size was determined using Taro's Sample Size Calculation Formula with an acceptable sampling error of 5% or 0.05% (Ahuja, 2001). The process involved generating a list of the borrowers' identification numbers of the 740 undergraduate students from the system database. These borrowers' numbers were displayed in excel sheets which were printed, cut into separate pieces, folded and then placed in a container. The folded pieces were then picked one apiece until the total number of 260 pieces, representing 260 respondents, was reached. The borrowers' identification numbers had the corresponding contact address (telephone number and email address) that was used to contact them. This ensured a bias-free sample. Additionally, purposive sampling was used to select the library staff, guided by the job roles and responsibilities, as guided by the University Librarian. Consequently, only two library staff participated in the study. Data was collected using questionnaires administered to the 260 students, interviews with the two library staff and observation.

Quantitative data analysis involved scrutinising the filled questionnaires to identify and minimise as far as possible, errors, incompleteness or gaps in the data collected. SPSS was used for analysis. Results are hereby presented using frequencies and percentages, presented in tables. Qualitative data was analysed using descriptive method (Patton, 2002) and the findings presented using verbatim quotations, photographs and images.

## **6 Findings and Discussions**

A total of 260 questionnaires were administered to undergraduate students IHSU out of which 231 were returned, constituting a response rate of 88.8%. In addition, two librarians were interviewed. The findings collected using questionnaires were supplemented by data collected using interview and observations.

### 6.1 Composition of respondents

The students that responded to the questionnaire included the Bachelor of Nursing Science (24%), Bachelor of Public Health (29%), Bachelor of Medical Laboratory Science (19%), Bachelor of Business Administration (10%), Diploma in Clinical Medicine (12%) and Diploma in Public Health (6%). This implies that the majority of the students that participated in the study were pursuing Bachelor of Science in Public Health and Bachelor of Science in Nursing.

### 6.2 Current status of the use of OPAC

The study sought to find out whether the students were using the OPAC to access information resources. It was established that 61% were actually using it while 39% were not. It indicates that more students used OPAC to access information materials from the library. This was attributed to the fact that OPAC is the only official information retrieval tool used by IHSU Library. One student hinted:

*“For me, I was told by the librarian to use OPAC whenever I want to search for books”*

This finding affirms Ansari (2008) who investigated the use of OPAC in five libraries in New Delhi. The study revealed that a bigger percentage of the library users used OPAC as a search tool for accessing and retrieving documents from the libraries' collections.

### 6.3 Purpose of using OPAC

OPAC was used majorly to check for the availability of items (38%), identifying particular titles (18%), and identifying items based on subjects (16%). However, less use of OPAC was indicated in the areas of identifying item location details (10%), checking for loan status of required items (9%), placing reservation on loaned items (3%) and renewing items that were overdue (6%). This revealed that the students are not using OPAC to its full capabilities. They attributed this to lack of adequate knowledge about OPAC use and its services as evident in one of the following verbatim remarks:

*“I did not know that I can also renew a book that I borrowed. If I knew it, then why not? This would even save my time of coming here.”*

The above findings were also supported by the comments made by one of the library staff who pointed out that there were doubts on users making proper use of OPAC as echoed in the following statements:

*“Users seem not to be making proper use of it [OPAC]. After spending much time on the OPAC terminals, they come to the issue desk with titles of books written on pieces of paper asking for their location even when these items are out on loan. At times, after searching for books through the OPAC terminals they move around the shelves, only to realise that the books they want are out on loan”.*

The above findings are in agreement with Onuoha *et al.* (2013) who examined the use of OPAC by final year students in Redeemer's University (RUN) and University of Agriculture Abeokuta (UNAAB), Nigeria. The findings revealed poor OPAC utilisation among the university students.

### 6.4 Orientation about OPAC use

Kumar and Vohra (2011) assert that users' knowledge and skills are an essential factor for searching the resources of a library efficiently. When lacking, it becomes difficult for the users to search for materials through the OPAC. It was established that only 66.9% had had orientation on OPAC use while 33% had not. Students, although aware of the orientation week that is organised during the first week of the academic year, indicated that they were more engaged in other activities to ensure they settled in and got ready for starting lectures. In fact, one the library staff revealed that much as the library organises an orientation session for new students, very few attended it. In addition, there were no OPAC user guides at the OPAC terminals to guide the users.

Table 1: Search Elements Used to Query OPAC

Search elements/options		Responses	
		Frequency	Percentage (%)
1	Author	36	15.45
2	Title	78	33.47
3	Subject/Keyword	119	51.07
4	Call Number	0	0
5	Barcode	0	0
6	ISBN/ISSN	0	0
<b>Total</b>		<b>233</b>	<b>100</b>

Source: Research Data

As shown in Table 1, the majority (51.07%) of the students used 'Subject/Keyword' option to query the OPAC while 'Call number', 'Barcode number' and 'ISBN/ISSN' were never used. This significantly impacted on the use of the collection. Reasons given for this were lack of sufficient prior knowledge about the required information materials. For

instance, one stated that:

*"I have never used them because I do not know where and how to get either call number or barcode number".*

The above findings are contrary to the findings of Sankari *et al.* (2013) who examined the use of OPAC by students and faculty members of Unnamalai Institute of Technology in Kovilpatti (Tamil Nadu). The findings revealed that library users used Author, Title, Subject, Call Number, ISBN, ISSN and Barcode Number to query the library OPAC.

The implication of the above findings is that since the OPAC is the most modern and efficient form of catalogue, users should use it to pursue various search strategies and select the most relevant information materials. According to the library staff, OPAC allows users to adopt search strategies that exceed those that can be used with the card catalogue such as author, title, subject, and keyword. The users can extend their search using Boolean operators (such as AND, OR, NOT) and by combining search strategies (such as title and author, subject and author). It is therefore important that the library department organises OPAC awareness campaigns for the users to understand how they can make the best use of the tool to their advantage.

### **6.5 Access to the OPAC**

The students mainly used the OPAC in the library (75%) as compared to the computer laboratory (25%). This is attributed to the distance between the library and computer laboratories which is about 30 meters. The users reported that it is inconveniencing to use OPAC from the computer laboratories yet the books are in another building.

### **6.6 User satisfaction level with OPAC usage**

The majority 131 (92.25%) of the students were not entirely satisfied with the use of OPAC. They cited their ignorance about how it works. For instance, one said as follows:

*"How can I be satisfied when I am not very conversant with OPAC?"*

These findings are similar to those of Kumar (2011) who examined Online Public Access Catalogue usage at Panjab University library and found that only a small portion of the users were satisfied with the working of OPAC. Ruzegea (2012) argued that proper use of OPAC eventually leads to increased usage of the library materials and other relevant information in library and outside the libraries.

It is important that steps are carefully thought and taken to ensure that users make the best use of OPAC and are satisfied with it. Ruzegea (2012) argues that this is a challenge that the library management should address for effective use of OPAC by the users. There is need to orient the users about OPAC so as to ensure that they understand it very well and become familiar with the way it works.

### **6.7 Benefits of using OPAC**

The second objective of this study sought to identify the benefits derived from using the OPAC. The major benefits identified were saving users' time and easing selection of relevant materials. This is in agreement with Olufunmilayo and Airen's (2015) assertion that the major reason for OPAC use was because it saves users' time and energy. Users do not need to spend time scanning through the library card catalogues before they know the shelving locations of books. OPAC thus minimises the time and stress of scanning through the shelves for books, thereby, supporting the fourth law of Ranganathan's laws.

### **6.8 Challenges faced in using OPAC**

The students also highlighted the challenges associated with using the OPAC. These included lack of proper knowledge and skills in OPAC use (66.9%) yet users' knowledge and skills is an essential factor for searching the resources of a library efficiently. When it is lacking, it becomes difficult for the users to search for materials through OPAC (Kumar & Vohra, 2011).

Another challenge related to inadequacy of computers in the library. This was confirmed by the computer to student ratio which was established to be 1:185. Mulla and Chandrashekara (2009) argued that shortage of system terminals in the library hinders the users' efforts to use OPAC tool. Similarly, Omoike and Oke (2014) recommended that there should be adequate computer terminals in the libraries to reduce the time students have to wait before using the system. This should be considered a top priority by library management. The library management should provide facilities to effectively meet the students' needs.

The students also sited insufficient staff assistance especially during break and evening hours. This was, however, attributed to the low staffing. To confirm this, the staff: student ratio was established to be 1:145. Sankri *et al.* (2013) argued that OPAC is a computer-based and supported library catalogue designed to be accessed via terminals so that library users may directly and effectively search for and retrieve bibliographic records within the assistance of a human intermediary such as a specially trained member of the library staff.

### 6.9 Suggestions to improve the use of OPAC

The researchers sought suggestions to address the challenges identified. These were sought from both the library staff and the students. Key suggestions included equipping users with sufficient knowledge and skills on OPAC use; increasing the number of computers in the library; setting up a reference desk for supporting OPAC users; improving Internet connectivity; and providing an alternative power supply. In fact, Onuoha, Umahi and Bamidele (2013) suggested that user education programmes should be organised to enable a user acquire basic skills of OPAC use. They further asserted that these user education programmes should be periodical to cater for the students that might have missed previous trainings. Similarly, Kumar (2011) suggested that to facilitate the users, the university library should organise quality instruction programmes on the use of different techniques and strategies in retrieving information about the various documents housed by a library. In addition, Onuoha and Umahi (2013) suggested that libraries should endeavour to provide and install more computer systems to enable more students to use the library OPAC. Sankri *et al.* (2013) expounded on the relevance of computer systems in relation to OPAC use when they suggested that an OPAC is a computer-based and supported library catalogue which is designed to be accessed via computer terminals. Therefore, for one to access OPAC, there must be a computer system in place. Further support of the suggestions is by Sankri *et al.* (2013) who suggested that assistance from a specially trained member of the library staff is an important element for effective use of OPAC. Thanuskodi (2012) argued that it is unlikely that all users will always be equipped with the basic skills of using OPAC. He suggested that libraries should set up reference desks to assist the users in using OPAC. In addition, Onuoha *et al.* (2013) recommended alternative sources of power supply as one of the strategies to enhance the use of OPAC among users.

## 7 Conclusion

This study revealed that students used the OPAC to check for the availability of books in the collection, location details of such books, books available on particular subjects, and available copies on particular titles and that they used title, author and subject as search elements to query the OPAC. However, lack of sufficient knowledge and skills of use coupled with limited computer terminals, absence of adequate staff assistance, and poor network connectivity, contributed to low utilisation of the OPAC at IHSU. Consequently, students missed some available resources that would satisfy their information need. In addition, they wasted a lot of time checking the shelves for items they would have accessed much faster. On the other hand, OPAC is a very significant tool in enabling access and use of library materials and eases access if it can be accessed off campus, say when one is at home. It is therefore prudent that measures are put in place to promote effective OPAC utilisation, not only among undergraduate students at IHSU, but whenever possible.

## 8 Recommendations

The authors recommend frequent OPAC user education programmes to be conducted through seminars, lecture talks, and library orientations/tours. These should be carried out during times which are convenient to the students preferably after they have settled in the university. In addition, universities should consider integrating information literacy programmes in the curriculum for all university programmes as it would enforce participation. An information literacy programme would contribute to building learners' capacity to effectively utilise OPACs and other services provided by academic libraries. It would also enable them to develop information searching skills and competencies to meet the demands of effective use of OPAC for searching the library collection.

Furthermore, more computers should be provided in the library. Some of these can be designated as OPAC access terminals. This will ensure the availability of terminals for OPAC use by the library users. In addition, a reference desk should be set up in the library near the OPAC access points with professionally trained staff conversant with the OPAC tools to provide guidance and support to the library users who may need assistance.

While working closely with the ICT support unit in the university, it is also prudent that more Internet bandwidth is provided together with alternative power supply for effective access. The above would require relevant training for the library staff and an appropriate policy framework to succeed.

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# Role of Digital Information Repositories in Enhancing the Visibility of Research Output: A Bibliometric Analysis of ILRI's Research Output Using Google Scholar

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## Abstract

*The purpose of the study anchoring this chapter was to investigate the role of the digital repository in enhancing the visibility of livestock research output by International Livestock Research Institute (ILRI) using Google Scholar. The objectives of the study were to: examine the visibility of ILRI's digital outputs on ILRI digital repository; establish the trends in authors' publications productivity; make recommendations on increasing awareness of the role of a digital repository. The methodology adopted was a quantitative approach. Bibliometric methods were used to collect and analyse data. The target population was all the publications published by ILRI scientists between 1995 and 2017 that are indexed by Google Scholar. The study period was selected in order to capture the publications published soon after ILRI was established to the most recent publication. Harzing's "Publish or Perish" software was used to capture data. Data was retrieved from Google Scholar using Boolean search techniques. The data obtained from the query was extracted and saved in Microsoft Excel spreadsheets, cleaned and used for further analysis. Findings indicate that a total of 990 papers were retrieved and the number of citations those papers received was 2575. The authorship pattern shows that the majority of papers were co-authored. The five-yearly publication distribution indicates that there was a rapid increase in the publications between 2010 -2014.*

**Keywords:** *Bibliometrics, Digital repositories, Google Scholar, International Livestock Research Institute, Kenya.*

## 1 Introduction

Research output plays an important role in social and economic development of most countries. Institutional repositories serve as platforms for capturing such output and making it available to a wider audience. The digital outputs are public goods which should be made visible and accessible globally. Their visibility maximises discoverability and reuse by the wider scientific community to generate innovative solutions to global challenges. Institutional repositories were created to promote Open Access (OA) to research and scholarship and have been around since the early 2000s. There are three commonly used repositories, namely, EPrints launched in 2000; DSpace; and Digital Commons launched in 2002. According to Bruns and Inefuku (2016), discipline-oriented repositories, starting with arXiv in 1993, have grown to a large number of repositories in more than 40 subject areas. Additionally, new open access platforms such as Academia.edu and ResearchGate have come up. Kenya is making progress in the adoption of institutional repositories. According to the Directory of Open Access Repositories (OpenDOAR) (2018), there are currently 28 institutional repositories in Kenya listed in the directory. These are mostly found in universities and research institutes, including the International Livestock Research Institute (ILRI). Most of the institutions use DSpace as the repository software (Gikunju & Otando, 2017). Despite their growth, institutional repositories continue to be viewed as the province for libraries rather than as a means for scholarly communication by researchers. Bruns and Inefuku (2016) assert that in order for researchers, universities, and funding agencies to view institutional repositories as a central pillar of the OA movement, repository managers need to prove the value of their repositories.

Repository managers can prove the value of digital repositories through the use of metrics. For library and university administration, institutional repositories need to demonstrate they are worth the financial and staff resources allocated to them. For academic and research units and faculty authors, repositories need to demonstrate they are worth the time needed to collect and submit publications. Therefore, a study to establish the visibility of digital research output is useful in determining the value of digital information repositories. Since its establishment from 1994 to date, ILRI has been involved in livestock research but the value of the digital research outputs has not been determined. Therefore, this study employed bibliometric analysis to establish the visibility of digital research output by ILRI on Google Scholar. By revealing the trends in the production of publications, the study reveals the visibility of digital research outputs captured in Google Scholar.

The purpose of the study anchoring this chapter was to investigate the role of the digital repository in enhancing the visibility of livestock research output by ILRI using Google Scholar. The specific objectives were to: examine the visibility of ILRI's digital output on Google Scholar using bibliometrics; establish the trends in authors' publication productivity; make recommendations on increasing awareness of the role of digital repositories.

## 2 Contextual Setting

The International Livestock Research Institute (ILRI), with headquarters in Nairobi, Kenya was established in September 1994. It conducts livestock research to improve food security and reduce poverty in developing countries (ILRI, 2018).

The International Livestock Research Institute employs digital technologies to capture, index, and store, distribute and preserve its digital research output through its institutional repository.

International Livestock Research Institute's Digital Repository initially called "Mahider" was set up in 2009 by ILRI Library using DSpace software. DSpace is an open source software package developed in 2002 through partnership between MIT and HP Labs in Cambridge, Massachusetts. It provides the tools for managing digital assets, and is commonly used in the development of **institutional repositories**. It supports a wide variety of data, including books, theses, 3D digital scans of objects, photographs, film, video, research data sets, and other forms of content produced or sponsored by ILRI (ILRI, 2018). The content is organised in three levels of hierarchy: communities, sub-communities and collections. From 2013, other international agricultural research centres that belong to the Consultative Group of International Agricultural Research (CGIAR) consortium joined ILRI as collaborators to jointly develop the platform and use it for managing their respective digital outputs. Thus, at the time of this study, the repository was a platform for all CGIARs then known as CGSpace. Each of the communities has their own administrators. For example, knowledge managers or librarians at the respective organisations assign content submission, edit, and approval permissions to their users (Yabowork, Orth and Ballantyne, 2017).

### 3 Literature Review

Institutional repositories have been defined differently by various scholars. The most frequently cited is the definition by Lynch (2003) who defines an institutional repository as a set of services offered by a university to the members of its community for the management and dissemination of digital materials created by the university and its community. Crow (2002) identifies the essential characteristics of an institutional repository: it is institutionally defined, scholarly in scope, cumulative and perpetual and open and interoperable. Callicot, Scherer and Wesolek (2016) define an institutional repository as a suite of services that support the preservation, organisation of, and access to the intellectual output of an institution. To summarise the foregoing definitions, an institutional repository is an online platform for collecting, capturing, preserving and disseminating the intellectual digital output of an institution.

The institutional repository should be accessible to users both within the institution as well as to the public with no barriers. Institutional repositories are also known as Open Access Institutional Repositories (OAIR) (Jain, 2012). Open Access repositories are digital collections whose content is freely accessible via the Internet without any barriers. The Budapest Open Access Initiative (BOAI) (2002) advocates two strategies to facilitate open access to content. One strategy is self-archiving which allows authors to deposit their work in an institutional repository, also called the "Green" open access publishing. The other strategy is publishing in open access journals which do not charge users fees to access content also called the "Gold" open access publishing. The last 10 years have witnessed some gains in the acceptance of open access publishing among scholars as seen in the increase of open access journals. The focus of this study is the "Green" open access publishing through institutional repositories.

There are many benefits of institutional repositories. Jain (2011) summarised these benefits into three categories: benefits to the institution, benefits to the authors and benefits to the library. To the institutions, institutional repositories are marketing tools that increase their visibility and prestige. Authors benefit from increased dissemination and impact of scholarship as well as visibility. To libraries, institutional repositories are platforms for storage, preservation and dissemination of institutional research outputs. To users, institutional repositories maximise availability, accessibility, discoverability of research outputs at no cost. Yabowork, Orth and Ballantyne (2017) observe that ILRI's institutional repository has provided a pathway to publish all research outputs through one channel, getting them off websites and properly curated. This publishing role has proved to be much more useful than a repository role as a value proposition to scientists and managers in the institute. Additionally, the institutional repository has enabled the tracking of metrics on hosted outputs.

Chisenga (2006) asserts that institutional repositories are valuable for development in Africa. By increasing accessibility and usability of Africa's scientific research outputs, institutional repositories provide raw materials for research and development in most countries. Rotich and Musakali (2012) opine that OA institutional repositories are a "must-have" for academic institutions. Similarly, Shafack (2012) emphasises the need for OA institutional repositories in Cameroon. On the other hand, the institutional repositories set up on DSpace have some weaknesses. For example, Yabowork, Orth and Ballantyne (2017) observe that the user interface in DSpace is not user-friendly. Generating reports, especially management ones, is also a bit cumbersome and it is hoped that the DSpace project as a whole may give more attention to this. According to Aguillo, Ortega and Fernandez (2008), visibility is one of the performance indicators representing 50 per cent of Webometrics rank. Therefore, this study was carried out to determine the visibility of digital outputs of a specific institutional repository, ILRI digital output on Google Scholar using bibliometrics.

### 4 Bibliometric Analysis

Various metrics may be used in determining the value of an institutional repository. At the repository level are the platform metrics which indicate downloads, uploads, location and citations. The inbuilt feature of the platform reports these metrics. Another important type of metrics is the third-party metrics which include: web analytics, citation

measures and altmetrics (Bruns and Inefuku, 2016). Web analytics such as Google analytics are used to track repository visits, user demographics and user behaviour. Altmetrics are alternative metrics based on social media. However, such metrics only show views and downloads of items which are not easy to quantify to show the impact of research which can be achieved through citation metrics. Citation metrics can be obtained from third-party sources such as Scopus.

This study was based on bibliometric analysis which has essentially been described as the application of quantitative analysis and statistics to publications such as journal articles and their accompanying citation counts (Thomson Reuters, 2008). It is a type of research method in library and information science that utilises quantitative analysis and statistics to describe patterns of publication in a given field or body of knowledge. Bibliometric analysis can be used as a tool to assess the visibility of digital research output. According to Diem and Walter (2013), the bibliometric indicators used to measure research performance are mainly based on two central elements: the number of publications and citation count. This study was based on publications count or the productivity pattern. According to Ocholla and Ocholla (2007), bibliometric metric studies are useful in informing policy decision in political, social and technological domains. In library and information science, such studies can be used to solve problems related to collection development, information retrieval, system design, user studies, management and knowledge organisation among others.

Bibliometric studies in various fields covering different geographical areas have been carried out by scholars in the past. For instance, the study by Arya and Sharma (2012) highlights the collaboration and authorship trend in the area of veterinary sciences all over the world with special reference to India from 2006 to 2010. The findings of the study revealed that collaborative research was preferred to solitary research and the major subjects covered were animal nutrition and veterinary physiology. In another study, Ahmed and Rahman (2008) carried out a bibliometric study to evaluate nutrition research in Bangladesh. They found that scientific productivity in the field of nutrition in Bangladesh experienced a significant rise in the period 1987-2006. Bibliometric studies have also been applied in library and information science research. Patra and Chand (2006) carried out a bibliometric study on library and information science research in India on author productivity from 1967 to 2004. The study established that the number of authors with one publication formed the major share while those who had published ten and more papers were the least. Another library and information science study was carried out by Singh, Mittal and Ahmad (2007) on digital libraries literature covering the period 1998-2004. In this study, single authors contributed the maximum articles (61.32 per cent).

In a study on the *Medical Journal of Malaysia*, Sanni and Zainab (2010) demonstrates that Google Scholar is a source of citation information even if the journals are not indexed by ISI. From the African scene, the study by Ocholla and Ocholla (2007) provides an awareness of the overall research output from library and information science discipline in South Africa based on publication count of peer reviewed articles in library and information science journals between 1993 and 2006. Additionally, Onyancha (2009) conducted a citation analysis of Sub-Saharan library and information science journals using Google Scholar and identified the most cited library and information science journals. The study revealed that publication of library and information science journals in Sub-Saharan Africa was irregular and identified only five core journals in the region. Onyancha and Ocholla (2008) advise researchers from developing countries to use Google Scholar for bibliometric studies as it is easily affordable and accessible. A study by Chilimo (2016) on the use of institutional repositories in Kenya revealed that the most-viewed publications in the repositories also received citations in Google Scholar thereby signifying their impact and importance.

## 5 Methodology

The study adopted a quantitative approach. Bibliometric methods were used to collect and analyse data. The target population was all the publications published by ILRI's scientists between 1995 and 2017 that are indexed by Google Scholar and captured in ILRI's repository, CGSpace. The study period selected to capture the publications was 1995 – 2017. However, ILRI was established in September 1994. The time frame was selected because it was found to include all publications from inception up to the most recent publication. The study period starts from 1995 as it is assumed that there could have been a time lag between the establishment of the institution and the first publications. The year 2018 was exempted because publication was still in progress. The study employed Harzing's "Publish or Perish" software to capture data. To get data from Google Scholar, a query combining the phrase "International Livestock Research Institute" and the word "CGspace" was presented. The data obtained from the query was extracted and saved in Microsoft Excel spreadsheets, cleaned and used for further analysis.

## 6 Findings and Discussions

This section presents and discusses the findings based on the objectives of the study. The study used publications count or the productivity pattern as the indicator for output.

### 6.1 Visibility of digital outputs of ILRI digital repository

One of the objectives of the study was to determine the visibility of digital outputs of ILRI's digital outputs using bibliometrics. Harzing's Publish or Perish (POP) software used the Google Scholar query to return a summary of metrics as shown in Table 1:



Table 1: Summary of metrics from Harzing’s “Publish or Perish” software

Metric	Quantity
Publication years	1995-2017
Citation years	23 (1995-2018)
Total number of papers	990
Total number of citations	2,575
Cites per year	112
Cites per paper	2
Authors per paper	3

Source: Research Data

The Table 1 above captures only the metrics from Harzing’s “Publish or Perish” software that are of interest to this study. The results indicate the production of digital outputs by ILRI scientists for the period 1995-2017 as captured by the IR (CGspace). The search yielded a total of 990 papers while the number of citations the papers received was 2575 citations. The results also show that the average cites per year were 112, cites per paper 2 and authors per paper 3.

The findings of the study indicate that ILRI’s research outputs are visible through the institutional repository as captured by Google Scholar. The results also show that most of the publications in the repository also received citations in Google Scholar thereby signifying their impact and importance. Table 2 shows the citation analysis.

Table 2: Top ten citations

Author Rank	Number of citations
1	99
2	92
3	88
4	69
5	64
6	61
7	57
8	47
9	39
10	35
<b>Total</b>	<b>651</b>

Source: Research Data

Table 2 shows the ranking of the top ten cited works which makes a total of 651 (25%) of the total citations. This further indicates the visibility of ILRI outputs through the IR.

## 6.2 Productivity of authors

The highest number of publications retrieved, 424 out of a total of 990 papers or 42.8%, was for the period 2010 -2014 while the lowest number retrieved 114 (11.5%) was for the period 2005 and 2009. This could be attributed to fluctuation in funding depending on research themes. The Figure below shows the chronological distribution of papers during the period 1995-2017.

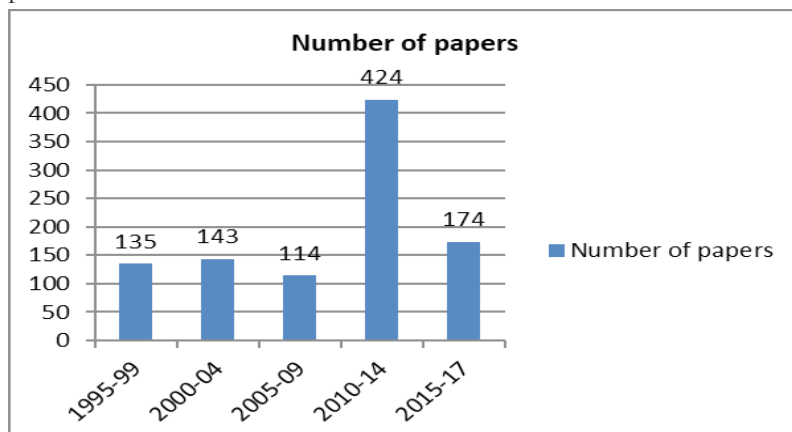


Figure 1: Distribution of papers by years

Source: Research Data

### 6.3 Number of authors per paper

The number of authors per paper range from one to seven authors. Papers authored by single authors were 365; by two authors 123; three authors 112; four authors, 134; five authors 178; six authors 74 and seven authors 4. These results indicate that authorship in livestock research can range from one author to seven authors per paper, an indication that scientists work both singly as well as collaboratively depending on the project. It also shows that the highest percentile of the total number of papers was by multiple authors which points to a high degree of joint research in livestock research. These findings concur with the findings by Sharma (2009) from a bibliometric study on research publication trend among scientists of Central Potato Research Institute (CPRI) in India. Sharma found that CPRI scientists preferred to work and publish in joint collaboration instead of single-handedly. Table 3 shows the authorship trend.

Table 3: Number of authors per paper

Number of authors per paper	Number of papers	Percentage (%)
One author	365	36.9
Two authors	123	12.4
Three authors	112	11.3
Four authors	134	13.5
Five authors	178	18.0
Six authors	74	7.5
Seven authors	4	0.4
<b>Total</b>	<b>990</b>	<b>100</b>

Source: Research Data

### 6.4 Productivity of single author vs. multiple authors

The total publications by a single author are 365(36.9%) out of 990 publications retrieved. On the other hand, publications by multiple authors are 625(63.1%) of the total number retrieved. This shows that the majority of papers were contributed by authors working in collaboration. The finding shows that scientists in livestock research prefer to do research in collaboration. These findings corroborate the findings by Arya and Sharma (2012) who found that veterinarians prefer to do research in collaboration. The Figure 2 shows a comparison of the total number of publications by single authors with those by multiple authors.

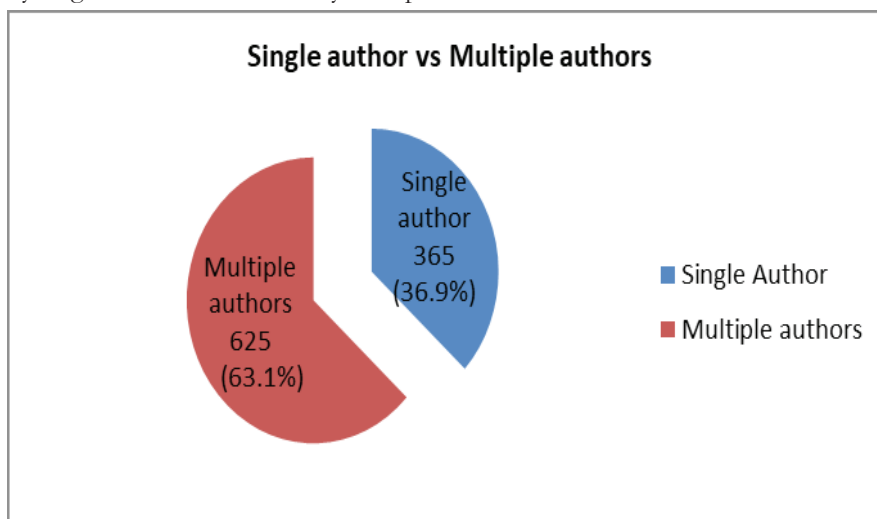


Figure 2: Productivity of Single authors vs. Multiple authors

Source: Research Data

## 7 Conclusion and Recommendations

The study has revealed that ILRI's institutional repository plays an important role in enhancing visibility of research outputs. This has been proven by the number of publications as well as the number of citations shown through Google Scholar. The study shows that multiple-authorship is high in applied science. The study also confirms that bibliometric analysis is a viable research method for determining the visibility of research outputs. Unlike other metrics, bibliometrics goes further to quantify impact of research through citation metrics. The study therefore recommends the following:

1. Librarians as the key information repository administrators should be sensitised on the use of metrics in demonstrating the value of information repositories both to the institution and to the researchers. This can be achieved through

training, workshops, seminars and conferences.

2. Librarians should in turn sensitise researchers as well as management on the role of an information repository in enhancing visibility of research output.
3. One way of proving the value of institutional repositories is through metrics studies. Institutional administrators should carry out metrics studies including bibliometrics and share these with both management and researchers. These will show the important role played by information repository. This in turn will motivate management to support the information repository development. It will also encourage researchers to submit their works in the information repository.
4. Librarians should train researchers on how to submit papers to the information repository that is, self-archiving as well as how to use it.

## 8 Practical Implications

The results of this study are useful indicators of the visibility of digital research outputs in the institutional repository as captured by Google Scholar in this study. The visibility of an institution achieved through its information repository may be used in securing research funding. The results of the study are also important for researchers and their affiliate organisations in gauging their performance and in planning for further research. Repository managers may also use this study to garner support from both the management and researchers. The study is also important to research funders as they may use it to gauge the value of output from funded research. The study also contributes to the body of knowledge on digital repositories, bibliometrics as well as in livestock research.

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# Digital Information Literacy Application among Academic Staff at Tumaini University Dar Es Salaam College

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## Abstract

*The study from which this chapter is extracted investigated the awareness and application of digital Information Literacy among academic staff at Tumaini University Dar Es Salaam College (TUDARCo). The objectives of the study were to determine the level of awareness of digital information literacy among academic staff and librarians; examine the extent to which academic staff apply digital information literacy; and propose mechanisms which can benefit the staff in digital information literacy. The study used a mixed method approach but qualitative approach was dominant. The respondents were academic staff and librarians. Data was collected through questionnaires from the academic staff while interviews were employed to gather information from librarians. From the findings, most respondents were familiar with different types of e-resources particularly e-journals. Respondents indicated that e-journals, e-articles, e-mail and e-books were frequently used while the use of e-databases and e-archives was rated low. Laptops are used by 90% of the respondents to access information and 80% of the respondents were competent in Digital Information Literacy (DIL). Creating and managing competencies of Digital Information were rated at 20% suggesting that academic staff need knowledge and skills in this. Most respondents use DIL in teaching and learning but a few use it for writing articles and projects. The study also found that some academic staff have no access to computers. TUDARCo Library has not conducted training for the academic staff on DIL. The study recommends that; TUDARCo should increase the number of computers especially in the library. TUDARCo should improve its Internet connectivity since most lecturers cannot access Internet services due to poor connectivity. There is need for TUDARCo to conduct training for both academic staff and librarian on DIL. If adopted, the recommendations may motivate lecturers to apply DIL and improve information accessibility and research.*

**Keywords:** *Digital Information Literacy (DIL), TUDARCo, Librarians, Tanzania.*

## 1 Introduction

Digital Information Literacy (DIL) is the ability to access, evaluate, and apply information from a variety of e-resources in appropriate contexts to construct knowledge (Maharana, 2007). In the current digital age, information literacy has inevitably been influenced extensively by developments in technology which has led to the need for digital information literacy. This chapter examines the impact and contribution of Information communication Technologies (ICT) to information provision for academic staff at TUDARCo with focus on DIL. It explores the level of awareness, access to, and use of ICT facilities and services among academic staff as well as the capacity of librarians to offer digital information services to research scholars.

The modern society has been changing due to rapid development and diffusion of ICT in fields such as education, business, health, agriculture, and so on. The process of identifying and selecting information from the vast array of available digital sources has become more complex and may bewilder Information users without the necessary Digital Information Literacy knowledge. In modern society skills for computer use are prerequisite for all scholar and citizenry at large but it also critical to promote Information Literacy as well.

In 2014 the TUDARCo set aside 10,000,000 Tanzania shilling for research by academicians. By the end of 2015, only 4,000,000 had been spent. In addition, many academic staff have not been promoted because of lack of publications to support their tenure/promotion applications. This indicates that the level of research at the college is low. One of the factors that could be a hindrance to research in the institution is poor digital Information literacy which would make it difficult for staff to use the existing ICTs to access and use information in an increasingly digital world. It is also important that the library plays its role in aiding research within the institution. Today's librarian is seen as an information resource provider, a resource centre manager, a human gateway to electronic resources, and a walking encyclopaedia providing quick reference to information sources (Asamoah-Hassan, 2003).

## 2 Statement of the Problem

In 2014 TURARCo's library received ebooks from JoKUCo, but the librarians lacked the knowledge on how to access them and make them available for their users and thus the publications remain unused. This lack of skills in use of digital information resources is not limited library staff but also extends to the academic staff some of whom are unable to search CD-ROM or online databases to retrieve information necessary for their research work. It is clear that the

challenge facing TUDARCo's academic staff, and particularly researchers, is lack of adequate training and skills to access and use the available ICT facilities and services.

ICTs have brought about considerable benefits to information users. It has become cheaper to digitally store, process and access large amount of information at greater speed as pointed by Karisiddapa (2005). ICTs have enhanced the information access to the extent that it is now possible to obtain information from any library anywhere in the world regardless of the geographical distance between the user and library. There is no need for any library to attempt to acquire all publications, (Effah, 2002), with suitable computer software, telecommunications, the national bandwidth, equipment memory facilities and input-output devices, a researcher in a remote outpost is able to search the comprehensive electronic database and obtain needed information in electronic format. TUDARCo library should adopt these available technologies to enhance the acquisition and use of information resources for research within college. This study on which this chapter is based therefore sought to access the level of awareness and use of digital information literacy among academic staff at TUDARCo and suggest strategies for promotion of digital information literacy in the institution.

### 3 Objective of the study

The main objective of the study on which this chapter is based was to investigate the awareness and use of digital information literacy among academic staff and librarians at TUDARCo. The study was guided by the following specific objectives to: identify the level of awareness of digital information literacy usage among academic staff and librarians at TUDARCo; determine the extent to which academic staff and librarians use digital information literacy at TUDARCo; and to propose a mechanism which TUDARCo can adopt to enhance the benefits academic staff and librarians can accrue from digital information literacy.

### 4 Literature review

Digital Information Literacy (DIL) is the ability to recognise the need for, to access, and to evaluate electronic information (Glister, 1996) The digitally Information literate can confidently use, manage, create, quote and share sources of digital information in an effective way. Similarly, Campbell (2004) argues that the way in which information is used, created, and distributed demonstrates an understanding and acknowledgement of the cultural, ethical, economic, legal, and social aspects of information. The focus on DIL not only incorporates Information Literacy concepts but also moves beyond the library to examine information technology, social media, and its role in society.

Digitally Information literate people demonstrate the ability to solve problems, capacity to critically reflect, technical capability and a willingness to collaborate and remain up to date. In light of these benefits it is clear that TUDARCo's academic staff are yet to adopt DIL for full utilisation of e-resources and opportunities of funding, research, collaboration even places for publications. Only a third of the academic staff at TUDARCo have tried to publish in local journals and have initiated international networks with different institutions. It is expected that DIL will empower other academicians who are interested in research and consultancies.

Maharana (2007) pointed out that ICTs facilitate the digital information literacy and enable users to:

1. Understand a problem and develop a set of questions that will solve the information need;
2. Solve the problem by using search methods which enable the users to access digital information sources on the web;
3. Evaluate the sources by making informed judgment about what is found online;
4. Consolidate the identified resources into a broader package of information gathered from a variety of media sources; and
5. Develop critical-thinking skills and use web tools such as search engines, listing of favourite sites, and mailing lists, among others.

Digital information literacy is therefore defined as a set of digital abilities requiring individuals to recognise when digital information is needed and have the ability to locate, evaluate, organise and effectively use the needed digital information in an ethical and legal way. Owusu-Ansah (2004) argues that DIL is the ability to use digital technology, communication tools or networks to locate, evaluate, use and create information; the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers; a person's ability to perform tasks effectively in a digital environment. The definition of literacy which has been understood as the ability to read and write needs to be expanded to include the ability to read and interpret media, reproduce data and images through digital manipulation, and to evaluate and apply new knowledge gained from digital environments. This redefinition of literacy is important so as to account the expansion of the nature of information into digital formats that now includes an understanding of Web 2.0 and social media tools as well as other emerging technologies.

## 5 Methodology

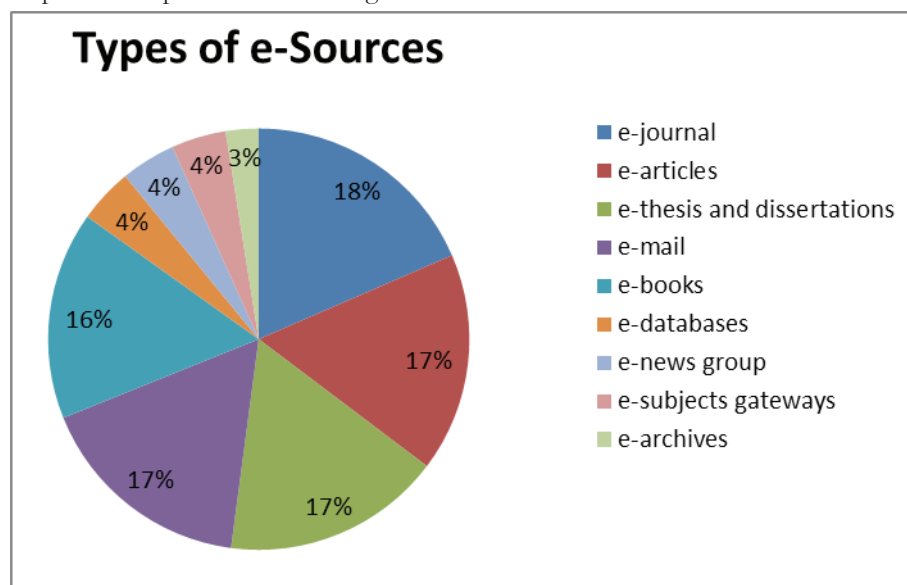
As pointed out earlier, the study on which this chapter is based was conducted at TUDARCo. The main respondents were lecturers (academic staff) and librarians. The study adopted a mixed method approach. The study sampled 50 academic staff and 4 librarians. Lecturers were selected purposefully. Questionnaires were administered to the academic staff to collect data on awareness and use of digital information literacy, computer literacy, digital information competency, training received on ICT, and orientation; and the role played by the librarians to facilitate or promote ICT usage among researchers. The librarians were interviewed on their roles in provision of DIL services, availability of ICT facilities in the library and DIL services in the library.

## 6 Findings

This section presents the findings of the study based on the objectives of the research.

### 6.1 Awareness and access to DIL

Respondents were asked to identify the type of e-information sources that they are familiar with. The summary of their responses are presented in the Figure 1.



**Figure 1: Types of e-Sources**

*Source: Research data*

From the data above it was noted that the majority of lecturers, 22 (18%), were familiar with e-journals as an e-source of information. E-articles, e-thesis and e-mail were equally acknowledged by 20 (17%). E-articles were noted as a popular source of information because they were used by lectures for both research and also for teaching. It was also noted that lecturers were familiar with e-thesis because they were often supervisors of students' research projects and had to use the collection to confirm the originality of the works presented to them. However, from the interviews, librarians reported that 40% of the lecturers asked for the print copies of the thesis rather than the electronic copy.

The data also indicates 19 (16%) of the lecturers were familiar with e-books as an electronic resource. However, during the interview the majority 3 (75%) of librarians pointed out that most lecturers asked for sources of information on particular topics, It was not common to be asked the title of a book or journal. It is assumed that information seekers ask specific type of information not general information. It is the duty of the librarian to be able to know different sources of information so as to meet the needs of the information seekers.

Data was also collected on the use of e-resources by lecturers. The findings are summarised in table 1 below.

Table 1: Types of e-information used (N=50)

e-Information Sources	Frequency	Percent
e-journal	22	88
e-articles	20	80
e-thesis and dissertations	20	80
e-mail	20	80
e-books	19	76
e-databases e	05	20
e-news group	05	20
e-subjects gateways	05	20
e-archives	03	12

Source: Research Data

Data in Table 1 suggests the following observations and interpretations. Generally, it was noted that respondents were reluctant to differentiate between the types of e-sources with which they were familiar and those used frequently. The data shows that the majority 22(88%) of academicians used e-journals as source. It was noted however that 2(50%) of librarians were of the view that few lecturers inquired for e-journal services. This contradiction suggests the need for a deeper understanding of how librarians promote e-journal sources to academicians.

### 6.2 Ways used to access e-information sources

Respondents were asked to indicate the methods they utilised to access e-information resources/materials. Figure 2 below has a summary of the ways used to access e-information sources by academicians and TUDARCo.

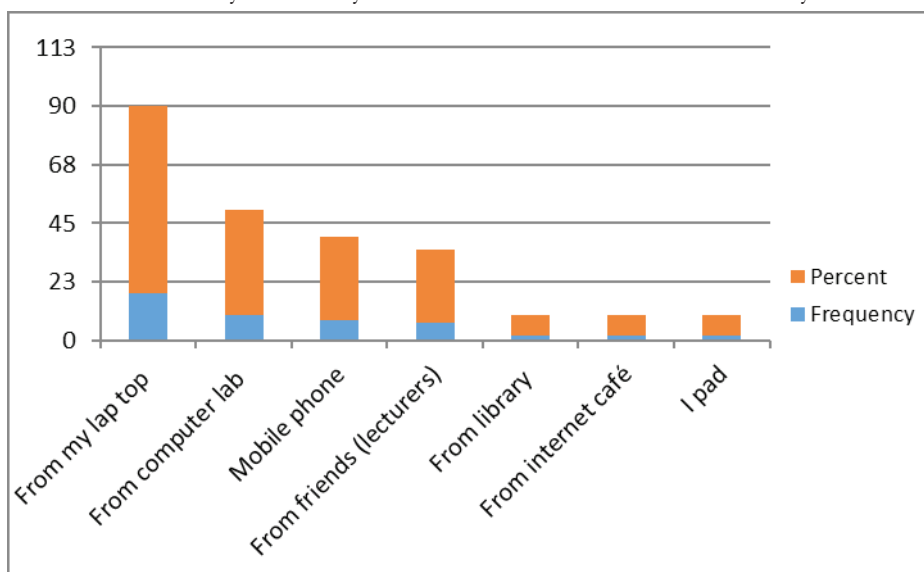


Figure 2: Ways used to access e-information sources

Source: Research Data

The data in figure 2 above establishes that the majority of academic staff 18(90%) and 10 (40%) use laptops and the computer laboratory respectively to access e-resources. Only 2(8%) of the lectures used the computers in the library to access e-resources. During the interview Librarians confirmed that the library did not have computers for information users. The head librarian informed the researcher that access to the e-resources was provided by sending links to the databases to lectures via email. The lectures could then use the links to access the information from their devices such as mobile phone (2, 8%), internet cafe (2,8%) and iPads (2,8%).

### 6.3 Digitally Literacy competence

The respondents were asked to indicate areas in which they were digitally literate. The list of areas was provided in the questionnaire and they were allowed to add other competencies that were not included. The data collected is summarised in table 2 below.



Table 2: Digital literacy competence elements (N=50)

Digitally literate competence	Frequency	Percent
Use	20	80
Quote	16	64
Share sources	15	60
Search	15	60
Manage	05	20
Create	05	20

Source: Research Data

A majority, 20(80%), of the respondents indicated that they are competent in terms of usage of DIL. The concept of usage in this field involves all processes which the users apply in getting information. These include knowing the search engines, types of e-sources, identifying genuine sources, selection of search tools and selection of relevant information.

From the interviews conducted one of librarians indicated that it was difficult to train staff on use of computers to access information because they had a shortage of computers in the library and a shortage of knowledgeable librarians to undertake the training. It is noted that a library is a centre for information resources which needs to be equipped with up to date skills on information provision in different formats. There is a need to make sure the College invests adequately in the training of librarians through seminars or short courses and/or long training in this field.

The findings also showed that only a minority of the staff 5(20%) were competent in creating digital information sources. The creation of blogs, database and other social media is very important ways of for academic staff to disseminate information/research and it is important that they are competent in this area of DIL.

#### 6.4 The use of digital information literacy

The second objective of this study was to identify the uses of digital information literacy applied among academicians. Therefore, respondents were asked to identify the main uses of digital information literacy from the list provided. Figure 3 has a summary of their responses.

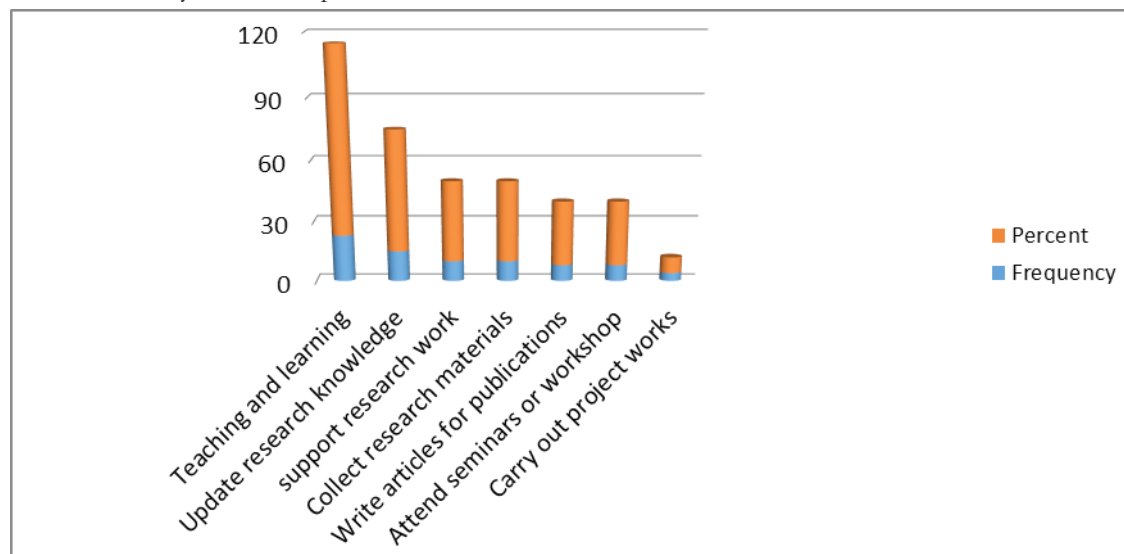


Figure 3: Use of digital information literacy

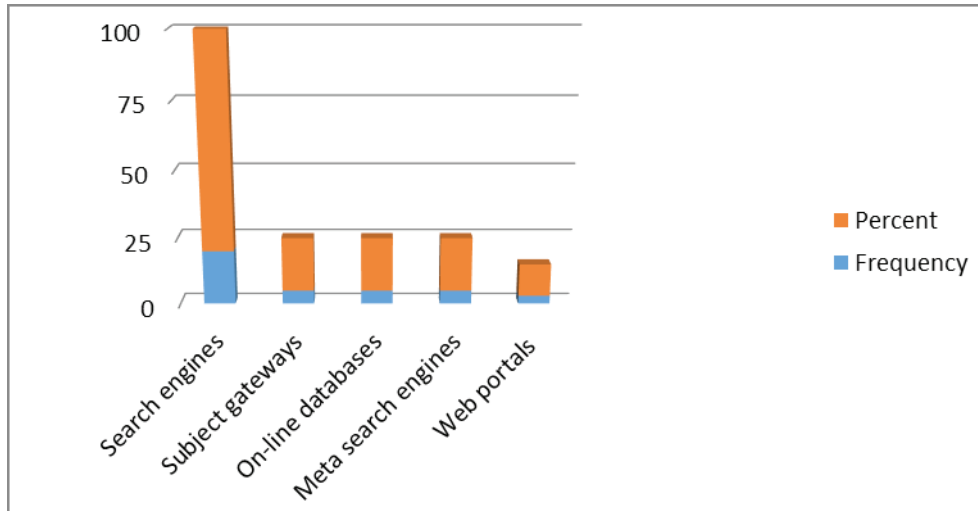
Source: Research Data

The majority of respondents, 23(92%), used DIL for teaching and learning while, 15(60%) of the respondents used DIL to update their knowledge. In which DIL is mainly used by academic staff as researchers. Only 10(40%) of the respondents use DIL to collect materials and 9(32%) used it to write articles for publication. This indicates that the majority of the staff at the institution is not actively involved in research but concentrate more on teaching and learning activities.

The data also revealed that academic staff there was low use of DIL for updating and supporting research works. It is obvious that DIL is a prerequisite for acquiring relevant information on different perspectives in educational and research culture. However, the question that remains: is this enough? As well as being digitally literate, we argue that academicians need to be information savvy and capable to identify when information is needed, how to locate it, and how to use it effectively. Gilster (2006) supports the idea by pointing out two important points about DIL which are central to the concept of being information savvy:

1. He describes how the digital environment has revolutionised not only information seeking, but also information handling behaviour.
2. He suggests that technical skills may be less important than a discriminating view of what is found on the Internet.

The respondents were requested to point out the Internet search tools they used frequently in their day to day research activities. The suggested Internet search tools were provided in the questionnaire but the respondents were allowed to add other tools which they were familiar with. Figure 4 gives a summary of the identified tools.



**Figure 4: Internet search tools**

*Source: Research Data*

The findings in Figure 4 show that the 20(80%) of the respondents, who are researchers, were familiar with using search engines. However, a majority of them were unaware of other ways to search for information as evidence by the low rates of use for subject gateways, online databases and metasearch engines and web portals. These data convey the message that academic staff at TUDARCo need to be equipped with more skills on Internet use.

Literature shows that the required cognitive skill for common Internet use is mainly based on communication, information and recreation. The cognitive skills required for DIL include knowledge comprehension, application, analysis, synthesis and evaluation.

The low level of utilisation of Internet search tools by researchers to get required information likely indicates a lack cognitive knowledge and skills to explore of richness of Internet sources. Internet use requires a user to demonstrate technical cognitive skills such as ability to launch browser, compare browser features, align browsers with search requirements and make recommendations on browser use.

The respondents were asked to identify the elements which they consider when evaluating electronic information resources. The summary of their responses is shown in Table 3 below.

**Table 3: Elements of evaluation for e-information resources**

Elements considered	Frequency	Percent
Reliability	12	48
Authenticity	10	40
Accessibility	10	40
Objectivity	08	32
Usability	08	32
Comprehensive	06	24
Exposure	05	20
Financial/money	05	20
Confidentiality	03	12

*Source: Research Data*

Findings from table 3 above show that less than only 10(40%) of the respondents considered authenticity of e-information resources as an important element in evaluating them. This is a significant oversight as the information used by researchers ought to be authentic to allow for authentic research.

### 6.5 The mechanisms to enhance DIL Application

After the identification of the problem, the study is required to come up with solutions. The respondents were asked to identify mechanisms which TUDARCo can use to make sure researchers and librarians benefit from digital information literacy. The suggested mechanisms were provided in the questionnaire. The respondents, however, were allowed to add other mechanisms which they were familiar with. Table 4 has a summary of their responses.

Table 4: Mechanism to be adopted (N = 50)

Mechanisms to be adopted	Frequency	Percent
Increase number of computers in the library	50	100
Improve internet connectivity and reliability	20	80
Training on DIL use among lecturers	19	76
Librarians should be empowered on DIL	17	68
Introduce DIL use policy	13	52
The university should increase on-line databases	13	52
Training of research skills and consultancy	13	52
Librarians should have updated skills on DIL	10	50
Academicians should be facilitated with laptops	08	32
Library to have enough databases	07	28
Academicians should use library materials	06	24

*Source: Research Data*

All the respondents agreed that TUDARCo should increase the number of computers at the College and particularly in the library. This recommendation is important as some of the academic staff have neither a laptop nor a desktop computer with which to access e-resources. Similarly, the library has no computers for information seekers. In this context, it will be difficult for individuals to practise DIL usage effectively. All librarians pointed out that the few computers are for their use not; for users.

It was also strongly recommended that TUDARCo make efforts to improve Internet connectivity at the College. It was reported that most of the time, lecturers do not access the Internet services because of poor connection. TUDARCo should use the national bandwidth 'Mkonga wa Taifa' to enhance network connectivity within the institution.

In addition to the above recommendations, TUDARCo should conduct training for academic staff and librarians on DIL usage at the College. This will motivate different lecturers to use DIL to improve information accessibility as individuals and in turn improve research requirements and processes.

Finally, the concept of digital competence needs to be prioritised by the institution and this should be reflected at policy level. DIL policies should be put in place to aid the creation of awareness on DIL.

## 7 Conclusion

Findings also show that the majority of respondents are familiar with different types of e-sources particularly e-journals. Apart from being familiar, respondents pointed out that e-journals, e-articles e-mail and e-books were frequently used while e-database, and e-archives were rated low.

Furthermore, the findings prove that majority use laptops to access different information; it was not established whether the laptops were provided by the College or are personal. Digital literacy competence findings indicate that the majority of respondents were competent in the aspect of usage of e-resources. The aspects of creating digital information were rated very low. This suggests that academicians need to be equipped with knowledge and skills on how to create and manage digital information. The findings also showed that the majority of respondents use DIL in teaching and learning while a minority used it for writing articles, articles and project work were in low percentage. The findings propose the following mechanism to be adopted by TUDARCo to enhance DIL usage.

In general, the findings show that the TUDARCo Library has played a limited role to conduct training to the academic staff to get or to improve DIL usage mainly because the library has no computers for users.

## 8 Recommendations

The findings propose the following mechanism to be adopted by TUDARCo to enhance DIL usage

1. The College should make sure ICT facilities, particularly laptops or desktops, are available to all lecturers. This can be done through buying desktops for each lecturer or having a soft loan for lecturers so as they buy new or modern laptops.
2. The College should make sure Internet connectivity is available all the time at the College and in all offices.

3. Lecturers should make sure they buy laptops or desktops to facilitate them to access Internet services.
4. The College should install computers in the library. Librarians should make sure the installed computers have access to updated databases of online sources.
5. Librarians should be equipped with digital information literacy so as to facilitate accessibility of online information among library users.
6. Academic staff should frequently visit the library to get updated sources of online information for example, currently e-maktaba has been introduced at the College

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# Perception of Lecturers and Researchers Towards Open Access Journals: A Case Study of the University of Zambia

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## Abstract

*This chapter assesses the perception towards Open Access Journals (OAJs) of lecturers and researchers at the University of Zambia (UNZA). To determine their perception, data was collected on lecturers' and researcher's awareness of the existence of OAJs, their use of OAJs in their work, Use of OAJs as a publication outlet of their scholarly work as well as their contributions in the promotion of the Open Access Movement. The study on which this paper is anchored was quantitative in nature; a survey design was used. A sample of 100 lecturers and researchers were selected in the study. Self-administered questionnaire was used in the collection of data. The findings show that majority (97%) of the lecturers and researchers at UNZA are aware of the existence of OAJs. Further, the research revealed that many (87%) lecturers have a positive attitude towards OAJs and 72% use OAJs in their research activities. However, it emerged that few lecturers and researchers (21%) publish their works in OAJs. The low percentage of lecturers publishing in OAJs is partly due to the negative attitude of UNZA management towards OAJs. Until recently, UNZA management never recognised articles published in OAJs during promotion of lecturers and researchers. The fact that few lecturers and researchers publish in OAJs affects the overall perception of the same. In view of the research findings, the authors recommend that the UNZA management should develop a policy that recognises articles published in OAJs by lecturers for their promotion.*

**Keywords:** *Open access journals (OAJS), Open access, Publishing.*

## 1 Introduction

The birth of the Internet and World Wide Web (WWW) has ushered academia into online publishing. Academic materials which include books, newsletters, conference proceedings, reports and journals are being published online. This has tremendously enhanced scholarly communication, access to academic publications and sharing of information. The Internet and the Web are slowly liberating scholars from the yokes of commercial journals who for many years have been amassing wealth through the toil and sweat of scholars. These technologies have made it possible to implement the commonly shared belief and spirit by academicians "to provide access to scholarly communication or publications freely". Many institutions of higher learning, organisations and individuals have established Open Access Journals (OAJs) on the Internet with a view to providing a platform for scholars to publish and freely access scholarly publications. Suber (2006) observed that Open Access (OA) is an alternative form of scholarly communication that emerged from the traditional business mode of scholarly publishing. Open Access Journals are scholarly journals that are available online to the readers without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself.

Open Access Journals are peer reviewed, and are made available free of charge to the public through the Internet (Suber, 2006). Unlike the business publishing model, in open access publishing, the end user is not charged anything to access journal articles. Publishers employ various funding strategies such as direct author fees, institutional membership to sponsor all or part of author fees, grants to open access publishers and institutional subsidies. The funds cover the cost of publication and distribution of open access content for free access by the end users (Hirwade & Rajyalakshmi, 2006). Some of the Open Access Journal avenues for direct access include the Directory of Open Access Journals (DOAJ), the Directory of Free Full Text, Free Medical Journals Directory, the High Wire Press and the Open J-Gate. It is also possible to access Open Access Journal articles indirectly by using search engines such as Google.

## 2 Background to the Study

The history of open access journals dates back to the Open Access Movement's "Constitutional Convention" in December 2001 at a meeting convened by the Open Society Institute in Budapest (Open Access, 2015). The meeting resulted in the creation of the "Budapest Open Access Initiative" (BOAI) which was made public in February 2002. The Budapest Open Access Initiative clearly stated that literature should be freely accessible online because scholars give to the world without expectation of payment (BOAI, 2002). In this regard, academicians may put online peer-reviewed journal articles and any un-reviewed preprints for comments or to alert colleagues in academia about important research findings.

Since 2002, many scholarly works have been published in open access journals and other platforms that allow free access to literature. Through open access concept, users of literature are permitted to read, download, copy, distribute, print, search, or link the full texts of their articles. Users are also permitted to crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers (BOAI, 2002). Two complementary strategies recommended for the achievement of open access to scholarly journal literature are “Self-archiving” and “Open Access Journals”. These strategies are often referred to as “gold and green” roads respectively (Open Access, 2015).

Self-archiving involves depositing of refereed journal articles by scholars into open electronic archives. The deposited articles can be searched and retrieved using search engines if the archives conform to standards created by the Open Archives Initiative. Therefore, it is not necessary for users to know which archives exist or where they are located in order to find and make use of their contents. Open access journals involve the creation and use of a new generation of journals committed to open access and help existing journals that elect to make the transition to open access. Since journal articles should be disseminated as widely as possible, they do not invoke copyright to restrict access to and use of the material they publish. They use copyright and other tools to ensure permanent open access to all the articles they publish. These new journals do not charge subscription or access fees but use stated strategies for covering their expenses.

Many scholars have embraced OAJs. They use OAJs not only to publish their works but also for research activities. In light of this, there has been a drastic increase in the number of OAJs listed by Directory of Open Access Journals (DOAJs) from 35 in 2002 to 7889 in 2012, (Poltronieri *et al.*, 2016). The increase in OAJs is driven by people in academia who are setting up OAJs to foster access to journal articles freely. The University of Zambia (UNZA) library has put in place measures that allow lecturers to have access to OAJs. For example, the library’s home page has a link to the DOAJ giving its users more access to these publications. This allows those in academia, especially lecturers and researchers, to access journal articles freely and also to encourage them to publish in OAJs. It is against this background that this study was conducted to determine the perception of lecturers and researchers at UNZA towards OAJs.

### 3 Statement of the Problem

As articulated in the background, scholars want to share their ideas with others for a variety of reasons. This could be to establish their reputations, to help solve problems, or to build upon the knowledge-base in their fields. Finding the fastest way to communicate their thoughts with the widest possible audience has been a challenge for scholars since the advent of the first journals. However, technological developments over the past 40 years have made the dissemination of scholarly publications to be efficient (UNESCO, 2015). The conceptualisation and creation of the Open Access Movement is perhaps the most likely method to make a fundamental change on how information is shared (Christie, Dill & Palmer, 2009). Research has shown that many researchers have positive perception of OAJs and open access.

A study conducted by Zheng and Yu (2014) on awareness and attitudes of faculty towards open access publishing among 295 faculty members at Texas A & M University in the United States of America revealed that half of the lecturers and researchers believed that OAJ publications were acceptable for considerations of tenure and promotion. Similarly, a study conducted in Tanzania by Dulle and Minishi (2009) on researchers’ perspectives on open access scholarly communication involving 544 lecturers and researchers from six (6) public universities shows that the majority were aware and positive of open access publishing and that majority of the researchers used open access publishing to disseminate their research findings. From these and other studies on perception and attitude of researchers towards OAJs, one may conclude that scholars in universities and other learning institutions have a positive perception. They also make use of OAJs to share their research findings and learn from others. However, the perception of lecturers and researchers at UNZA towards OAJs was not known. This was because there had never been a research conducted to assess their perception.

### 4 Research Objectives

The aim of the study was to assess the perception of lecturers and researchers towards OAJs at UNZA. To accomplish the above task, the study sought to establish if lecturers and researchers at UNZA are aware of the existence of OAJs; determine if lecturers and researchers at UNZA use OAJs for their research; establish if lecturers and researchers at UNZA publish their scholarly works in OAJs; establish what lecturers and researchers at UNZA think of OAJs; as well as determine if lecturers and researchers at UNZA promote the Open Access Movement.

The study focused on OAJs, not institutional repositories, which also provide open access to academic publications. Furthermore, not all university of Zambia lecturers were included in the study, only lecturers and researchers based at UNZA Great East Road Main Campus were included in the study. Lecturers in the Faculty of Medicine were not included in the sample because they are based in another campus of the university. The main limitation of the study was the use of self-administered questionnaire as some questions were misunderstood by respondents.

## 5 Theoretical Framework

This study was guided by *Perceived Attributes Diffusion of Innovation theory*. According to this theory individual will adopt an innovation if it possesses the following attributes:

- a) perceived to have relative advantages over an existing innovation;
- b) it must be compatible with existing values and practices;
- c) the innovation should not be too complex;
- d) it must have been tried (the innovation can be tested for a limited time without adoption); and
- e) The innovation must offer observable results (Rogers, 1995).

From the above theory, it can be contended that perceptions of lecturers at UNZA regarding OAJs could be influenced by the attributes they see in OAJs. If lecturers and researchers at UNZA perceive OAJs to have advantages over already existing journal systems, the perception will be good and more lecturers are likely to adopt OAJs. Furthermore, if lecturers at UNZA learn that OAJs offer benefits to them such as free publishing and more access to articles and other publications as compared to closed access journals, their (lecturers) perception could perhaps be positive. Additionally, if lecturers realise how easy it is to publish on the Open Access platform and a likelihood of having wider readership of their works than provided by traditional journals (closed journals), OAJs are likely to be viewed positively and supported.

## 6 Research Methodology

The study was quantitative in nature. A survey method was used in which lecturers and researchers at UNZA, Great East Road Campus were sampled was employed. A total of 100 lecturers from eight (8) schools were sampled. Disproportionate stratified sampling technique was employed and samples from each stratum were randomly selected and invited to take part in answering the questionnaire. Using disproportionate stratified random sampling, samples varied from school to school (Gray, 2009); bigger schools such as School of Education had more respondents than other schools. Data was collected using self-administered questionnaire. This data collection instrument was used in order to allow participants to provide information without interference of the researchers. The collected data was organised and analysed using descriptive statistics in Statistical Package for Social Sciences (SPSS version 16.0).

## 7 Findings of the Study

The distribution of respondents by gender was 78% male and 22% female. This indicates that the majority of the lecturers and researchers at UNZA are male. In terms of academic qualifications, 51% and 49% of lecturers held Master's and Doctoral degrees respectively. As per school distribution, the majority of the respondents came from the School of Education as shown in table 1.

Table 1: Distribution of respondents among the eight schools

School	Percentage (%)
Agriculture	10
Education	20
Engineering	10
Law	10
Humanities and Social Sciences	15
Natural Sciences	15
Mines	10
Veterinary Medicine	10
<b>Total</b>	<b>100</b>

*Source: Research Data*

On computer literacy skills, the majority of the respondents (97%) said that they were computer literate while 3% of respondents were not. The majority of lecturers who said they were computer literate indicated that they were able to perform computer tasks such as sending e-mail, searching the web, preparing teaching materials, managing students' records of work and word processing.

### 7.1 Awareness of the existence of OAJs

In regard to the awareness of the existence of OAJs, 90% of lecturers said they were aware of their existence while 10% were not. The research further revealed that all (10) of the lecturers from School of Agriculture were aware of the existence of OAJs and that School of Education had the highest number of lecturers who were not aware of OAJs as shown by the in Table 2.

Table 2: Awareness of the existence of OAJs

School	Yes	No	Total
Agriculture	10	0	10
Education	15	5	20
Engineering	9	1	10
Law	10	0	10
Humanities and Social Sciences	14	1	15
Natural Sciences	14	1	15
Mines	9	1	10
Veterinary Medicine	9	1	10
<b>Total</b>	<b>90</b>	<b>10</b>	<b>100</b>

Source: Research Data

The majority (85) of the respondents indicated having known about OAJs through a memo from the library while others cited sources such as the Internet, friends, workshop and seminars.

### 7.2 Use of Open Access Journals by lecturers

The lecturers were asked if they had ever used OAJs. 77% said they had while 23% respondents indicated having not used OAJs in their academic research. It was further discovered schools of Agriculture, Engineering and Law had the higher percentages of lecturers using OAJs as shown by the Table 3.

Table 3: Use of Open Access Journals by lecturers

School	Yes	No
Agriculture	9	1
Education	12	8
Engineering	9	1
Law	9	1
Humanities and Social Sciences	12	3
Natural Sciences	10	5
Mines	7	3
Veterinary Medicine	9	1
<b>Total</b>	<b>77</b>	<b>23</b>

Source: Research Data

The frequency of use of OAJs among those who use them varied with 33% of respondents indicating the frequency of usage as “not often” while 67% indicated using OAJs often. The research established that the majority (56%) of the lecturers at UNZA use OAJs because they were freely accessible as compared to closed journals.

### 7.3 Publishing of scholarly work in OAJs

The majority (73%) of the respondents indicated having had published their works in OAJs while 27% said they had not published. Further investigations, revealed that 21% of respondents had published recently in OAJs, 41% had published in closed access journals (CAJs) while 11% indicated having used both journal systems.

### 7.4 Opinion of lecturers about OAJs

Many (87) lecturers among those who know OAJs view them in a positive light. They said OAJs were a good source of information and needed to be encouraged. Only 3 lecturers indicated that OAJs lack credibility.

### 7.5 Awareness and participation in the open access movement

In regard to the awareness of the Open Access Movement, 21% respondents said they were aware while 79% said they were not. Among the lecturers who indicated that they were aware of Open Access Movement, 10 said that they participate in the movement while 11 said that they do not. Lecturers who participate in the Open Access Movement publish articles in OAJs and evangelise about OAJs to others as shown in Table 4.

Table 4: Contribution to Open Access Movement

Contribution	Yes	No	N/A	Total
Publishing my scholarly work in OAJs	5	5	90	100
Encouraging students and friends to publish in OAJs	5	5	90	100
Using Open Access Journals in my research	10	0	90	100
Doing all of the above	3	7	90	100

Source: Research Data



## 8 Discussion of research findings

It is clear from this study that the majority of lecturers at UNZA are aware of the existence of OAJs. Most of the lecturers, (85%), were made aware of the existence of OAJs through the University of Zambia Library circular which it sent to them and the links to Directory of Open Access Journals which the Library has created on its home page. This is commendable and implies that UNZA has done well in sensitising lecturers about the existence of these journals. The findings on awareness are direct opposite of what Christian (2008) found among lecturers at University of Lagos where only 3% out of 66 respondents were aware of the existence of OAJs. Eqbal and Khan (2007) discovered in their study in Malaysia that lecturers and researchers from the Faculty of Natural Sciences were more aware about OAJs than any other faculties. This study found the same as lecturers from schools of Agriculture, Engineering and Natural Sciences had the highest percentages of lecturers who were aware of the existence of OAJs. Further, the study revealed that majority (77%) of lecturers use OAJs in their work and that the bulk of those lecturers who use these journals come from the natural sciences and related schools. This trend requires further investigation to determine why it is so.

It is also regrettable to note that few lecturers at the University of Zambia are involved in promoting the concept of Open Access Movement. Only 10% of lecturers participate in promoting the Open Access movement. Globally, people in academia have taken a leading role in sensitising the masses about the need to publish under Open Access so as to share and create more knowledge. Unfortunately, UNZA has not done enough to encourage the Open Access Movement.

## 9 Conclusion

It can be concluded that many lecturers at UNZA are well aware of the existence of OAJs and are using them for their academic works. However, usage of these journals is biased towards lecturers in natural sciences and related faculties. It can also be concluded that few lecturers and researchers publish in OAJs. The majority still publish exclusively in closed access journals.

## 10 Recommendations

In view of the research findings, the following recommendations could be considered for implementation by UNZA management:

1. Develop a promotion policy that support publishing under Open Access;
2. The library at UNZA should intensify its activities in promoting publishing under Open Access Movement
3. Archiving scholarly articles in UNZA library institutional repository by lecturers and researchers should be mandatory.
4. Faculties and departments at UNZA should set up OAJs platforms as a way to promote open access to knowledge.

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# The Use of Self-Archiving Technology by Strathmore University Faculty

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## Abstract

*The study from which this chapter was extracted investigated the use of self-archiving technology by Strathmore University faculty. The objectives of the study were to identify self-archiving technology used in Strathmore University; establish the faculty's self-archiving experience; examine the self-archiving platforms used by Strathmore University faculty; and propose strategies of maximising self-archiving by the faculty. The study adopted a single-case study research design with a qualitative approach. The authors used purposive sampling to select a sample size of 16 comprising of teaching staff from the Faculty of Information Technology which is the oldest Faculty in Strathmore University and 2 the institutional repository librarians. Data was collected using interviews and virtual documents. The findings of this study indicated that staff from the Faculty of Information Technology do not self-archive in the institutional repository. The authors recommend that the institution should enforce self-archiving mandate and train staff on how to deposit articles in the institutional repository. Similarly, the staff should be sensitised to use the institutional repository effectively. The faculty should also be informed of the benefits of self-archiving in the institutional repository.*

**Keywords:** *Self-Archiving Technology, Institutional Repositories, Open Access, Strathmore University, Kenya*

## 1 Introduction

The emergence of information and communication technologies makes information and knowledge easier to access and share. According to Chawner and Cullen (2009), academic libraries are best placed locations for digital repositories. Having established information repositories, there is a great urge to see scholars deposit their articles in these repositories. Scholars opt to take the next step in making their articles available by self-archiving the same on personal websites or in institutional repositories. Self-archiving is a practice of uploading digital versions of scientific works online by making them available freely on the Internet. Self-archiving makes any individual's research work widely accessible, searchable, and useable. This increases the reach, impact and the number of citations the publications receives (Chilimo, 2016). This open accessibility of scholarly articles depends solely on the user rights, the timing of the availability, funding of the open access publishing, and on whether the reader finds the original or copy of the article.

Self-archiving, the "green road to open access", is the practice of placing digital versions of scientific literature online. When a researcher self-archives research products, the work becomes freely available to anyone on the Internet. In other words, self-archiving makes research to be widely visible, accessible, harvestable, searchable, and useable, thus increasing its reach and impact, and possibly the number of citations it receives (Cerejo, 2013).

Self-archiving is a synonym for green open access. However, in this study green open access is defined as all journal articles that are freely accessible on other web locations than the original publisher's website (Björk *et al.*, 2014). Green open access is achieved when an author publishes in a non-open access journal but self-archives it in an open access repository (Novak & Day, 2018). Open access is a term used to describe a radical new dissemination model for scientific research publications. It is gradually replacing the earlier method of selling journal subscriptions and restricting access to paying readers only. This model matured and established itself during the era of printed journals. Examples of these are copies self-archived by authors; copies uploaded to institutional repositories by librarians; and copies stored in subject repositories by the publishers such as PubMedCentral.

Lin (2006) defines knowledge sharing as the activities of how to help communities and groups of people with similar objectives work together, facilitating the exchange of knowledge amongst them to enhance organisational learning capacity, and increase their ability to achieve organisational as well as individual goals. Self-archiving, therefore, is a way of sharing knowledge in that it allows the users to access and utilise the journal articles without being charged.

## 2 Strathmore University Institutional Repository

Strathmore University used D-Space application to develop an open digital repository named SU+ (Strathmore University, 2007). SU+ is a digital repository used to preserve and promote the research record and support research data at Strathmore University. The platform is an interoperable varied access system hosted and managed by the university library.

Strathmore University Portal, a digital repository, was set up in the year 2005 by the library staff. Desktop research reveals logs of the first submissions dating back to 2015 as well as views. After successful completion of institutional

repository installation (currently SU+Portal), Strathmore University library staff promoted it to all the internal publics who included academic staff, administrative staff, and students. A policy to run the institutional repository was thereafter drafted. The SU+ Digital Repository is organised according to communities and collections by issue date, authors, titles and subjects for easy access.

The platform currently hosts documents from conferences and workshops held at Strathmore University. It also hosts digital archives (assorted collections of resources covering various subject themes contributed by faculty and library staff), research and publications of conference presentations, published research articles and other faculty and corporate research outputs among others.

### **3 Statement of the Problem**

Several studies show that despite its numerous benefits, self-archiving is not widely prevalent (Xia & Sun, 2007); (Lagzian, Abrizah, & Wee, 2015); (Chan, Kirsop, & Subbiah, 2006). One of the reasons for this is the lack of awareness of the benefits of self-archiving by authors. Therefore, even if the authors' institutions have repositories, the authors themselves do not bother with self-archiving unless their institutions mandate it (Singe, Abrizah, & Karim, 2013).

Bjork (2017) conducted a study which concluded that traditional green open access in institutional repositories has been struggling with getting researchers to upload content despite the fact that most major universities now have such repositories in place. Despite all the promotion efforts of Strathmore University institutional repository during e-resources campaigns and the presence of an open access policy, self-archiving practice in the institutional repository has not been done by the faculty according to unpublished statistics. The institutional repository librarians have to upload the articles into the institutional repository on behalf of the faculty.

This study investigated self-archiving in the institutional repository by Strathmore University faculty with a view to proposing strategies of maximising the practice. The specific objectives of the study were to establish the faculty's self-archiving experience; examine the extent to which the faculty deposit their work in Strathmore institutional repository; identify the challenges faculty faced in self-archiving to Strathmore's institutional repository; and propose strategies for maximising self-archiving of content in the institutional repository by faculty at Strathmore University.

### **4 Methodology**

This research study was conducted at Strathmore University which has a well-established institutional repository. The study adopted a qualitative approach with semi-structured interviews. The qualitative approach enabled the researcher to explore and understand the phenomenon (Creswell, 2013). The semi-structured interviews gave room for exploration of issues outside the tight constraints of a structured interview. Semi-structured interviews have a capacity to provide insights into how research participants view the phenomenon (Bryman, 2016). This study targeted 217 fulltime teaching faculty. Purposive sampling was used to select a sample size of 16 comprising all the 14 full-time lecturers from the Faculty of Information Technology since they were not many and two librarians in charge of the institutional repository. The Faculty of Information Technology was selected because it was the first founding faculty in Strathmore University. Data was collected using semi structured interview schedules and through desktop research. Being a qualitative study, data obtained was analysed thematically.

### **5 Findings and Discussions**

This section presents the findings and discussions of the study based on the objectives of the research study.

#### **5.1 Self-archiving experience of the faculty**

The first objective was to establish the self-archiving experience of the faculty. To answer this question, questions were posed to the respondents. The questions were: Do you self-archive? Where do you self-archive your research works?

All the respondents stated that they self-archive content in Academic Social Networks such as Research Gate, subject repositories and personal websites. The results from the findings revealed that the faculty self-archived their research works in academic social networks, subject repositories, and personal websites of authors to provide free access to their publications. The virtual documents revealed that most of the respondents had deposited their research/teaching materials on publicly accessible web sites such as ResearchGate which is a platform where researchers can discover scientific knowledge and make their research works visible. This is in consistent with Kim (2008) who found that the faculty deposited their research articles on publicly accessible archives.

#### **5.2 The extent to which self-archiving has been done in the institutional repository**

The second objective was to find out the extent to which self-archiving in the institutional repository has been done. To answer the question, a question was posed to both the faculty respondents and the institutional repository librarians: how many articles have you self-archived in the institutional repository?

All the lecturers stated that they did not self-archive in the institutional repository. The two institutional repository

librarians stated that it was difficult getting the faculty to submit their research works to the library for archiving and so the librarians upload the content on behalf of the faculty.

This study found out that that institutional repository librarians deposited articles on behalf of the faculty members. However, it is still an uphill task convincing the faculty to submit their research works for depositing in the institutional repository. The institutional repository librarians, who willingly deposited these articles in the repository, indicated that the statistics of the archived research works in the institutional repository were very low compared to the self-archived journal articles available on other openly accessible platforms.

### 5.3 Challenges faced by the faculty when self-archiving in the institutional repository

The third objective was to find out the challenges that the faculty face when self-archiving in the institutional repository. Given that the respondents self-archived in other platforms as indicated above, the respondents were asked why they do not self-archive in the institutional repository. One respondent asserted that, *"I need to know what the library policy is with regards to accessing Strathmore research output online"*. This response was echoed by three other faculty members who said they needed information on how the library deals with copyright issues. Another respondent said: *"I do not have the rights to deposit any article in the institutional repository"*. This statement was echoed by eight other respondents that they could not do much in the institutional repository since they did not have the rights to deposit. One respondent said, *"Time would not allow me to do all that; if I can have someone archive on my behalf, the better"*. This statement was echoed by two other respondents. This clearly showed that the majority of the respondents were concerned with the depositing rights in the institutional repository.

The desktop research revealed that depositing of collections in the institutional repository was done by the library staff who also provided keywords for easy retrieval. None of the faculty respondents had self-archived their research work in the institutional repository despite having the self-archiving experience in other publicly accessible platforms. They reported sending their soft copies to the librarians for upload upon requests by the librarians. This request was reported to have come as a result of numerous requests for access by other researchers within the institution. They also revealed that as much as most of them have credentials to log in to the institutional repository, their activities on the platform were only limited to self-registration and getting notifications on new publications from their colleagues. These findings are consistent with the findings by (Singeh et al., 2013) who found that the major barrier to self-archiving was fear of plagiarism and proposed the need to create awareness to enlighten the scholars on the importance of self-archiving.

They proposed appropriate repository infrastructures which will allow them rights to add, edit as well as deposit articles in the institutional repository on their own. Currently, the faculty have no self-archiving management rights in the institutional repository and this fact contributed greatly to failure to self-archive in the institutional repository.

They also advocated for the explanation on policy in regard to public good and ethical implications of open access. Established principles of professional librarianship acknowledge the rights of information producers, the importance of the free exchange of knowledge for social progress, and the responsibility for preserving knowledge for posterity.

The institutional repository librarians interviewed revealed that due to technicalities involved in self-archiving, they opted to deposit these articles in order to save on time and that it was an uphill task trying to convince the researchers to self-archive. Copyright concerns and the risk of plagiarism were also raised when the librarian sent requests to the faculty to submit their research works. On copyright concerns, the respondents needed clarity on retaining copyright for their work sharing their work as well as transferring it without intervention. On plagiarism, the respondents feared that given the institutional repository is an open platform and needed clarification on the position of the library with regard to their works being duplicated.

## 6 Conclusions

The study found out that the faculty have self-archived their research works in different publicly accessible platforms but none of them self-archived in the institutional repository. It can therefore be concluded that the faculty are familiar with the practice. This study found out that the faculty were not self-archiving their work due to lack of depositing rights in the institutional repository; copyright concerns and fear of plagiarism; and time constraints. It can therefore be concluded that lack of depositing rights in the institutional repository, lack of clear information on library policy regarding self-archiving in the institutional repository and lack of time were the main challenges faced by the faculty.

## 7 Recommendations and proposed strategies

It is evident that faculty members from Faculty of Information Technology at Strathmore University self-archive their research works in publicly accessible platforms but not in the institutional repository. The technology in support of the institutional repository operations, DSpace, is also in place. This study proposes the following strategies to maximise self-archiving by the faculty in the SU institutional repository:

There is need for deposit rights in the repository to enable the faculty to archive their research works. Librarians also need to collaborate with the research office in creating awareness among the scholars about the self-archiving policy in

relation to institutional repository and explain the benefits associated with knowledge sharing through self-archiving. Aggressive marketing strategies are recommended to the institutional repository librarians at Strathmore University. The librarians as well as the entire university can use the findings to strategize on marketing the self-archiving practice as well as the benefits of the practice make the process user-friendly for the key contributors of knowledge.

The institutional librarian reported that the faculty claimed they had tight schedules leaving no room for induction on self-archiving. The self-archiving open access mandate should be enforced in the institution in order to have positive results. In addition, the library management should put measures such as orientations and trainings in place to ensure that the faculty members are well conversant with the self-archiving practice in the institutional repository. They need to take them through the procedures of self-archiving. The librarians should also popularise the self-archiving practice in the institutional repository to the faculty and inform them about the benefits it brings both to the individual authors as well as to the institution as a whole.

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# Collaboration Patterns in Knowledge Management Research in Eastern and Southern Africa Region, 1991 - 2016

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## Abstract

*Using a bibliometrics analysis, this chapter examines the collaboration patterns in knowledge management research in Eastern and Southern Africa (E&SA) region as indexed in Scopus database for the period 1991-2016. The study leading to this chapter used a quantitative approach as the study required numerical data to achieve its objectives. Data was collected from the SCOPUS database using a variety of keywords. The VosViewer software and Microsoft Excel were used to analyse, visualise and present the data. There were a total of 3,681 papers published on KM in Eastern and Southern Africa between 1991 and 2016. The number of publications is not consistent and varies from year to year. Seven (7) was the minimum number of publications per year while 518 was the highest. The number of publications stagnated between 1991 and 1992, with a slow growth rate being observed from 1993 to 2000. There was a significant steady increase of the number of publications from the 2001 to 2016. Two-author publications were dominant (33.93%), followed by three-author publications (23.03%) and then single-author publications (9.04%). Most of the publications emanated from academic institutions. The study has revealed collaborative efforts among authors and countries, both at the local and international level. The authors recommend that researchers should increase collaborations in the field of KM in a bid to advance KM research productivity and impact in Eastern and Southern Africa region. Both internal and external collaborations should be encouraged in a bid to increase visibility and research impact. In order to improve the impact of these publications, for instance through citations, it is highly recommended that authors should publish their findings in high quality open access journals.*

**Keywords:** *Bibliometric Analysis, Content Analysis, Knowledge Management, Eastern and Southern Africa, Scopus.*

## 1 Introduction

Knowledge management (KM) is a subject that has been embraced by many institutions all over the world (Vu-Thi & Stenberg, 2017; Park & Kim, 2005). The concept of KM has been part of the economy for decades. It is not surprising, therefore, that KM practices are deeply entrenched in the economic spheres. This can be attributed to the fact that corporate knowledge and its management has intensified over the years (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015). This concept has attracted the interest of the academics, economics and practitioners alike (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015). As a result, there has been an increasing trend of embracing knowledge management. Many organisations have since considered this concept as a tool for saving organisational costs and propelling growth (Chaudhary, 2005). As such, knowledge management has been recognised as a critical organisational management tool (Rono, 2011). The adoption of knowledge management as a management strategy has promoted a knowledge-driven organisational culture thereby enabling organisations to gain competitive advantage. The subject of KM has grown massively and thus attracted significant attention from a number of disciplines over the years (Ndwandwe & Onyancha, 2011).

The growth of KM as a discipline spans many years and can be traced way back to the 1990s during the scientific and strategic management demarcations (Park & Kim, 2005) when harnessing an organisation's knowledge, sharing expertise and disseminating knowledge at the right time to the right people was recognised as means to achieving competitive advantage (Rono, 2011; Hlupic, Pouloudi, & Rzevski, 2002). Davidova, Kokina and Zarina (2014) stress that KM is not a radically new concept since many of its principles originate from a variety of disciplines with different names. Consequently, similar ideologies have emerged that have contributed to KM's growth. However, knowledge management, as a research theme and an organisational strategy, has received varying consensus on issues such as the meaning of KM (Chua, 2009). Nonetheless, being a new research discipline, KM has boasted a great deal of scientometrics research in a bid to understand its identity better (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015).

## 2 Contextual Setting

This study focused on the Eastern and Southern African (E&SA) region in the African continent. This is a vast, geographically diverse region that stretches in the north from the Red Sea to the Cape of Good Hope in the south (UNICEF, 2017). This region comprises of 22 countries. According to the International Food Policy Research Institute (2017), the last 15 years has witnessed a massive economic growth particularly in the land and agricultural sector in Eastern and Southern Africa region. In spite of this rapid economic growth over that period, the economic outlook for E&SA, just like for Africa as a whole, remains optimistic in the face of challenging global macro-economic conditions.



In terms of research and development, the World Bank (2016) approved E&SA Higher Education Centres of Excellence Project for the purposes of supporting the region to promote specialisation among participating universities in areas that address regional challenges by strengthening their capacities to offer quality training as well as applied research. As such, there is likely to be a steady growth of research in most of the E&SA countries.

### 3 Review of Literature

KM is growing steadily and is rapidly gaining a widespread attention of the researchers, practitioners and policy makers (Harman & Koochang, 2005; Nonaka & Peltokorpi, 2006; Serenko, 2013). Serenko and Bontis (2004) emphasise that the popularity of KM has increased dramatically over the last decade amongst academics and practitioners. Even though KM is a young interdisciplinary area, the field has notably received tremendous attention and is being used to support a wide-range of applications (Qiu & Lv, 2014).

Qiu and Lv (2014) noted that research on KM have been published in a large number of journals with authors affiliated with institutions world-wide. In addition, these research studies have established a number of bibliometric projects which have been widely applied in in different disciplines. For instance, Kumar and Mohindra (2015) conducted a bibliometric analysis of KM research from 2000 to 2014 to explore the research trends in terms of growth of literature, geographical distribution, most productive journals, top authors, and highly cited papers among others. They observed that there was an average of approximately 342 articles published every year. The highest number (583) was published in 2012 while the lowest number (128) was published in 2000.

Based on the meta-review of KM and intellectual capital (IC) literature by Serenko and Bontis (2004), which focused on research productivity and citation analysis of individuals, institutions and countries, 64 most productive KM and IC researchers were identified based on their number of publications in the three journals (*Journal of Intellectual Capital*, *Journal of Knowledge Management and Process Management Journal*) (Dattero, 2006). Serenko and Bontis (2004) found out in their review of research publications that almost half of the research papers were written by a single researcher. On the contrary, Bapna and Marsden (2002) had done a similar study of comparing the research productivity of quantitative and technical departments in schools of business which found out that a vast majority of articles are co-authored (74.5%). Meaning therefore, that only 24.5% of the articles in their study were single-authored.

In regards to Serenko and Bontis' (2004), studies of the 64 most productive KM and IC researchers, Dattero (2006) analysed collaboration patterns among these top 64 KM and IC researchers. The results of the study revealed lack of collaboration in the KM/IC literature. It was also revealed that almost half of all the publications were sole authored. Dattero (2006) and Serenko and Bontis (2004) noted that this was due to the fact that in universities and organisations there is a single person who leads the KM/IC research efforts. In addition, Serenko and Bontis (2004) pointed out that the sharp contrast between their findings and others (Bapna & Marsden's, 2002) was due to a demonstration that KM/IC is a relatively young field in which a single person may provide a substantial contribution.

Similarly, Jena, Swain and Sahoo (2012) in their study on bibliometric analysis of the Journal Annals of Library and Information Studies (ALIS), 2002-2010 revealed that there was a high domination of multi-authored articles i.e. 67.7% over the single-authored articles i.e. 32.4%. Barik and Jena (2013) revealed in their study "bibliometric analysis of journal of knowledge management practise, 2008-2012" that majority of the articles have been multi-authored i.e. 95 of the total articles, followed by the single authored article i.e. 85 of the total articles published. Also, Thanuskodi (2011) in his study on bibliometric analysis of the journal Library Herald, 2006-2010 revealed that maximum number of articles was contributed by single author i.e. 72 (52.17%). The minimum number of articles was contributed by multi-authors, i.e. 66 (47.83%) of the total articles.

Evidently, therefore, collaboration in research is on the rise and has been embraced not only in KM research but also in many other disciplines (e.g. Wadhwana and Chikate 2016; Hazarika, Goswami and Das 2003; Das 2013; Biswas, Roy and Sen 2017)). This pattern could be attributed to the belief that collaboration in research leads to higher research production and impact than research that is conducted singly (Onyanha & Ocholla 2007; Franceschet & Costantini 2010; Hsu & Huang 2011).

### 4 Methodology

The research design applied by the present study encompassed bibliometrics and content analysis. The study targeted all articles on knowledge management published between 1991 and 2016 indexed in the Scopus database. Data was collected from the Scopus database because it is the largest abstract and citation database of peer-reviewed literature which includes scientific journals, books and conference proceedings. The period 1991 to 2016 was considered because this is the period under which scientific research output in Eastern and Southern Africa region recorded rapid growth (Park & Kim, 2005; World Bank, 2016; Rono, 2011; Hlupic, Pouloudi & Rzevski, 2002).

A search was conducted within titles, abstracts and keywords fields. Search #1 involved a search for terms in Table 1 using the OR Boolean operator. Similarly Search #2 followed the strategy in Search #1 but involved keywords in Table 2. The two searches were then combined using the AND Boolean operator, i.e. Search #3 = Search #1 AND Search #2.

Table 1: List of names of countries in E&amp;SA regions used to search and retrieve data from Scopus database

Angola	Botswana	Djibouti	Eritrea	Ethiopia
Kenya	Lesotho	Madagascar	Malawi	Mauritius
Mozambique	Namibia	Seychelles	Somalia	South Africa
South Sudan	Sudan	Swaziland	Zimbabwe	Tanzania
Uganda	Zambia			

Source: Research Data

Table 2: List of keywords used to search and retrieve data from the Scopus database

Knowledge Management	Information Management	Knowledge Sharing
Artificial Intelligence	Knowledge Economy	Knowledge Transfer
Organisational Learning	Intellectual Capital	Knowledge
Knowledge based Organisation	Knowledge Culture	Knowledge Audit
Knowledge Strategy	Knowledge Worker	Knowledge Retrieval
Knowledge Capture	Knowledge Creation	Knowledge Elicitation
Knowledge Acquisition	Knowledge Engineering	Tacit Knowledge
Explicit Knowledge	Knowledge Management Model	Intellectual Capital/asset
Organization culture	Computer science	Management science
Library science	Information science	Information retrieval
ICT/Internet	Learning organization	Project management
Information need	Business process	Software development
Knowledge structure	Knowledge flow	Contextual knowledge
Knowledge organization	Human Capital	Social knowledge
Organizational memory (OM)	Knowledge Infrastructure	Knowledge work
Knowledge conversion	Organizational performance	Software engineering
Knowledge Integration	Document management	Social network
Customer knowledge	Knowledge visualisation	Knowledge search
Knowledge modeling	Knowledge engineering	Knowledge discovery
Socialization	Knowledge mapping	Competitive Intelligence
Knowledge Management Process	Intangible asset	knowledge base
Knowledge dissemination	Community of Practice (CoP)	Content management
Knowledge life cycle	Knowledge asset	Data mining
Knowledge representation	Knowledge network	Knowledge managers
Knowledge codification	Expert system	Implicit knowledge
Risk management	Innovation	Knowledge flow
Knowledge Management Systems	Knowledge methods	Knowledge repository
Management	Knowledge society	Knowledge exchange
Knowledge market	Knowledge broker	Knowledge education
Knowledge based system	Learning organisation	Story telling
After action review	Lessons learnt	Intellectual property
Information systems /management systems	Knowledge sharing platform	Knowledge soliciting
Knowledge retention	Knowledge codification	

Source: Research Data

The search results were saved in csv format which is compatible with VosViewer software that was used to analyse the data. The VosViewer is a software tool for constructing and visualizing bibliometric networks for such items as journals, researchers, or individual publications. The networks may be based on citations, bibliographic coupling, co-citation, or co-authorship relations. This study applied the co-authorship option to analyse the data in order to generate collaboration networks for authors and countries. The frequencies of authored papers per author and country were generated using VosViewer software while the number of publications per year was obtained based on an analysis of the data using Microsoft Excel.

## 5 Results and Discussions

The results of the study are presented in this section using the following subheadings: Trend of KM research publication in Eastern and Southern Africa; and research collaborations in Eastern and Southern Africa region.

### 5.1 Trend of KM research in Eastern and Southern Africa, 1991-2016

Figure 1 shows the trend of KM publications per year for the period under analysis. A total of 3,681 publications were published during the period under study. The number of publications per year varied from 7 to 518. It was observed that the number of publications stagnated between the year 1991 and 1992. A very slow growth rate was observed from

1993 to 2000. However, there was a significant steady increase in the number of publications from 2001 to 2014 with a sudden significant surge in the year 2015. Notwithstanding the variance in the number of publications, the results reveal a positive trend in the entire period under study.

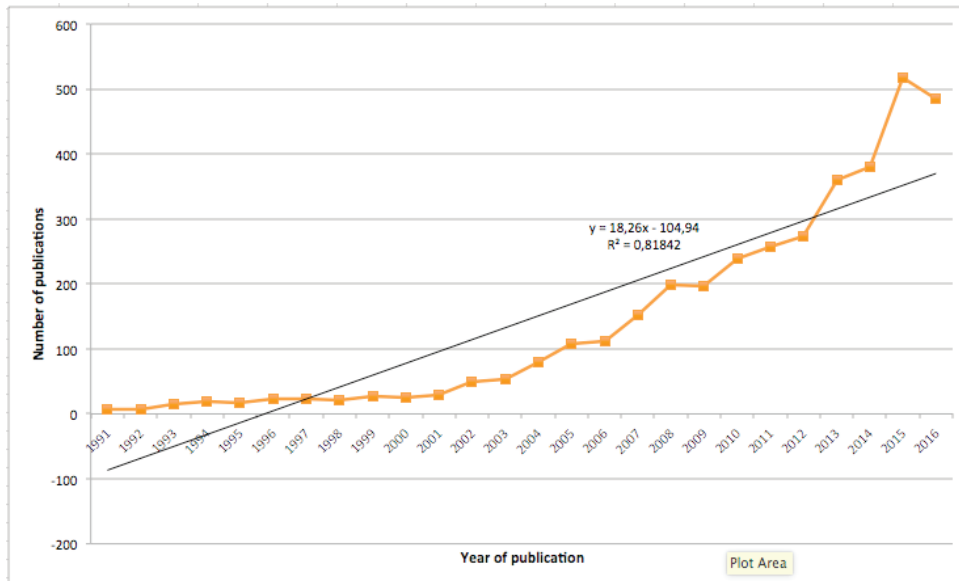


Figure 1: Trend of publication of KM research in Eastern and Southern Africa, 1991-2016

Source: Research Data

This finding is important in the field of knowledge management because it reveals that knowledge management as a discipline is advancing and has attracted a lot of attention hence the increased number of publications. Similarly, the number of scholars interested in the area is also increasing with the advancement of the discipline.

5.2 Collaboration in KM research in Eastern and Southern Africa, 1991-2016

This subsection presents results on author patterns and collaboration in the E&SA region.

5.2.1 Author collaborations

Table 2 lists the findings by the identified authors. It indicates that the number of authors involved in writing KM research ranged between 2 and 9 based on the list of top 25 authors by contributions. The results indicate that the highest number of publications (1249; 33.93%) are by two authors. This is followed by three authors (848; 23.03%); one author contributed (757; 20.56%), while four authors contributed 333 (9.04%) publications. The number of joint contributions by five or more authors was found to be 494 (13.42%). Figure 1 visually represents the co-authorship patterns.

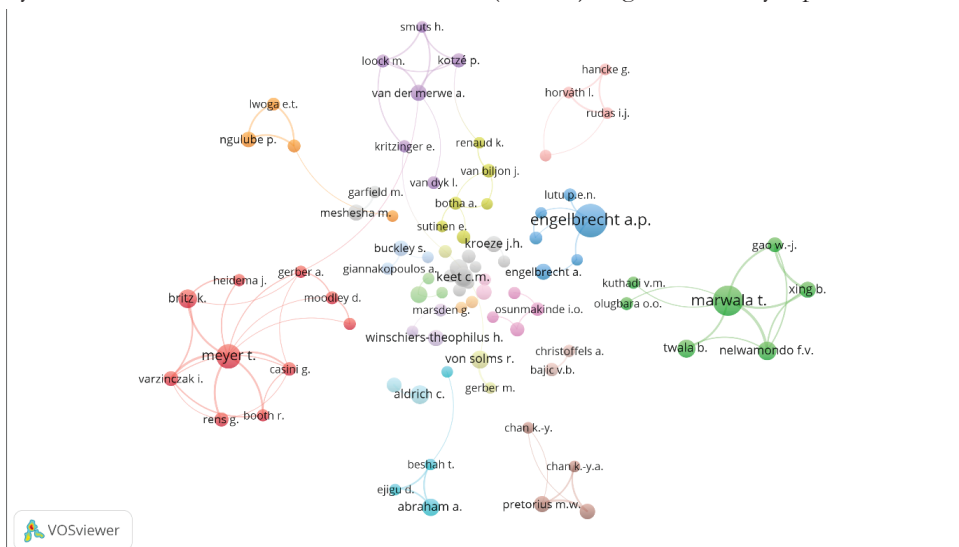


Figure 2: Author collaboration network in KM research in Eastern and Southern Africa, 1991-2016 (Author – threshold 6 papers each)

Source: Research Data

Table 2: Author collaboration in KM research in Eastern and Southern Africa, 1991-2016

No	Author	Cluster	No of collaborating authors	No of collaboration links	No of documents	Country of affiliation
1	Meyer T.	1	9	45	36	South Africa
2	Marwala T.	2	6	42	59	South Africa
3	Nelwamondo F.V.	2	4	26	19	South Africa; USA
4	Xing B.	2	3	25	14	South Africa
5	Gao W.-J.	2	3	23	11	South Africa; China
6	Varzinczak I.	1	5	22	11	Brazil; France
7	Van Der Merwe A.	5	5	17	13	South Africa
8	Britz K.	1	4	17	19	South Africa
9	Looock M.	5	4	16	8	South Africa
10	Oerlemans L.A.G.	8	3	16	12	South Africa; Netherlands
11	Pretorius M.W.	8	3	15	13	South Africa
12	Smuts H.	5	3	14	6	South Africa
13	Kotze P.	5	4	13	10	South Africa
14	Booth R.	1	3	13	7	Thailand; Luxembourg; South Africa
15	Stilwell C.	7	3	13	8	South Africa
16	Casini G.	1	5	12	9	Luxembourg; South Africa
17	HorivaTh L.	10	3	12	6	Hungary
18	Rudas I.J.	10	3	12	6	Hungary
19	Lwoga E.T.	7	2	12	8	Tanzania
20	Ngulube P.	7	2	12	12	South Africa
21	Engelbrecht A.P.	3	4	11	75	South Africa
22	Beshah T.	6	3	11	6	Ethiopia
23	Chan K.-Y.A.	8	2	11	6	South Africa
24	Rens G.	1	3	10	10	South Africa
25	Abraham A.	6	2	10	16	Sudan; USA

Source: Research Data

Similarly, the results indicate that majority (i.e. 19 authors) of the authors originate from South Africa or are affiliated with the institutions from South Africa. This may be attributed to the increased KM research output. Thus KM research is most productive in countries of affiliation by authors.

Table 3 further provides patterns of authorship of KM papers. The Table presents and compares single and multi-authored papers. The highest number of publications (1,249; 33.93%) is by two authors. This is followed by three authors (848; 23.03%), one author (757; 20.56%) while four authors contributed 333(9.04%) publications. The number of joint contributions by five or more authors was (494(13.42%). Thus, the results reveal that contributions by small number of authors comprising two, three or four authors, including single authors dominated the field of KM.

Table 3: Single vs multi-authorship patterns of KM papers, 1991-2016

A/Year	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	>Ten	Total
1991	2	3	2	0	0	0	0	0	0	0	0	7
1992	0	6	1	0	0	0	0	0	0	0	0	7
1993	3	4	7	0	0	1	0	0	1	0	0	16
1994	7	8	4	1	0	0	0	0	0	0	0	20
1995	6	7	3	1	0	0	0	0	0	0	0	17
1996	4	10	6	1	2	1	0	0	0	0	0	24
1997	5	8	6	3	1	0	0	0	0	0	0	23
1998	7	9	4	0	0	1	0	0	0	0	0	21
1999	14	10	3	1	0	0	0	0	0	0	0	28
2000	12	6	5	1	2	0	0	0	0	0	0	26
2001	8	10	7	2	1	1	1	0	0	0	0	30
2002	18	17	5	1	4	3	1	0	0	0	1	50
2003	13	19	15	6	1	0	0	0	0	0	0	54
2004	21	33	10	7	4	2	1	1	0	0	1	80
2005	31	34	18	14	1	4	1	3	0	0	2	108
2006	27	38	30	6	6	0	1	2	1	0	1	112
2007	29	69	35	12	5	1	0	0	0	0	1	152
2008	45	69	48	16	6	4	1	1	2	0	6	198
2009	38	67	43	12	15	5	0	4	0	1	11	196
2010	53	87	50	24	14	3	1	2	3	0	1	238

A/Year	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	>Ten	Total
2011	56	80	66	17	16	7	4	3	3	0	6	258
2012	60	97	60	27	16	2	1	2	3	1	4	273
2013	71	121	84	36	16	7	9	3	2	1	10	360
2014	73	125	83	39	13	16	7	7	4	2	11	380
2015	81	172	132	55	31	13	7	8	6	2	11	518
2016	73	140	121	51	22	24	8	7	8	7	24	485
<b>Total</b>	<b>757</b>	<b>1249</b>	<b>848</b>	<b>333</b>	<b>176</b>	<b>95</b>	<b>43</b>	<b>43</b>	<b>33</b>	<b>14</b>	<b>90</b>	<b>3681</b>
<b>Per cent</b>	<b>20.56</b>	<b>33.93</b>	<b>23.03</b>	<b>9.04</b>	<b>4.78</b>	<b>2.58</b>	<b>1.16</b>	<b>1.16</b>	<b>0.89</b>	<b>0.38</b>	<b>2.44</b>	<b>100</b>

Source: Research Data

### 5.2.2 Country collaborations

Table 4 lists the findings by the identified countries. It indicates that South Africa led in KM research collaboration i.e. collaborated with 105 countries, 1,397 times in a total of 2,723 publications. This is followed by the United States, which collaborated with 97 countries, 823 times in 315 publications. Kenya came in fifth position after Germany with 77 as the number of collaborating countries, collaborative strength of 362, and a total of 229 publications. Figure 3 visually represents the collaboration patterns.

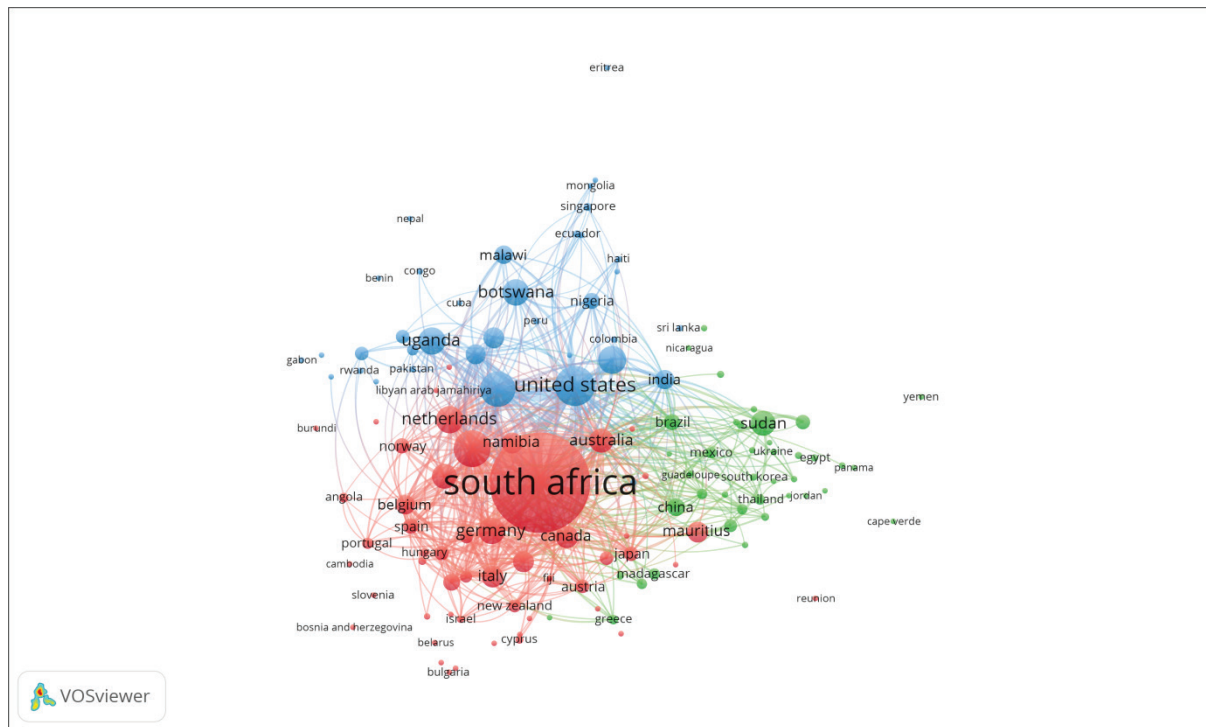


Figure 3: Country collaboration network in KM research in Eastern and Southern Africa, 1991-2016

Source: Research Data

Table 4: Top 25 countries with highest number of country collaborations in KM research in Eastern and Southern, 1991-2016

No.	Label	Cluster	No. of collaborating countries	No. of collaboration links	No. of documents
1	South Africa	1	105	1397	2723
2	United States	3	97	823	315
3	United Kingdom	1	89	731	257
4	Germany	1	84	397	120
5	Kenya	3	77	362	229
6	Australia	1	81	357	94
7	Netherlands	1	63	347	121
8	Italy	1	67	304	70
9	Canada	1	65	303	81
10	France	1	67	278	69
11	Belgium	1	55	236	54
12	India	3	75	223	56
13	Brazil	2	73	210	35

No.	Label	Cluster	No. of collaborating countries	No. of collaboration links	No. of documents
14	Sweden	3	57	208	61
15	Switzerland	1	54	192	41
16	Spain	1	53	178	34
17	Tanzania	1	51	165	100
18	China	2	60	163	45
19	Japan	1	54	163	29
20	Ethiopia	3	40	141	136
21	Uganda	3	41	138	121
22	Nigeria	3	59	132	36
23	Botswana	3	33	120	120
24	Austria	1	49	119	26
25	Sudan	2	43	118	101

Source: Research Data

## 6 Summary, Discussions and Conclusions of the Major Findings

The study yielded a total of 3,681 KM publications that were published between 1991 and 2016. It was observed that the number of publications is not consistent and varies from year to year. The minimum number of publications per year was seven (7) while 518 was the highest. The number of publications stagnated between 1991 and 1992, with a slow growth rate being observed from 1993 to 2000. There was a significant steady increase of the number of publications from 2001 to 2016. There was a sudden significant surge in the year 2015 accounting for 14.07 percent of the entire sample with a small reduction of the number of publication comprising 0.89 percent in 2016. This may be attributed to increased attention that KM has drawn among researchers. Scholars are increasingly researching this relatively new discipline thereby demonstrating its relevance.

In terms of collaboration, Meyer T. was the most collaborative author with 45 links. Although the author collaborated with 6 authors, she/he co-authored more papers with some of these authors than others, hence the higher collaborative links than the number of authors with whom she/he collaborated. Two-authored publications are dominant (1,249; 33.93%), followed by three-authored publications (848; 23.03%) and then single-authored publications (333; 9.04%). These findings concur with Bapna and Marsden (2002)'s observation that a vast majority of articles are co-authored. Based on their findings, Bapna and Marsden (2002) conclude that majority of authors in KM research collaborate. However, these findings contracted the findings of a study by Serenko and Bontis (2004) which indicated, in their review of research publications, that almost half of the research papers were written by a single researcher.

South Africa led in KM research collaborations. This may be attributed to the growing number of publications affiliated to the country. The country also leads other countries in Africa in terms of research performance as attested to in different ranking systems such as the Times Higher Education World University Ranking (THE), Webometrics Ranking of World Universities (WRWU) and Shanghai's Academic Ranking of World Universities (ARWU). An examination of the aforementioned ranking systems reveals that South African institutions take the top ten positions in sub-Saharan Africa, a situation that may be attributed to the intensity of research collaboration in the country as noted in Sooryamoorthy (2009). In his research on collaboration and publication in South Africa, Sooryamoorthy (2009: 419) observed that "collaboration research in South Africa has been growing steadily and the scientists are highly oriented towards collaborative rather than individualistic research". This trend seems to permeate all disciplines including KM.

We have further noted that KM researchers in E&SA collaborate both with both their local/regional and international counterparts. The country of researcher-affiliation demonstrates a wide network of authors conducting KM research in the region. Previous studies such as Sooryamoorthy (2009), Onyancha and Ocholla (2007), and Pouris and Ho (2014) have reported that African authors largely collaborate with their international counterparts, especially in biomedical research, biology, earth sciences and space sciences. South Africa seems to record more internal than external collaborations, particularly during and immediately after the apartheid era (Narvaez-Berthelemot, Russell, Arvanitis, Waast & Gaillard 2002).

## 7 Recommendations

The study has revealed collaborative efforts among authors, both at the local, regional and international level. We recommend that researchers should increase collaborations in the field of KM in a bid to advance KM research in Eastern and Southern Africa. Both internal and external collaborations should still be encouraged in a bid to increase visibility and research impact.

In order to increase the production of these publications, there is need to regularly organise local and international conferences in E&SA during which researchers can have an opportunity to present their findings, exchange ideas and

identify other researchers from the region with whom they can collaborate.

In addition, it is highly recommended that authors, researchers or publishers, should publish their findings in recognised channels so as to improve the impact of these publications. They should particularly consider using quality Open Access (OA) journals.

We recommend further research to assess, among others, the type of channels used to publish KM research and the subject content of KM research as well as identify the major producers of KM research.

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## Research Trends by TU-K Staff in Google Scholar, 2013-2016

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### Abstract

*This chapter explores the research trends by Technical University of Kenya's staff in Google Scholar for the period of 2013-2016. The study from which the chapter has been extracted analysed research output including all publications such as books, research papers, dissertations, theses, research projects, and conference proceedings produced by fulltime academic staff. The publications were collected from Google Scholar using Harzing's "Publish or Perish" software. A total of 647 papers were published in the years 2013 to 2016. The findings revealed a steady increase in the quantity of the research output from 2013 to 2015. However, a drop in the number of publications occurred in 2016. The highest number of publications came from lecturers who produced 182 (28.1%) papers while associate professors ranked highest (12.2%) in the average publications per author. The majority 457 (70.6%) of the publications were in journals while 72 (11.0%) papers were published in institutional repositories (like theses and dissertations) and 118(18.2%) papers in conference proceedings. Out of the 647 publications analysed, only 196(30.29%) were singly authored while 451(69.71%) were co-authored. The authors recommend more collaboration between researchers. They also recommend the use of research load to complement the teaching load stipulated for researchers since teaching and research are all core activities in universities. Therefore, teaching and research should receive the same attention. Finally, the authors recommend that further research into the factors that influence researchers in the choice of channels to publish their research output in be conducted to demystify and improve journal selection and visibility of research from TU-K.*

**Keywords:** *Bibliometrics, Research Output, Impact, Visibility, Academic Staff, Google Scholar, the Technical University of Kenya.*

### 1 Introduction

Research is defined in this study as the systematic search for appropriate information to respond to a particular problem, question or issue for the purpose of obtaining a solution to it or even to satisfy curiosity through scientific application of procedures (Kothari, 2004; Collis & Hussey, 2013). There are various reasons for conducting research. According to Kothari (2004), some of the reasons include gaining certain academic qualifications; desire to solve unsolved problems; quest for intellectual joy of doing some creative work; and prestige. Research involves either or both searching through literature and empirical observation. The result of this process is an original research output which constitutes knowledge which can be used for decision making or scholarly purposes (Ocholla, Ocholla & Onyancha, 2013).

Research output is a core concern in universities. It influences capacity to attract funding, research grants, quality of staff and students. Research output also contributes to the prestige of a university (Parker & Gathrie, 2012). Furthermore, university rankings are partly based on research output, visibility and research impact. Academic staff who engage in research gain from their output by securing employment, tenure, prestige and promotions (Altbach, 2015). Therefore, the research output of academic staff contributes immensely to marketability.

Research output by academic staff is usually made available to readers and other researchers through publishing in journals, books, conference papers and proceedings. Research output constitutes individual and institutional publications. However, some research outputs are sometimes never published. Some are placed in institutional repositories or self-archived without ever being published formally. Examples of such output include theses and dissertations. The visibility of published research output is influenced by their quality and availability. Citing Fooladi, Salehi, Yunus, Farhadi, Chadegani, Farhadi and Ebrahim (2013), Ebrahim, Salehi, Embi, Habibi, Gholizadeh and Motahar (2014) note that high quality research papers receive high citations and reach the widest audience possible.

Research should be beneficial. This implies that it should improve life in one way or another. Research impact is partly associated with the visibility of output which is usually gauged by metrics such as citation analysis (Harmelen & Workman, 2012). Research impact has six zones, namely, knowledge, teaching and learning, practice, public policy, society and environment, and economy (Peters, 2010) and the impact in each zone is measured differently. However, the impact of research may vary from discipline to discipline hence it is important to compare like to like. The impact of research is also a factor of where the research output is published in terms of whether it is open access or subscription-based channel.

Google scholar offers an opportunity for most researchers in developing countries to avail their work for scholarship. This can be attributed to the fact that researcher accounts or profiles are free of charge. Research output and impact can be easily accessed from this platform through search tools such as "Publish or Perish" software. Visibility is an

important aspect as it accounts for over twenty percent in the metrics used in university rankings (Usher & Savino, 2007). Therefore, it is important to note that research impact is not only a factor of how much one publishes but also of how visible the research is to other researchers (Ravenscroft, Liakata, Amanda & Duma, 2017).

## 2 Contextual Setting

The Technical University of Kenya (TU-K) was established through the elevation of the Kenya Polytechnic University College (KPUC) to a full-fledged university status. TU-K was established as the first technical university in Kenya in line with the provisions of the enacted Universities Act, 2012. Being a new type of university, it has a mandate to offer higher education in research and technology. Its programmes contribute to the realisation of Kenya's Vision 2030 by providing the skills and technologies which drive national socio-economic development (TU-K, 2015). At the time of this research, TU-K had three faculties that offer a vast range of courses. Each faculty has both fulltime and part-time academic staff. One of the roles of these academic staff is to conduct research whose visibility and impact contributes to their survival and continuity in the institution.

The study from which this chapter has been extracted investigated the visibility and impact of research by TU-K academic staff using Google Scholar. The period of consideration was from 2013 to 2016. The objectives of the study were to determine the trends of research publication and impact at the TU-K from 2013 to 2016; establish the locations in which TU-K researchers publish their work; and ascertain the nature and pattern of research collaboration in TU-K.

## 3 Literature Review

Bibliometrics, just as the name implies, is metrics about biblios (Wilson, 2016). Biblio means book and metrics means science of meter, that is, scale or measure (Kori, 2016). The term was coined by Alan Pritchard in 1969 (Roy & Basak, 2013). It was used to describe the quantification of discrete data publication elements of the processes of written communication. It came up as a substitute of statistical bibliography which involved the application of mathematical models and statistics to research (Russell & Rousseau, 2010).

Bibliometric-based studies analyse research production and avail the results to policy makers, stakeholders and other researchers (Ellegaard & Wallin, 2015) for informed decision making. This analysis is based on the assumption that carrying out of research and communicating the results of that research goes hand in hand (Russell & Rousseau, 2010). Bibliometrics applications are myriad. Some of them include locating core literature, especially journals; classifying literature; tracing the spread of ideas and growth of literature; improving the efficiency of information handling services; and predicting publishing trends (Powell & Connaway, 2010), just to mention a few.

Research trends give the general direction of change or evolution of research publication. It can be monitored by the fluctuations in quantity or the changes in subject of research. These can show the development in research over time. Research trends can focus on quantity or subject area or discipline and mostly reflects underlying strategies and priorities. However, comparison of trends in research in various disciplines necessitates the comparison of like against like (Ma, Dong, Zhou, Mita, Liu & Wayne, 2016; Agarwal *et al.*, 2016).

The trend of research shows the evolution of an institution's intellectual journey. This, in universities, is seen in the varying interests of the researchers over time and points to the motivation behind such interests. For instance, the ranking and evaluation of university staff based on number of papers published is an incentive which has led to an increase in publications (Larivière & Costas, 2016). Subject-wise evolution can point to the emergence of particular subject areas which need demystification or new modern subjects which have been researched less. Quantity fluctuation, on the other hand, may point to funding availability, increase in the number of academic staff with Master's and doctorate degree qualifications and introduction of new rules which may require publishing portfolio as a mandatory metric for promotion, tenure and recruitment, among others.

As much as quantity of research output is given attention, quality and influence is equally of great importance since the former measures productivity and the latter measures impact (Agarwal *et al.*, 2016). Quality and influence are subject to the content produced and partly to where the content is published. The choice of journals in which to publish research output can be based on factors like the reputation of the journal (Smith, 2015; Rosas, Kagan, Schouten, Slack & Trochim, 2011), whether the journal is open access or subscription-based, whether publishing is free or payment is required, the acceptance rate of the journal, whether the journal is online, the journal indexing services and publication frequency (Adjei & Owusu-Ansah, 2016).

The quality of research in the academic arena is usually controlled by the peer review process. Papers published in academic refereed journals are known for their quality, credibility and authority (Mweru, 2010). These traits increase the influence and impact of the research publication which should be the outcome of every research and desire of every researcher. Bearing in mind that such publishing is one way of scholarly communication, researchers therefore need to dedicate time and effort for this activity.

The impact and visibility of research output is influenced by collaborations (Aksnes, Osipov, Moskaleva & Kullerud, 2016). Research collaboration, which can also be termed as intellectual collaboration (Ramkrishna & Grover, 2016), uses co-authorship as a proxy in its measurement (Rosas, Kagan, Schouten, Slack & Trochim, 2011). Through co-authorship, two or more researchers come together and conduct research and produce outputs of greater quality and quantity than could have otherwise been produced by one researcher working alone. Collaborations can take place between authors in the same institution, same country, different institutions or different countries which can be further categorised into inter and intra collaboration.

Collaboration has a close association with research output and research quality (Morrison, Dobbie & McDonald, 2003). As researchers collaborate, their research capability improves (Chen, Yao, Sun, He, Yao & Liu, 2016). Katz and Martin (1997) further add that the desire to increase recognition, popularity, and visibility are some of the factors stimulating collaborations. When scholars collaborate, ideas are shared (Ware & Mabe, 2015), new ones are created, better combination of skills required is achieved, new relationships are formed and research visibility is increased. Collaborations most often result to professional growth and development (Walker, Anbari, Bredillet, Söderlund, Cicmil & Thomas, 2008) and a social network for researchers.

#### **4 Methods and Procedures**

This study took the form of a quantitative research approach since data collection was based on predetermined instruments that yielded statistical data. Bibliometrics was applied as a research design and more specifically publication count, co-authorship analysis, and citation analysis were examined as a means of assessing research quantity, quality and visibility at the Technical University of Kenya.

Publications count measured productivity using variables such as the number of publications per author, publications per department, publications per school, publications per faculty, collaboration, and year of publication, among other variables. Content analysis and citation analysis, which indicated the university's research areas and impact, respectively, assessed the subject content and the number of citations respectively. Co-authorship showed the nature and pattern of research collaboration among researchers.

This study analysed research output including all publications such as books, research papers, dissertations, theses, research projects, and conference proceedings produced by fulltime academic staff. The publications were collected from Google Scholar using Harzing's "Publish or Perish" software.

The scope of the study covered all the three faculties of the Technical University Kenya. These include the Faculty of Engineering Sciences and Technology (FEST), Faculty of Social Sciences and Technology (FSST) and Faculty of Applied Sciences and Technology (FAST). In terms of time scope, the authors considered the period between 2013 and 2016. This is because the university was chartered in 2013 and additionally, all the research from 2016 had not been reflected in Google scholar at the time of research.

The researchers selected "New Google Scholar Query" under "Query" which is located in the menu bar then keyed in the name of the authors under "Authors" which is one of the provided fields. The researchers then specified the time period as 2013-2016 on the "Year" slot provided on the right end of the "Authors" field. This was then concluded with a look-up to retrieve the results. The results from the look-up were retrieved and tabulated in their various fields. These fields were: cites per year, rank, authors, year, publication, and publisher. A metrics section also displayed the summarised details of the searched author. The results were then copied through "Results for Excel" option under the "Copy" dropdown menu and saved in Microsoft Excel for cleaning purposes with the help of the checklist before analysis was done. The same procedure was repeated for all the academic staff to obtain their data for the study. The data was processed and analysed using Bibexcel, VOSviewer and Ms Excel and WordPad. The choice of these software for processing and analysing the research data was based on the different aspects of the subject of the study which demanded different tools for comprehensive and accurate results.

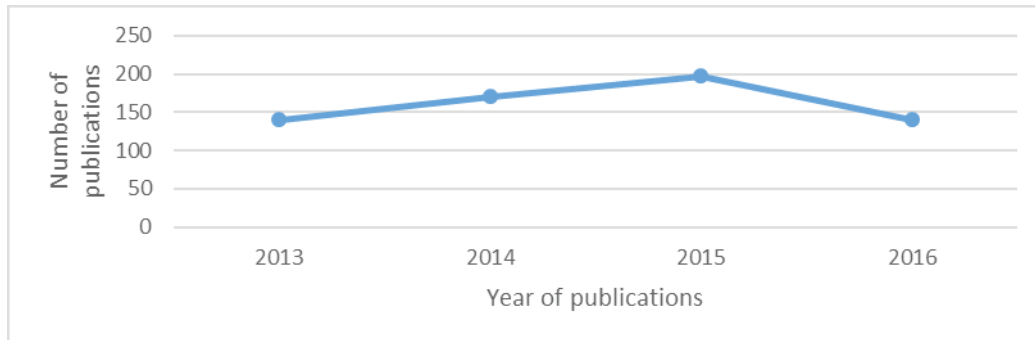
#### **5 Results and Discussions**

This section presents and discusses the findings under the following subsections: the trends of research publication and impact; the locations in which TU-K researchers publish their work; and the nature and pattern of research collaboration in TU-K.

##### **5.1 The trend of research publication and impact**

The study revealed, as shown in Figure 1, a steady increase in the quantity of the research output from 2013 to 2015. However, a drop in the number of publications occurred in 2016. Out of a total of 647 papers published in the years 2013 to 2016, the highest number of publications per year, that is, 197(30.4%) was published in 2015 whereas the lowest number of publications (140), (21.6%) was published in 2013 and 2016. The increase of publications from 140 (21.6%),

170 (26.3%), 197(30.4%) in the years 2013, 2014 and 2015 respectively could be related to the growth of the university since it was chartered in 2013. This may be due to recruitment of more senior researchers. On the other hand, the decrease in the year 2016 could be related to the fact that not all research publications produced had been indexed in Google Scholar at the time data was collected. However, this trend implies that more growth in research publications is expected in the near future as the university grows and recruits more senior researchers.



**Figure 1: Number of publication from 2013-2016**

Source: Research Data

Table 1 further shows the number of research publications listed according to the rank of the academic staff at the Technical University of Kenya. Production of research papers was done at all ranks from the professors and associate professors down to graduate or teaching assistants. The highest number of publications was from lecturers who published 182 (28.1%) papers. This was followed closely by senior lecturers that had 152(23.5%) publications and assistant lecturers who had 138 (21.3%). Professors published 61 (9.4%) publications while graduate teaching assistants produced 23(3.6%) publications.

Table 1: Research publication by rank

S/N	Rank	No. of Authors	No. of Publications	% of 647	Number of publications per author
	Professor	11	61	9.4	5.8
	Associate Professor	6	73	11.3	12.2
	Senior Lecturers	25	152	23.5	6.1
	Lecturers	61	182	28.1	3.0
	Assistant Lecturers/Tutorial fellows	60	138	21.3	2.3
	Teaching Assistants/Graduate Assistants	10	23	3.6	0.4
	Others i.e Technicians, Technologists	5	18	2.8	0.3

Source: Research Data

## 5.2 The channels in which TU-K researchers publish their work

The study revealed out of the total 647 papers published, the majority 457 (70.6%) of these were published in journals while 72 (11.0%) papers were published in institutional repositories (like theses and dissertations) and 118(18.2%) papers in conference proceedings.

The top twenty journals, ranked by the total number of the publications, produced a total of 91(19.9%) publications while the rest, 366 (80.1%), of the publications were produced by the remaining journals. At the top of the top twenty list was the *International Journal of Soft Computing and Engineering* (IJSCE) which contributed 8(1.8%) publications, following closely by *International Journal of Advanced Research in Management and Social Sciences* and PLOS One which had 7 (1.5%) and 6 (1.3%) respectively. Table 2 presents the top 20 journals as well as the number of papers published in each.

Table 2: Top 20 journals in which research is published, 2013-2016

NAME OF JOURNAL (SOURCE)	No of Publications	% of 457
International Journal of Soft Computing and Engineering (IJSCE)	8	1.8
International Journal of Advanced Research in Management and Social Sciences	7	1.5
Plos one	6	1.3
Aquatic ecosystem health & management	5	1.1
Chemistry International	5	1.1
Citeseer	5	1.1
Aids research and human retroviruses	5	1.1
Scholars Journal of Arts Humanities Social Sciences	5	1.1

NAME OF JOURNAL (SOURCE)	No of Publications	% of 457
European journal of business and management	4	0.9
Inkanyiso: Journal of Humanities and Social Sciences	4	0.9
International Journal of Economics, Commerce and Management	4	0.9
International Journal of Education and Research	4	0.9
International Journal of Psychology	4	0.9
Journal of Acquired Immune Deficiency Syndromes	4	0.9
Journal of sustainable research in engineering	4	0.9
Mediterranean Journal of Social Sciences	4	0.9
Plos neglected tropical diseases	4	0.9
Innovation: journal of appropriate librarianship and information work in Southern Africa	3	0.7
BMC Health Services Research	3	0.7
International Journal of Humanities and Social Science	3	0.7

Source: Research Data

### 5.3 The nature and pattern of research collaboration in TU-K

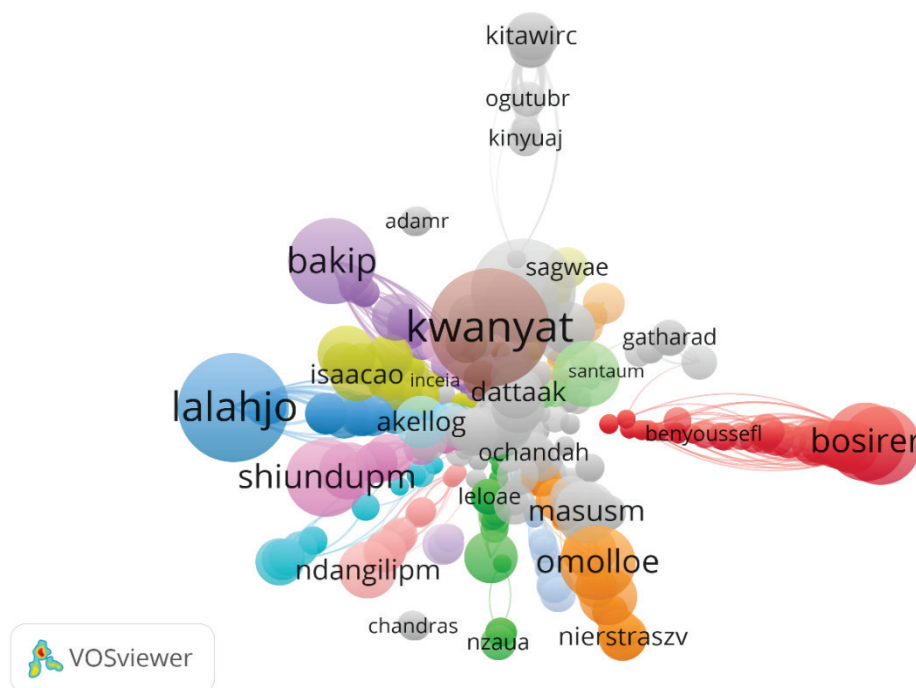
As shown in Table 3, the study showed that out of the 647 publications analysed, only 196(30.29%) were singly authored while 451(69.71%) were co-authored. The study further revealed that more publications 141(21.79) were done by three collaborating authors while ten collaborating authors produced the least number 13 (2.01%) of papers. From the study, it was found that researchers in the university collaborated more. This is a good gesture given the myriad benefits of collaboration in research. Some of benefits include sharing of skills and techniques, transferring of knowledge, and more especially tacit knowledge, encouraging cross-fertilisation of ideas, enhancing of intellectual companionship and increasing the potential of visibility of the work produced by collaborating authors (Ocholla & Ocholla, 2007; Sitienci & Ocholla, 2010; Katz & Martin, 1997).

Table 3: Number of collaborating authors and corresponding number of papers

Number of Authors	Number of Papers	% of 647
1	196	30.29
2	76	11.75
3	141	21.79
4	66	10.20
5	37	5.72
6	26	4.02
7	21	3.25
8	18	2.78
9	19	2.94
10	13	2.01
11	34	5.26

Source: Research Data

The pattern of collaboration was further displayed in a social network, Figure 2, to show how different authors were collaborating. The social network reveals that researchers with larger nodes (kwanyat, lalahj, omolloe, shiundupm, bakip) were doing more collaborative research than their counterparts with relatively smaller nodes. This kind of findings can be attributed to the fact that most of the researchers with relatively larger nodes are professors and engage much in mentorship on research work and also supervise students in research. The network further revealed the researchers who have not collaborated in any of the analysed publications. These researchers (adamr, chandras) had nodes not connected with other nodes in the social network.



**Figure 2: Pattern of research collaboration**

Source: Research Data

## 6 Conclusion and Recommendations

Research and the well-being of universities are inseparable. Universities with more research output and impact tend to be more visible to researchers and the user community in general compared to their counterparts that have less. This is based on the gradual increase in the number of publications and the production of more publications from collaborations between and among authors which encourage knowledge incubation and enhance visibility of research output. However, the finding on the research publications by ranks in the university does not present the expected scenario. Professors and senior researchers should produce more research output than their counterparts given their immense experience and knowledge on matters pertaining to research.

The authors recommend more collaboration between researchers. They also recommend the use of research load to complement the teaching load stipulated for researchers since teaching and research are all core activities in universities. Therefore, teaching and research should receive the same attention. Finally, the authors recommend that further research into the factors that influence researchers in the choice of channels to publish their research output in be conducted to demystify and improve journal selection and visibility of research from TU-K.

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# Effect of Information Literacy Strategies on the Utilisation of Electronic Resources Among Students: A Case of Egerton University

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## Abstract

*This chapter discusses the effect of information literacy strategies on the utilisation of electronic resources among students at Egerton University. A case study research design was used for the study on which this chapter is based. The population of the study comprised of both undergraduate and post graduate students at Egerton University. Systematic random sampling was used to derive a sample of 76 respondents from the eight faculties in the University. Semi-structured online questionnaire was used to collect primary data. Six (6) staff in-charge of e-resources were purposively selected to participate in a face to face interview. Results from the study revealed that undergraduate students in their fourth year of study were comfortably able to access and use electronic resources. It was also revealed that postgraduate students used the electronic resources for research purposes. However, the study revealed that the majority of the respondents in their first and second years of study were not aware of the existence of e-resources and did not use them. Access and utilisation of electronic resources benefits both students and staff in universities since they are not only authentic, from reputable publishers, but are cost effective. Libraries are required to consistently create awareness on the availability of the electronic resources among the user community. Libraries should continue giving specialised information literacy sessions to enhance hands-on experience and promote discoverability. In addition, librarians should improve their delivery of information literacy strategies so as to ensure maximum utilisation of the electronic resources.*

**Keywords:** *Electronic Resources, Information Guides, Information Literacy, Social Media*

## 1 Introduction

With the emergence and proliferation of new technologies, electronic resources have become the backbone for library collection development. The diverse user needs have led libraries to employ new technologies in providing access to e-resources aimed at availing to users the most authentic and valuable information from reputable publishers. Such a paradigm shift towards new information implies that users need to be equipped with the right skills to enable them to discover the content that meets their needs. Therefore, there is need to incorporate information literacy strategies into the mainstream services of the library. Robertson (2014), recognises the need for creating awareness of the available resources and developing training material, as institutions need to market the resources more intensively.

Electronic information resources are resources provided in electronic form. Additionally, the American Library Association Presidential Committee on Information Literacy (1989), defines information literacy as a set of abilities which include recognising an information need and locating, evaluating, and using the needed information effectively. It was first defined as being able to find information by (Zurkowski, 1974) who stated that, “people trained in the application of information resources to their work be called information literates since they have learned techniques and skills for utilisation of information tools as well as sources in moulding information solutions to their problems”. In addition Zurkowski maintains a firm position on information literacy by stating that identifying electronic information online requires the ability to locate, manage, critically evaluate and use information for problem solving, research and decision making.

## 2 Literature Review

With the fundamental need for information by all, academic institutions have realised the need to embrace information literacy in order to enhance the utilisation of the electronic resources that they subscribe to. Due to the high cost of these resources, academic institutions need to put in place strategies for creating awareness of the available resources, ensuring that they are accessed and utilised. Kinengyere (2007), however, points out that access does not usually mean usability. Academic libraries should, therefore, ensure that formal programmes like information literacy, continuous training sessions, one-on-one demonstrations (individual programmes), end user training programmes, target databases and workshops are put in place to sensitise clients on access and utilisation of the e-resources.

Over the last few decades the need for collaborative efforts among academic and research institutions has seen the establishment of the Kenya Library and Information Services Consortium (KLISC). KLISC was established with an aim of collective subscription to electronic resources to cope with the increasing cost of information resources. Over

the years, KLISC has remained at the forefront in ensuring that the goals of information literacy have been achieved by organising sensitisation workshops and seminars among member institutions who in turn organise the same for their respective clients. The Commission for University Education (CUE) has also made it mandatory for universities and other academic institutions to develop and embed the information literacy course in the academic programmes. Such initiatives consequently help the users to become information literate. This is a prerequisite for human right lifelong learning (USNCLIS, 2003).

### 3. Information Literacy Strategies

According to Candy *et al.* (1994), information literacy involves knowledge of major current resources; the ability to frame researchable questions; ability to locate, evaluate, manage and use information; ability to retrieve information; ability to decode information; and capacity critically evaluate information.

Today, in most academic libraries one of the librarians' primary responsibilities is to provide appropriate skills to support information literacy to new and continuing students. According to Okello-Obura and Magara, (2008), users would in turn exploit the benefits of information literacy in their academic work. Besides imparting relevant skills on users utilising the library services, Okello's survey revealed that Library orientation in the form of a library tour can be adapted in creating awareness on available e-resources; individual hands-on training on access to information resources; collaboration between faculty and librarians to encourage maximum use of the library resources; as well as virtual tours with information about the library's products and services accessed online among others. Library orientation is an important undertaking since library patrons are citizens of the information age and need to be information literate.

The purpose of the study leading to this chapter was to investigate the effect of information literacy strategies on the utilization of electronic resources among students at Egerton University. The specific objectives of the study were to;

- i. examine the level of awareness on the access and utilisation of the available electronic resources among students at Egerton University;
- ii. find out the effect of the information literacy strategies on access and utilisation of electronic resources; as well as
- iii. determine the challenges encountered by students while accessing and utilizing the electronic resources.

### 4 Methodology

A case study research design was adopted in the study. The location of the study was Egerton University library and its constituent branches and campuses comprising of main university library in Njoro; Faculty of Arts and Social Science Library (FASS), J.D. Rockefeller Library; Nakuru Town College Campus Library; and Nairobi City Campus Library. The target population of the study was undergraduate and postgraduate students. The sample selected from student respondents was 76. Interviews were conducted with six (6) purposively selected librarians in charge of the electronic resources in each of the campuses and the e-learning with an aim of assessing the effectiveness of the information literacy strategies put in place.

To select student respondents, systematic random sampling was used whereby the total number of units in the general population was divided by the desired number of units for the sample population. Every "nth" member was selected from the total population for inclusion in the sample. The total student population was 19,000 and the "nth" number was 250. Therefore, the sample was calculated as:  $19000/250=76$ . Consequently, the researcher settled on a sample of 76 students. A semi-structured online questionnaire was used to collect data from the student's respondents.

### 5 Findings

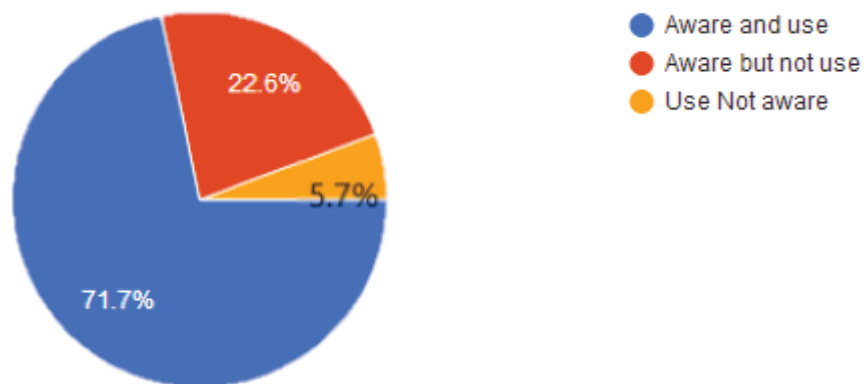
The target population was 76 undergraduate and postgraduate students. Fifty-four (54) students completed and returned the questionnaires. The response rate for the students was therefore 71%. All the six (6) key informants, who comprised of the incharge electronic resources were interviewed.

The findings revealed that 44(81.5%) of the respondents were undergraduate students while 10(18.5%) indicated that they were postgraduate students. The findings imply that the majority of the respondents were undergraduate students. It emerged from the findings that 19(35.8%) respondents were in their fourth year of study; 16(30.2%) respondents indicated that they were second year; 12(22.6%) indicated that they were in their first year of study; while 6(11.3%) respondents said that they were third years. This was an indication that most of the respondents were in their fourth year of study.

#### 5.1 Awareness and usage of the electronic resources

The study sought to establish the level of awareness and usage of the electronic resources among the respondents. The respondents were required to state whether they are aware of and used the electronic resources, whether they are aware

of the resources but they do not use them, or whether they use the electronic resources and are not aware. The results are shown in Figure 1.



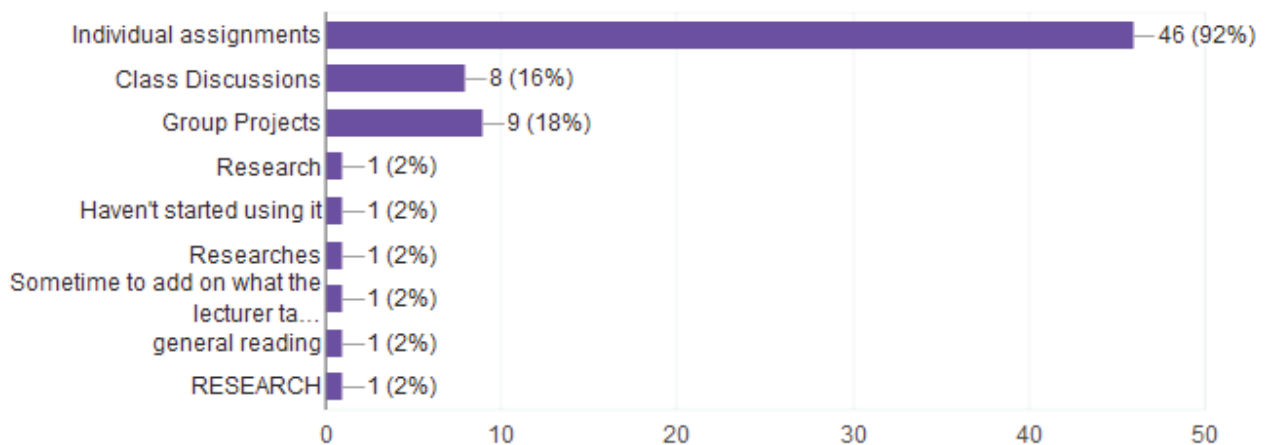
**Figure 1: Awareness and usage of the electronic resources**

*Source: Research Data*

The findings of the study showed that 38(71.7%) were aware and used electronic resources while 12(22.6%) stated that they are aware of the electronic resources but do not use them. 3(5.7%) of the respondents indicated that they used the electronic resources but are not aware of their availability. From the study, it is evident that most the respondents are aware of the electronic resources and they used them.

### 5.2 Purpose of using the electronic resources

The study also sought to find out why the respondents used electronic resources. The summary of responses is shown in Figure 2.



**Figure 2: Purpose of using electronic resources**

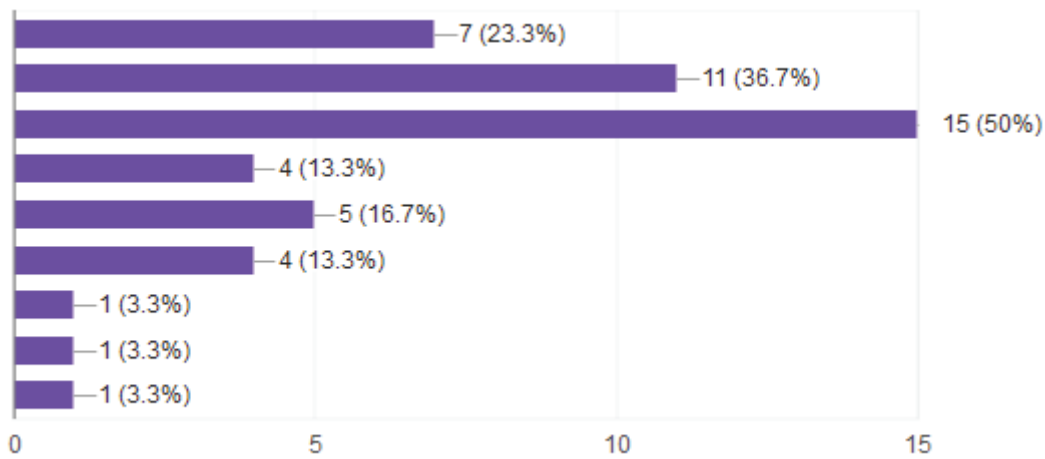
*Source: Research Data*

As indicated in Figure 2, 46(92%) of the respondents used e-resources for individual assignments while 9(18%) respondents used them for group projects. 8(16%) of the respondents used the e-resources for class discussions; 1 (2%) of the respondents used electronic resources for research and sometimes to add on what the lecturer taught or for general reading. 1 (2%) of the respondents did not use the electronic resources. The findings indicate that the electronic resources were mostly used by the respondents for individual assignments and group projects.

### 5.3 Attendance of information literacy sessions covering electronic resources

The study sought to establish respondents' attendance of information literacy sessions covering electronic resources. From the findings, 30(55.6%) of the respondents indicated that they attended information literacy sessions covering electronic resources while 24(44.4%) of the respondents indicated that they had not. This was a clear indication that the majority of the respondents had attended information literacy sessions covering electronic resources.

Respondents were also asked to indicate the kind of information literacy session they had attended. The results are shown in Figure 3.

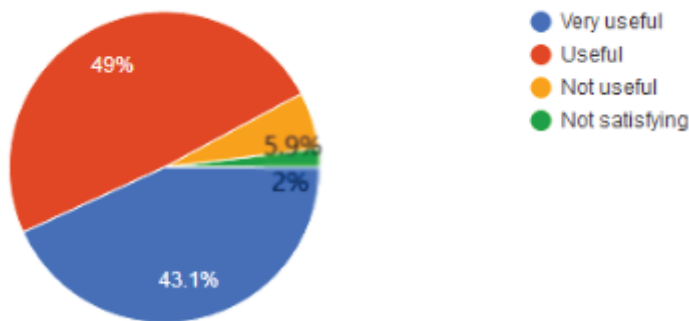


**Figure 3: Kind of information Literacy session attended**

*Source: Research Data*

As shown in Figure 3, 15(50%) of the respondents indicated that they had a one-on-one instruction session with the librarians while 11(36.7%) stated that they had electronic library instruction as part of a class. 7(23.3%) of the respondents said that they had online orientation and 5(16.7%) indicated that they had face-to-face instruction during the information literacy sessions. Additionally, 4(13.3%) indicated that they had self-guided orientation and online tutorials. 1(3.3%) stated that they had peer to peer consultation while 1(3.3%) gave the option that they had open access and another 1(3.3%) indicated that the question was not applicable. It is clear that one-on-one instruction sessions in the library covered electronic resources.

The respondents were asked to indicate the quality of the training sessions offered in the library. The findings are as shown in Figure 4.



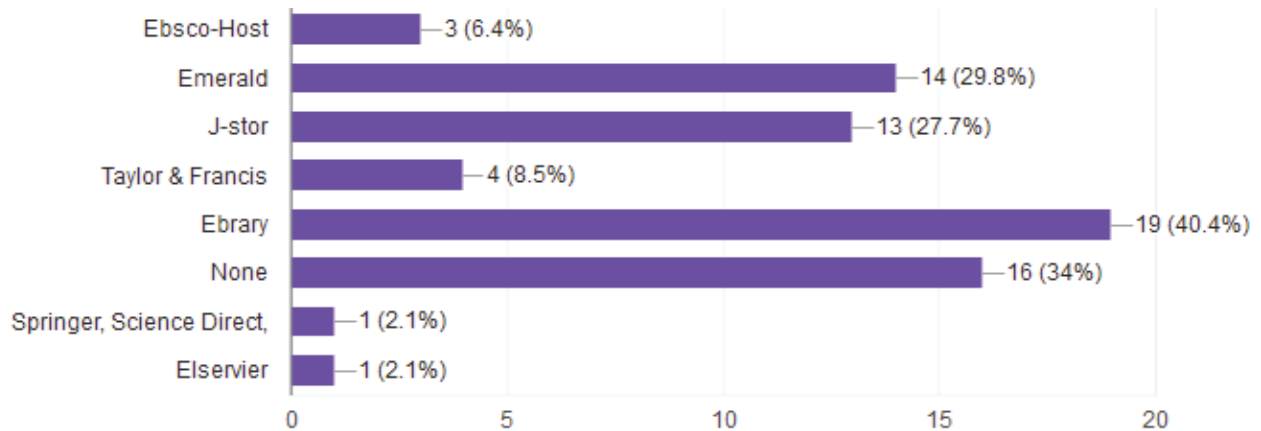
**Figure 4: Quality of the training sessions offered in the library**

*Source: Research Data*

Figure 4 shows that 25(49%) of the respondents indicated that the training was very useful to them while 22(43.1%) indicated that the training was useful to them. 3(5.9%) of the respondents stated that the training sessions were not useful to them while 1(2%) stated that the training was not satisfying. This was a clear indication that most respondents found the training sessions offered in the library to be very useful to them.

**5.4 Electronic resources used**

The study investigated the type of electronic resources used by the respondents. There were several options given from which the respondents could choose more than one depending on the circumstances as shown in Figure 5.



**Figure 5: Electronic resources used**

*Source: Research Data*

From Figure 5, the study established that 19(40.4%) of the respondents used Ebrary; 14(29.8%) used Emerald; 13(27.7%) of the respondents used J-Stor; while 4(8.5%) of the respondents used Taylor and Francis during the research process. 3(6.4%) used Ebsco-host while 1(2.1%) of the respondents used Springer, Science Direct and Elsevier. 16(34%) of the respondents did not use any of the electronic resources during the research process. This study established that a high number of respondents used none of the electronic resources hence the low usage of the resources noticed during the utilisation statistics.

### 5.5 Importance of accessing electronic resources to academic success

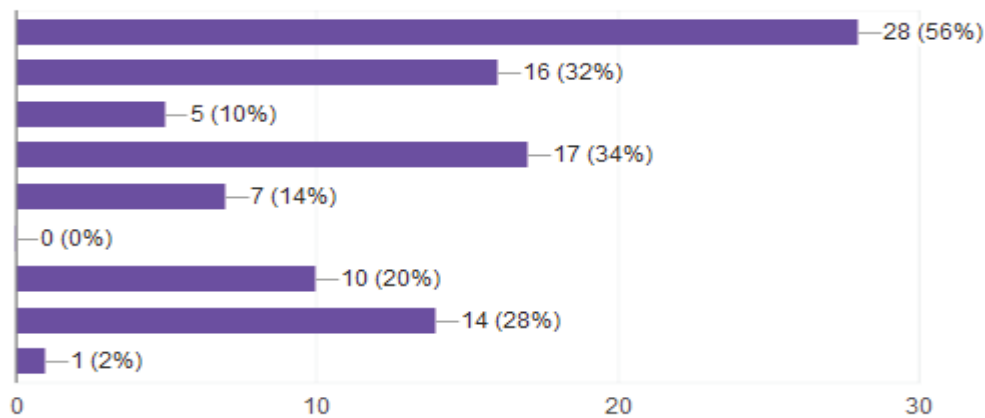
The respondents were asked to indicate the importance of accessing electronic resources for their academic success. The findings indicate that 41(71.7%) of the respondents stated that access to electronic resources was very important to their academic success while 13(22.6%) said that access to electronic resources it was important to their academic success. In addition, 3(5.7%) of the respondents indicated that access to electronic resources was somewhat important to their academic success. It can be concluded that access to electronic resources has a positive impact to academic performance.

### 5.6 Out of campus access to electronic resources

The study sought to determine whether the respondents accessed the electronic resources when out of campus. From the findings, 28(52.8%) of the respondents stated that they accessed electronic resources while out of campus while 25(47.2%) indicated that they did not. One can conclude that most of the respondents had off-campus access to electronic resources. The respondents were also asked to indicate if the off campus access improved their academic performance. From the results, of the 28(52.8%) of the respondents who accessed electronic resources while out of campus, 28(90.3%) stated that off-campus access to electronic resources improved their academic performance while 3(9.75) indicated that off-campus access does not improve their academic performance. This implies that off-campus access to electronic resources has a positive impact in improving respondents' academic performance.

### 5.7 Challenges experienced in access and use of the electronic resources

The study sought to establish the challenges in access and use of the electronic resources. The results are indicated in Figure 6.



**Figure 6: Challenges experienced in access and use of the electronic resources**

Source: Research Data

As shown in Figure 6, 28(56%) indicated slow or unreliable network as one of the challenges while 17(34%) of the respondents stated insufficient workstations in the library as a challenge. Additionally, 16(32%) of the respondents indicated lack of adequate information retrieval skills and 14(28%) said that requirements to purchase some articles within subscribed databases was a challenge. 10(20%) of the respondents cited complex searching mechanisms as a challenge. 5(10%) and 7(14%) indicated irrelevant information in databases and lack of awareness of e-resources respectively as major challenges in access and use of the electronic resources. 1(2%) of the respondents stated that some interfaces not user friendly. It can be concluded that slow or unreliable network and insufficient workstations in the library are the major challenges experienced in access and use of the electronic resources.

### 5.8 Responses from the librarians in-charge of e-resources

From the interview sessions conducted with librarians in-charge of e-resources it was revealed that all campuses of Egerton University conducted information literacy. The following are excerpts from the interviews:

*"We conduct one-on-one instruction among all students from their respective levels of study".*

*"The library provides printed guides to the electronic resources in both hard copy and soft copies available on the university website".*

*"Some electronic resources are well utilised while others are not utilised at all".*

*"The library has an active email address where users send queries".*

*"The library also trains students on off-campus access to electronic resources".*

*"Students are aware of the electronic resources and they use them".*

When asked about challenges faced in enhancing the information literacy strategies, the librarians presented responses as indicated hereunder:

*"We experience technological barriers since access to electronic resources requires both equipment and internet access. These are costly leading to challenges while enhancing information literacy to the students".*

*"Subscription to electronic resources is costly and some publishers hinder libraries from accessing such resources when they fail to pay for them".*

*"Information literacy sessions should be fully embedded into the curriculum so that students take them more seriously".*

*"Lack of interest in the electronic resources among the undergraduate students".*

## 6 Conclusion

With the continued subscription to e-resources, libraries in academic institutions have continued to develop and implement workable information literacy strategies based on individual user requirements. Popular information literacy strategies include formal orientation programme; development of information literacy curriculum; individual hands on training; offering continuous information literacy sessions training sessions; faculty/librarian collaboration; classroom tour on information literacy talk; virtual tour for e-learning campus through off campus access; use of social media; and information guides in print and online formats. This study has brought forth useful information about the positive effects of the information literacy strategies put in place in the library and how effective they are in guiding users on how to access and use the electronic resources. The findings of this study have provided useful insights about appropriate strategies that can increase skills and awareness of the users in accessing and using the electronic resources.

## 7 Recommendations

Libraries should create more awareness on the availability of electronic resources among users and consistently guide the users on how to access and use them. There is need to establish a long-term committee in higher education institutions to advise on the new developments in electronic resources since they are dynamic and keep increasing with time hence the need to keep up with the pace of their development.

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# Assessing Institutional Repositories as Enabler of Research Output in Academic Institutions in Kenya: Case of KCA University

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## Abstract

*This chapter assesses the role of institutional repositories in promoting open access. Mixed methods involving both qualitative and quantitative were used. Questionnaires and interview guides were used to collect data. Content analysis was used to analyse the qualitative data from open-ended questions and interviews. Quantitative data from the questionnaires was analysed through Statistical Package for Social Sciences (SPSS). Institutional repositories have gained relevance in academic institutions as a way of disseminating research output. Respondents were aware of open access and agreed that there were benefits of using open access. The majority (74%) of the respondents agreed that university management support for institutional repositories was evident. A model is proposed for use to guide the training of librarians, academic staff and students the use institutional repositories better. If the repository is marketed well, content depositors will understand its benefits and will allow their documents to be uploaded on them. Access to the institutional repository can improve institutional ranking. Authorisation forms granting rights to upload students/ staff work should be done at the library level. There is need to revise the institutional repository policy to include mandatory submission.*

**Keywords:** *Institutional Repository, Academics, Academic Institutions, Open Access, Research Output.*

## 1 Introduction and Background Information

Knowledge is considered as a strategic resource and therefore it is inevitable that libraries create, store and transfer information in a continuous flow. Academic libraries have continued to play a key role in scholarly communication for many years. During this period, they have experienced major changes in the creation, dissemination and preservation of new knowledge through the emergence of new technologies. Libraries continue to mobilise and provide access to local and global knowledge for social, political and economic development thereby acting as gateways for information. No wonder Cullen and Chawner (2010) point out that, digital libraries have revolutionised society.

Open access refers to access and use of research output available on the public Internet, permitting any user to read, download, copy, distribute, print, search or link the full-text of these articles, pass them as data to software or use them for any other lawful purpose without financial, legal or technical barriers other than those inseparable from gaining access to the Internet (Ezema, 2011). There has been an increase in the use of open source software to access scholarly work. The open access movement has brought new ways of disseminating scholarly work. Before the emergence of the institutional repository, scholars used to send their manuscripts to the publishers. If accepted the manuscripts were published in a journal or a book. For those who could not afford the publishers' fee, their work was kept in the computer drives or on websites which after some time was difficult to trace. Sometimes the files were destroyed by viruses. Institutional repositories have offered a solution to this problem (Musangi and Sawe, 2013).

The use of Information and Communication Technology (ICT) in academic institutions has enhanced the quality of teaching and learning, research productivity of the faculty and students, as well as the management and effectiveness of the institutions. Kenya has already developed policies that articulate the significance of ICT in higher education. Cullen and Chawner (2010) argue that setting up an institutional repository in academic institutions is paramount and requires commitment of financial and staff resources.

## 2 Context of the Study

KCA University (KCAU) was founded by the Institute of Certified Public Accountants of Kenya (ICPAK) as a training division of Certified Public Accountants (CPAs). The decision to establish KCA University was in response to research carried out by the Chartered Institute of Public Finance (CIPF) in 1988 which indicated a growing gap between the demand and availability of accountants in the country. The university initially offered training to accountants only. KCAU was awarded a temporary charter to operate as a university in 1999 by the then Ministry of Higher Education. In 2013, the university obtained a charter from the Commission of University Education (CUE) to operate as a fully-fledged university (KCA, 2017).

The university has embarked on research in its academic programmes with the intention of producing and disseminating research outputs which are grounded in knowledge and innovation. Martin Oduor Library in KCAU provides the



resources and environment for academic research in the university. The library supports research by providing a learning environment which is supported by technology-based resources and customer-oriented services. Resources in the library include e-learning materials, electronic books, institutional repository, online electronic catalogue, digital repository and e-newspapers. Print resources such as books, journals and theses are also conveniently placed in the library. Access to print resources is through the online public access catalogue (OPAC). The library has adopted open access (OA) practice which allows free access to the university's and global research outputs. Martin Oduor Library has been ranked as a top library by Kenya Libraries Association (KLA) for three years consecutively for its conformance to established interaction best library practices (KCA, 2017).

### **3 Statement of the Problem**

Research is a driving pillar of universities all over the world. Universities are ranked in the academic arena based on how much scholarly outputs are visible globally (Lwoga & Questier, 2014). Universities in Kenya are ranked poorly in the world despite a lot of research being done in the universities. The major problem is how the research outputs are preserved and accessed. The competitive academic environment that organisations are operating in requires them to utilise and strengthen their knowledge capital.

In the recent past, researchers used various methods to publish their research findings. These included the use of printed books and journals. Other outlets included theses, dissertations, technical reports, conference proceedings and projects. These traditional methods led to limited access of research outputs because they were hosted by the libraries in the respective universities under closed access and only accessible to the academic community and authorized members (Ezema, 2010). The use of ICTs has provided a better way of preserving and accessing the scholarly materials.

The revolution of digital libraries and the availability of open source software solutions such as DSpace have enabled several institutions of higher learning in Kenya to embrace institutional repositories (Odongo, 2012). Institutional repositories have become important because they provide extensive opportunities for scholars, learners, and teachers to access, evaluate and use information to create new knowledge. They also provide opportunities for users to conduct research on personal computers and work stations located anywhere.

Academic libraries are important organs in universities as they facilitate teaching, learning and research. Martin Oduor Library in KCA University provides appropriate resources and environment for academic research in the university. The library has adopted an institutional repository to manage the digital content produced by the researchers and enhance scholarly communication among the university community and the world at large. Institutional repositories bring together all the works that have been done within the institution to a central place where they are accessible both within and outside the institution. Despite the efforts made by the university in developing the repository, the usage of this channel of scholarly communication is yet to be realised.

The purpose of the study leading to chapter was to assess the role of institutional repository as an enabler of effective access to research output in academic institutions in Kenya with special reference to KCA University. The specific objectives of the study were to assess the level of awareness of information repository as a tool of enhancing access to research output at KCA University; investigate the usage of institutional repository by researchers at KCA University; explore the role of the university management in supporting wide adoption of the institutional repository at KCA University; and propose an appropriate model for embracing an institutional repository as an enabler of wide access to research output at KCA University.

## **4 Literature Review**

This section reviews relevant literature according to the salient themes of the topic.

### **4.1 Level of awareness of users towards institutional repository**

Reviewed literature indicates that scholars have been able to benefit from this platform without knowing this mode of scholarly communication. Studies from Africa indicate that academics are becoming aware of open access platforms such as institutional repositories. Dulle (2010) in his study on researchers' perspectives on open access scholarly communication in Tanzania public universities found that 60% of the scholarly community were aware of institutional repositories. However, studies carried out in the USA (see Kim, 2010) indicate that academics are still not aware of institutional repositories in their institutions and self-archiving practices. Similar studies in Malaysia (Abrizah, 2012; Sigheh *et al.*, 2012) indicate that academic staff do not know about self-archiving opportunities. Instead, the faculty are using other repositories like subject-based repositories since they are not aware about institutional repositories from their institutions.

It is paramount for researchers to be aware of institutional repositories because of the benefits such as increased visibility leading to more citations, free publications for authors, free access to research work online and boosting the reputation of the scholars. It is evident that academic staff and research community do not value repositories as a publishing

platform. Some researchers do not deposit their research output either due to lack of awareness, lack of interest, lack of knowledge or concern over the benefits of institutional repositories (Cullen and Chawner, 2009). Librarians need to do more marketing in educating academics of the benefits for this platform to be successful.

#### 4.2 Usage of institutional repository

Access and dissemination of research work in Kenyan academic institutions, like in other developing countries, is affected by several factors. Researchers produce a lot of scholarly research output but this work is only accessible to the academic community and authorised members only locking other potential users from access (Ezema, 2013). If these results are not disseminated to the public, it is a waste of resources (Lwoga & Questier, 2014). This calls for an effective tool for knowledge dissemination such as the institutional repository. The more widely scientific results are disseminated, the more readily they can be understood, applied and built upon for future use. The process of scholarly research is essential for the progress of scientific research.

In India, Dhanavandan and Tamishcheivan (2013) studied the awareness of institutional repository and open access publishing among faculty members in Annamalai University. The study revealed that awareness of open access and repository archiving was low but there was very high level of support for the concept of open access. They also concluded that the benefits of increased exposure and potential for sharing outweighed the perceived risks. Various studies that have been conducted in the developed world indicate that there is low usage of institutional repositories as a tool for disseminating the scholarly communication (Abrizah, 2012). Lack of awareness may result to the scholars using other methods of disseminating their work such as personal web pages.

The attitude of users towards the institutional repository affects its use. A user will consider a system to be useful if they find it easy to manipulate. Perceived usefulness of a system is defined as the level to which one believes that a new technology would enable him to increase his performance in a given task. Embracing the institutional repository boosts the research output (Dulle, 2010).

Librarians have long been challenged to effectively promote scholarly communication concepts to their faculty especially when there are concerns about quality or going against the publishing models (Laughton-Dunker, 2014). Laughton-Dunker continues to argue that faculty are reluctant to embrace open access due to the existing university reward system and misconceptions about quality. Faculty are motivated to publish in high prestige journals that have a reputation for quality to get tenure and promotions. Open access journals are thus at double disadvantage because they have not yet earned respect of the scholars and are overlooked by faculty who prefer to publish through the already established journals to disseminate their work.

Institutional repositories support teaching and collaboration through archiving of institutions' scholarly activities. Research output are collated at one stop where they can be accessed easily. This enhances the quality of teaching and scholarship as researchers have access to the right information (Ezema, 2011). These platforms support knowledge sharing and collaboration with other institutions. Access to institutional output is improving because of institutional repositories and access to ICTs. Increasingly, a number of academic institutions are encouraging their students to submit their thesis in electronic formats. Institutions then digitise these theses to make them visible on the Internet.

#### 4.3 Support from University Management

Success of institutional repositories depends on the commitment of management in terms of planning, development, implementation and adoption. Senior management provide resources and promote positive attitude among other managers and users towards the institutional repositories (Nabe, 2010). This ensures the sustainability of institutional repositories as observed by Makori and Njiraine (2015). Institutional repositories support open access policies which allow works to be used or distributed freely. Management must come up with policies that require every faculty member to submit their work to the repository. The author should confirm the publisher's policy before submitting their work to the repository.

### 5 Research Methodology

Mixed methods involving both qualitative and quantitative approaches were used. Questionnaires and interview guides were the main instruments for collecting data from the respondents. Content analysis was used to analyse the qualitative data from open-ended questions and interviews. Quantitative data from the questionnaires was analysed using Statistical Package for Social Sciences (SPSS). The target population was 170 respondents who included 14 library staff, who were purposively selected, all the 88 fulltime academic staff selected through census method while 68 postgraduate students undertaking Masters in Commerce (MSc Com) were selected through cluster sampling. The response rate was 7.8% (12) library staff, 54.5% (84) fulltime academic staff and 37.7% (58) were postgraduate students. A sample size of 154 respondents was therefore used representing 90% of the target population.

## 6 Discussion of Findings

The first objective of the study was to assess the level of awareness of institutional repositories as a tool for increasing access to research output. Several questions were raised to achieve this objective and findings revealed that 40.3% of the respondents who included librarians, faculty staff and students strongly agreed that institutional repositories effectively manage the research output. In terms of whether the institutional repositories are relevant and beneficial to the institution, the results indicated that 64.9% strongly agreed. On whether it would offer solutions in terms of access and use of research output, the results revealed that 40.9% strongly agreed. Therefore, it can be concluded that the respondents were aware that the institutional repository was relevant, beneficial and offered solutions in terms of access and use of research output. From the responses obtained, management need to offer the necessary support and infrastructure to make it possible for the objectives of the institutional repositories to be realised. The results are as indicated in Table 1 below.

Table 1: Level of Awareness Towards Institutional Repository

Statement	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %
Effective in managing the research output	5.2	5.8	12.3	36.4	40.3
Relevant and beneficial to the institution	1.3	1.9	4.5	27.3	64.9
Offers solutions in terms of access and use of research output	1.3	5.8	12.3	39.6	40.9

*Source: Research Data*

The second objective was to establish the reasons for using the institutional repository. Results revealed that the majority of the respondents agreed to the fact that institutional repositories enhanced the visibility of the institution with 54.5% of the population strongly agreeing and 37% agreeing. Another major reason was that the institutional repository promotes quality of teaching and collaboration with 55.2% of the population strongly agreeing to this statement while 34.4% of the same population agreeing. Other reasons were that the institutional repository promoted open archiving, it provided a platform for scholarly output, enhanced accessibility of resources in other locations apart from the library and that the repository increased visibility and prestige of researchers. The responses are as presented in Table 2. From the findings it can be deduced that there is need to have institutional repositories in universities to enhance the visibility; promote quality of teaching and collaboration; promote open archiving; and enable access of research output in other locations apart from the library. Ezema (2011:477) justifies the need for an institutional repository by stating that “what is obvious with open access movement is that there is democratisation of the availability and access to information and this will go a long way in bridging the information gap between the developed counties and the developing countries”.

Table 2: Reasons for Using the Institutional Repository

Statements	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %
Enhances visibility of the institution		1.9	6.5	37	54.5
Provides a platform for scholarly output	3.9	5.8	11.7	37.7	40.9
Promote quality of teaching and collaboration	0.6	3.2	6.5	34.4	55.2
Accessibility of resources in other locations apart from the library	2.6	5.2	7.8	39.6	44.8
Promotes open archiving	1.3	4.5	4.5	40.3	49.4
Increase visibility and prestige of researchers	4.5	11	17.5	30.5	36.4

*Source: Research Data*

The third objective was to explore the role of the university management in adopting an institutional repository at KCA University. The results revealed that most of the respondents felt that the university's provision of infrastructure was the most crucial step towards establishing the institutional repository. The bigger population wanted the university to provide software required for setting up and hosting the repository. 59.7% of the population strongly agreed to this aspect while another 30.5% of the population agreed too. A section of the populations also held the view that providing enough computers as part of the infrastructure needed for accessibility is an important aspect. This is evident with 59.1% of the population who strongly agreed to this aspect while 30.5% of the respondents agreed. Another aspect was the provision of leadership in the setting up of the repository with 42.9% of the population strongly in agreement that this was a crucial aspect. Another 56.6% agreed that funding was needed to set up the repository system while 33.8% agreed that as an enabler to research, the management must have strategies in place for the promotion and marketing of the institutional repository. These results are presented in Table 3.

Table 3: Support of the Institutional Repository by management

Statements	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %
Provides enough computers	0.6	3.2	6.5	30.5	59.1
Provides the required software for hosting the repository	1.9	2.6	5.8	29.9	59.7
Provides scanners for digitization	26.6	27.9	28.6	11	5.8
Provides leadership in the setting up of the repository		1.9	11	44.2	42.9
Provides training and workshops about the use of institutional repository	41.6	14.9	18.8	17.5	7.1
Provides enough funds for the repository	0.6	5.2	32.5	56.5	5.2
Have strategies in place for promoting and marketing institutional repository		3.2	51.3	33.8	11.7

Source: Research Data

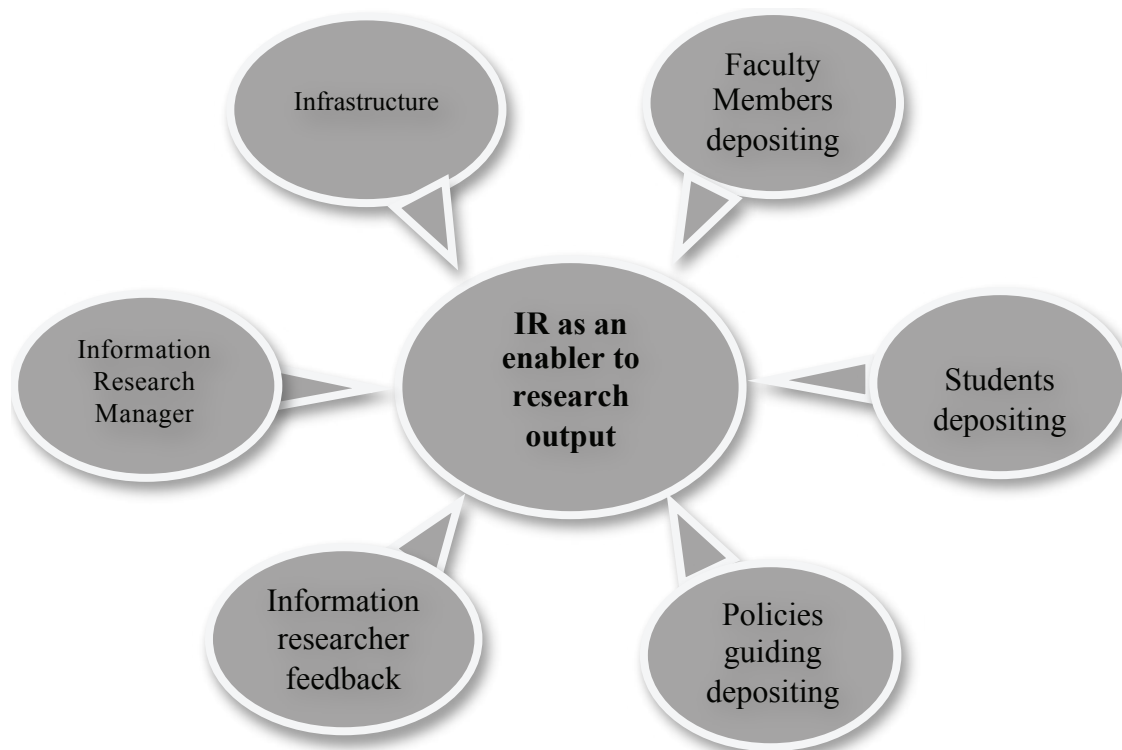
The study investigated the challenges which hindered the adoption of an institutional repository at KCA University. A majority (54.5%) of the population strongly agreed to the statement that legal and copyright issues are a hindrance to the adoption of an institutional repository. Another 48.7% strongly pointed out that the issue lied with poor infrastructure while 47.4% of the population strongly pointed at the lack of skills to use the institutional repository. Table 4 presents these findings.

Table 4: Challenges that Hinder Adoption of Institutional Repository

	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %
Lack of skills to use the institutional repository	0.6	2.6	3.9	45.5	47.4
Lack of awareness of IR	1.3	3.2	2.6	57.1	35.7
Legal and copyright issues		4.5	0.6	40.3	54.5
Perception of IR contents as being of lower quality	0.6	1.3	19.5	41.6	37
Inadequate funding	1.3	7.8	7.1	42.9	40.9
Poor ICT infrastructure	3.9	6.5	5.8	35.1	48.7

Source: Research Data

The final objective was to propose an appropriate model for embracing the institutional repository as enabler of increased access to research output at KCA University. In view of the study findings, an integrated model depicting the institutional repository as enabler to research output at KCA University was proposed as illustrated in Figure 1. The model guarantees that research output is pegged on several aspects. These aspects include research that is produced from both the faculty that is teaching at the university as well as the students studying. The research conducted by the faculty can take the form of knowledge shared to the students directly in class or information that is published in journal articles. The knowledge that these lecturers share in class becomes key in determining what the students will publish in the end. Similarly, policies that guide depositing of research publication are an important aspect since they define the limits needed for these publications to be deposited in the repository. The institution needs feedback from users that are accessing publications. This will help them understand the impact IR is making to research. The publications need appropriate infrastructure to enable the content to be shared to the information researchers. The infrastructure will include tools such as the enabling software as well as networks to facilitate sharing of the research output. There is also need to have people who are skilled enough to manage the knowledge acquisition, knowledge processing, archiving and preservation and knowledge sharing of the research output as per existing policies. All these aspects should work together because each has its own specific role in order for the model to be effective.



**Figure 1: Proposed model for embracing IR as enabler to research output at KCA University**

*Source: Research Data*

## 7 Conclusions

Institutional repositories have gained relevance to the academic institutions. However, the respondents revealed a lack of awareness about the repository. There is need for aggressive marketing and promotion strategies to create awareness to the clients. Orientation and training on the usage of the repository will be an effective intervention strategy that has the potential to enhance usage of institutional repositories. The majority of the respondents indicated lack of training on the use of the repository and this calls for serious user education and staff training because it was evident that the training offered was not adequate. Management support and commitment is also vital for the success of the repository by formulating policy guidelines directing the clients on rights and limitations of access and limitation of use of repository materials. Management also needs to provide the right infrastructure, for instance backup power, and personnel to manage the repository.

## 8 Recommendations

This study suggests the following recommendation:

1. A comprehensive promotion and marketing of the benefits of institutional repositories to the faculty and all other stakeholders is recommended. These will create awareness to the researchers on the open access outlets where they can disseminate their scholarly work. Different mechanisms should be employed such as website, emails, library orientation, information literacy classes as well as social media platforms. Librarians should also organise more workshops and trainings as a way of populating the repositories as a platform to disseminate scholarly research. This will create a deeper understanding and awareness of this form of open access.
2. Clear policies with guidelines on ownership, contents, quality standards, and copyright issues to support adoption of IR should be formulated. The policies should be revised to include mandatory submission of research work by the staff members. They should also be clear on the reward system as a way of growing the repository.
3. The authorisation forms should be signed at the library where the repository is hosted so that clients can get an opportunity to be enlightened by the librarians who are more knowledgeable in this area on the benefits of submitting their work through open access platforms such as the repository.
4. The management should ensure adequate supply of resources such as funds, adequate space and technology, required human skills and backup power.

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# Innovative Content Delivery for Library Patrons 2.0 Retention

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## Abstract

*This chapter examines the innovative approaches that can result in the delivery of authentic content to retain the ever evolving modern-day library users, dubbed Patrons 2.0. The chapter analyses the services offered under Library 2.0 at the University of Nairobi and recommends other approaches that can be adopted by academic libraries to retain Patrons 2.0. Data was collected through exploratory survey, documentary reviews of related literature on the subject and interviews with senior librarians at the University of Nairobi library. The collected data was analysed using qualitative techniques. Essentially, the findings of the study are useful to curriculum developers in the field of information and library science in designing curricula that can empower students to be innovative and creative in response to the dynamic information and services delivery. The findings may also be useful to practicing information professionals in designing and delivering information services that meet the evolving needs of Patrons 2.0. The findings may also be useful to librarians as a guide in terms of developing library services and improve on the existing approach and more so in the area of digital content delivery.*

**Keywords:** *Patrons 2.0, Information services, Academic libraries, Content delivery.*

## 1 Introduction

Invariably, most of the libraries today operate in a dynamic environment (Williams and Rowlands, n.d.; Kwanya, Stilwell & Underwood, 2013; Huvila, Nivakoski & Widén, 2013). The advent of technology, among other compelling vast issues, confronts service delivery and operations in libraries. One is likely to conclude that librarianship and information science is an arid subject and a province of stodgy mundane librarians and other information professionals. Nothing could be more mistaken. Human nature is never more evident in adversity when men struggle to gain significance and relevance that influences the prevailing circumstance and in essence providing them with a reason and purpose to remain valuable in a myriad of alternatives. De Sarkar (2012) indicates that for the libraries to be relevant to the present day context, they need to go beyond their physical boundaries and working hours, to potentially expand library services and facilities to users located far-off. This necessitates libraries to introduce Web 2.0 technologies, with an emphasis on dynamic or interactive web sites, to encourage users' involvement in promoting web-based library services. According to Schonfeld (2015), the opportunities to consider user services as a collective activity of libraries open up a variety of opportunities to learn more systematically from librarians' experience in these roles.

In the aggregate, reference questions could, for example, be analysed to help librarians to better understand where there are more systemic issues. These might help to indicate where users are faced with challenges from a discovery service, a link resolver, or access to a specific e-resource, allowing for library resources to be applied in attending to the challenge accordingly. They might also suggest new areas of need currently unmet programmatically by the library. Creativity and innovation plays a role in establishing impetus for the involved parties. Librarians will ponder on how to effectively deal with recalcitrant challenges, resolve conflicts and have a competitive edge over the emerging trends and challenges that pose a significant threat to the mere existence of the profession.

The concept of "Patron 2.0" has been discussed by a number of authors in the context of "Library 2.0", Web 2.0 and "Librarian 2.0" (Abram, 2007; Williams and Rowlands, n.d.; Kwanya, Stilwell, and Underwood, 2013; Huvila, Holmberg, Kronqvist-Berg, Nivakoski, and Widén, 2013). Kwanya *et al.* (2011) describes Patron 2.0 as an emergent new brand of library users, who exhibit unique information seeking behaviour. Kwanya *et al.* explain that this breed of users is generally young, exhibits a know-it-all attitude, glorifies ICTs, depends more on peers, finds it easier to "Google" than visit a physical library, wants to be in charge of library usage, and wants to contribute content. Critically, studies indicate that these users are gradually reducing their usage of the physical library. Chawner (2008) has categorised librarians into four roles based on their use of social web technologies in relation to Librarian 2.0 roles. These roles are: content consumer (passive), content commenter (reactive), content creator (proactive) and content collector (current awareness). Three of the roles can be applied to Patron 2.0 who is considered as being a content commenter (reactive), content creator (proactive) and content collector (current awareness). Moreover, the user is assertive and plays a central role in the information delivery cycle. Abram (2007) contends that librarians have an opportunity to invent a new future for the emerging group of information seekers. For them to address the needs of Patron 2.0, they need some improvements in the capacity, competencies, aptitudes and attitudes of library workers. Further, he summarises the requisite competences of a librarian serving Patron 2.0 as represented in Table 1.

Table 1: Skills librarians require to serve Patrons 2.0

<b>Requisite skills, abilities and knowledge</b>	
<ol style="list-style-type: none"> <li>1. Understand the power of Web 2.0 opportunities.</li> <li>2. Learn the major tools of Web 2.0 and Library 2.0.</li> <li>3. Combine e-resources and print formats seamlessly.</li> <li>4. Be container and format agnostic.</li> <li>5. Be device independent; use and deliver to everything from laptops to PDAs to iPods.</li> <li>6. Develop targeted federated searches and adopt the OpenURL standard.</li> <li>7. Don't shy away from non-traditional cataloguing and classification and choose tagging, tag clouds, folksonomies and user-driven content descriptions and classifications where appropriate.</li> <li>8. Embrace non-textual information and the power of pictures, moving images, sight and sound. Understand the 'long tail' and leverage the power of old and new content.</li> <li>9. See the potential in using content sources like the Open Content Alliance, Google Book Search and OpenWorldCat.</li> </ol>	<ol style="list-style-type: none"> <li>10. Use and develop advanced social networks to enterprise advantage.</li> <li>11. Mine their usage data for insights into user behaviour.</li> <li>12. Connect people and technology and information in context.</li> <li>13. Connect users up to expert discussions, conversations and communities of practice and participate there as well.</li> <li>14. Use the latest tools of communication (such as Skype) to connect content, expertise, information coaching and people.</li> <li>15. Understand the wisdom of crowds and the emerging roles and impacts of the blogosphere, web syndicasphere and wikisphere.</li> <li>16. Encourage user driven metadata and user developed content and commentary.</li> <li>17. Connect with everyone using their communication mode of choice – telephone, Skype, IM, SMS, texting, e-mail, virtual reference.</li> </ol>

Source: Abram (2007)

## 2 Rationale of Study

Jones (2015) concludes that “these are exciting times. Not so long ago libraries realised the power of the Internet and the user-created social media content. These exciting developments have created increased interactivity between the user and information. A natural outcome of this interaction is user content creation in makerspaces. Some libraries have reacted to this phenomenon with fear – fear of lack of control of digital information and then of information creation by library users. And yet the vast majority of libraries have moved forward, knowing that professional values would be questioned in the process.” Library services and operations are influenced by a multitude of factors which are both from internal and external environment. Librarians are increasingly beginning to worry about their library’s ability to respond to a combination of increasing technological options and changing conditions brought about by globalisation, changing life styles, deregulation, operating virtually, increased competition from alternative information resources providers and changing economical, political and social conditions. Smith (2015) posits that the 21<sup>st</sup> century has ushered in a rapidly evolving environment in academic libraries with shifting user behaviours, expectations and needs. Further, he summarises the impact of the new environment where the library “must, in a global way, create, collaborate, and connect scholarship for and with users at a level never seen before to ensure lifelong learning and the ability to solve the world’s continuing challenges inclusive of all cultures, time periods, and approaches.” According to Kwanya *et al.* (2017), “information and knowledge have become the key pillars of national, organisational and individual performance, excellence, competitiveness, growth, innovation and impact.” The need to access and exploit information resources in this regard requires the information provider to not only understand the information needs of its potential users but also to assertively and comprehensively acknowledge this user’s profile, taste, preference and background among other factors which inform individual information needs. This is crucial in order to conveniently avail complete, accurate, timely, relevant and quality information resources using the most preferred mechanism in an effective and efficient manner. The information management strategy adopted should focus on the lifecycle of information since knowledge management encompasses the processes, people, techniques and tools used to enhance the intellectual capital owned by individuals, groups and organisations in terms of their know-how, ideas, expertise, competencies and experiences.

Conway *et al.* (2015), suggest that libraries should “provide the library community with behavioural evidence about individuals’ perceptions, habits, and requirements to help ensure that future library services are designed around a set of expectations that have been influenced by consumer technologies and modern research and learning environments - designed for the life of today’s library user.” Lukanic (2015) concludes that for “academic institutions seeking to thrive amidst the constantly shifting world of higher education, libraries have become the heart of the spirit of collaboration and innovation—going beyond being places to merely access knowledge to become hubs to truly explore and create. The institutions at the frontlines of this change are thinking beyond the days of the library as a collections repository to something much more powerful.” This is in agreement with Smith (2015) who posits that “the internationalisation of higher education and the continuing expansion of technology as a means for learning and sharing information



have radically changed the way in which academic and research libraries offer services and perform outreach. This evolution is exhibited in the physical environment as libraries move from places to seek information to spaces of learning and collaboration where cross-curricular synergies take root; in the services offered through a rapidly evolving digital information system; in the growing number of partnerships, regional, national, and increasingly global; and in the re-visioning and recent focus on metrics in terms of monitoring and measuring library success.” This chapter explores the innovative approaches that can result in the delivery of authentic content to meet the needs of the evolving modern-day library users, dubbed Patrons 2.0, and in the process enable libraries to retain this group of frequenters.

### 3 Methodology

The study on which this chapter is anchored was an exploratory survey. This is a methodological research approach that is used to investigate emerging research problems which have not been clearly defined. The study seeks to gain familiarity to the concept of Patron 2.0 and some of the innovative strategies that can be adopted to retain this breed of users. Kwanya (2015) indicates that exploratory research often uses secondary data such as existing literature or data sets. He further notes that exploratory researchers utilise discovery and serendipity to explore and gain valuable insight into research problems.

The site of this study was the University of Nairobi library which is expected to serve its current population of more than 90,000 users. These comprise of the faculty, students and other relevant stakeholders. Key informant interviews were conducted with a total of 40 libraries senior staff who were purposively selected on the basis of their job descriptions. Secondary data was collected through documentary analysis of literature using relevant keywords. The choice of the methodology was informed by the nature of the study that Patron 2.0 is a new emerging concept in the field of library and information studies in Kenya.

### 4 Findings and Discussions

The findings of the study on which this chapter is based are presented and discussed in this section.

#### 4.1 Key tools adopted by the University of Nairobi library to retain library Patron 2.0.

The findings indicated that the majority (83%) of the respondents were not aware of the concept of library Patron 2.0. However, on further interrogation, clarification and explanation of the concept, they were able to identify some approaches that have been adopted in the library to retain library Patrons 2.0. The use of Web 2.0 tools that the library has adopted clearly indicated that regardless of the terminology and jargon used to describe the practices, the library was conscious of the changing user needs and demands and had focused on leveraging on the emerging technological platforms to retain its users. Table 2 present some of the tools that the library has adopted so as to retain Patrons 2.0.

Table 2: Innovative services offered to Patrons 2.0

Aspect	Nature	Impact
Space, amenities and facilities	Collaborative study rooms, range of sitting types, sufficient space for user support, broadband connection and other internet connection requirements, free wifi and configuration setup and digital labs.	Timely response to continuous changes in pedagogy and technological requirements and successfully leveraging in responding to changing user needs and demand.
User support	Access issues for the print general collection, interlibrary loaning, help with research questions, various types of instruction, and troubleshooting incase of information communication technology challenges.	Timely, easier access and navigation through the resources and the services that the library has to offer and at the same time facilitate the process of monitoring and evaluation of services and operations that the library provides.
Library website	A gateway to all important links of authentic academic resources, user manuals as well as complementary and supplementary databases that assist users in academic writing and references. Action control programming and protocols such as rules and regulations, quality assurances tools such as the library service charter, important contacts among other downloads are accessible via these platforms. The library website has been integrated with the university intranet that allows users to blog as they generate content and provide feedback. The website is interactive and provides a platform for availing immediate feedback to users.	Convenient, cheap and accessible platform that advertises library operations and services, provides timely access to information resources, facilitates communication, and liaises users with special links to important research databases. The library website facilitates prompt and timely feedback to users, networks the library with global audience, provides a blog page that is interactive and “fresh”, helps in building a better relationship with library patrons through continuous review of services and prompt feedback, improved credibility and opportunity as the library users are able to relate to the services at their convenience and rank the quality of offered services; and the library has been able to alert potential users of the operations and services offered.

Aspect	Nature	Impact
Remote access	This is a platform that allows authentic users of the University of Nairobi library to remotely access library resources and services off-campus or through a Virtual Private Network (VPN). A user is required to have a browser that accepts cookies, JavaScript and at least allows pop-up windows from the University of Nairobi's main domain uonbi.ac.ke. Usually, at the University of Nairobi library, access to subscribed e-resources is made available on user name and password or a network access account that is configured by the library ICT department or individual University email credentials.	Authentic library users seamlessly access content in a timely manner regardless of their location. This saves time and provides opportunity for complete and exhaustive use of resources by many users simultaneously from the library through its interface anywhere.
Digital repository	Collects, preserve and disseminates the grey literature or a published information generate by the community of the University of Nairobi.	Increased readership and practical application of research, facilitates collaboration and availed funding for further research. Improved citation, referencing and quality of generated research, and more discovery of reading information resources for prosperity and informed communities.
Open access resources	Links to available research output at no cost, embargo or any other barrier. The works under open access are licensed within the Creative Commons (CC) license. This is a public copyright license that gives individuals or entities the right to use, manipulate and circulate or share without infringing on the conditions that are specific to the license.	The open access resources are available for anyone connected to the Internet and provides authoritative and authentic academic references, increased readership, citation, referencing and reputation, facilitated collaboration and lowers barriers to cross-disciplinary research, discovery of more reference work and improved research further attracting funding and built institutional and individual reputation as research profile and recognition of academic work has been enhanced, and it has contributed to reduce friction that slows or limits research and teaching in the process increasing the world knowledge.
Aggregator	The word 'aggregate' means the total obtained by adding items together. One may define aggregation as bringing together in a coherent collection disparate information sources. Examples are PROQUEST, EBSCO, EMERALD among other databases.	Links library to publishers and resources.
Multimedia	Multi-media is a collection of text, audio, video, animation, and graphics, which are converted from different formats into a single platform that are accessible via different platforms in the library. The hardware requirements include computer input and output devices and secondary storage. The software requirement includes multimedia technology and digital video interface. Some of the software includes Photoshop, Adobe Dreamweaver, Adobe Fireworks, Gimp, Google, Skechup, AdobeFlash Player, Adobe CS4.	Multimedia has increased learning efficiency; makes the program easy, interesting excellent and user friendly; interesting sound and animated effects; helps users to browse and navigate easily; enhanced networking and resource sharing; freedom to users for searching information, provide good quality video, image, amination etc. and creates a 3-D effect of object in a variety of ways.
Library helpdesk	Help-desk "ticketing" approach in which a user query is tracked from initiation to resolution.	The library helpdesk has improved efficiency and timely response to user queries and challenges; sequential approach and a through categorization and prioritizing of issues, centralized and single interface platform that provides a track and evidence of action, and ability to assign issues to the relevant personnel based on skills, competence and experience or a defined criterion.

Source: Research Data

However, as much as the library has adopted the above approaches with some of the summarised impacts, much more can still be employed to ensure that Patrons 2.0 are retained in the library.

#### 4.2 Suggestions of other approaches of retaining library Patron 2.0

The chapter through documentary review identified other approaches that the University of Nairobi library or any other information centres could employ and adopt in retaining Patrons 2.0 as follows;

##### 4.2.1 3D Printing labs and fabrication technology

*Garcia and Colegrove (2015) define 3D printing as the ability to print an extended three-dimensional object from a digital file. Jones (2015) contends that "the phenomenon of user-created content has been an exciting growth area of 21<sup>st</sup> Century and especially in providing library services. The digital information revolution has brought us far beyond the rental*

typewriters of the 1950s. The goal of 3D printing in libraries is to create the next artificial heart. But a library user can learn the technology and potential of digital fabrication and reinforce that learning with simpler hands-on projects. A library 3D printing service could easily inspire future medical technicians or entrepreneurs and give them a head start on creating that heart in a future career in a highly specialized medical laboratory.” The library by adopting this technology will not only attract Patron 2.0 but will provide an interactive platform that simulates real life experiences but also captivate the imagination and attention of the user providing a valid justification of continuously engage and seek library services.

#### **4.2.2 Virtual Reality (VR)**

Jackson (2015) defines Virtual Reality (VR) as the “use of computer technology to create a simulated environment. Unlike traditional user interfaces, VR places the user inside an experience. Instead of viewing a screen in front of them, users are immersed and able to interact with 3D worlds. By simulating as many senses as possible, such as vision, hearing, touch, even smell, the computer is transformed into a gatekeeper to this artificial world”. Lambert, (2016) identifies a number of area virtual reality programme can be used in the library that includes Virtual Travel and Experience where library user can visit and access places through this programme, Virtual Gaming and New Skills gamification of learners at different avenues, Virtual Reality Levels the Playing Field where users are made equal and biases and stigmas such as gender, weight, height race color, creed and even disabilities are eliminate promoting equality and growth , Storytelling where application such as VRSE are used to inspire and make readership easy, NASA Education where library users can have real experience of the space, Driver Safety Programs, and field trips that have been simulated. Virtual reality certainly if adopted in the library will play a significant role in retaining Patron 2.0 and other users with sophisticated and complex needs in future.

#### **4.2.3 Podcast**

De Sarkar (2012) defines podcasts “a series of digital audio files (voice recording), distributed over the internet, released with episodes and downloaded through web syndication. There are several audio formats available on the internet, but podcast differs from them because podcast files are identified and downloaded automatically as soon as they are released via special software, called pod catchers. They are then made available to iPods, computers, PDAs, cell phones, and other digital devices for offline use”. The library by podcasting (which is the process of regularly posting audio contents featuring a range of new topics of interest to the users), will ensure that users are able to get supplementary and complementary academic information from resource person termed as podcasters (The person whose voice is recorded in a podcast file). Authors can be engaged by the library as podcasters to provide additional information on their works and these recordings can be distributed to Patron 2.0 via the internet. These breed of users will be able to find relevance and relate with the library through these platforms.

#### **4.2.4 Other identified platforms**

The study identified learning commons, coffee shops, augmented reality, embedded librarianship, and use of library apps such as My library book, crawler library, British library 19<sup>th</sup> Century collection, kindles, ireasheach among other as potential platforms that need to be evaluated and included in the library services and operations with the view of retaining Patron 2.0.

### **5 Recommendations and Conclusion**

Majority of the staff were either unaware or failed to relate with the practicability of implementing some of the approaches discussed above in the library. They cited reasons such as integration with existing services, funding, lack of personnel and justification. A minority felt that the library has to plan on how to embrace these technologies in order to remain attractive and relevant to the ever changing user expectations demands and need. The library need to invest in the emerging technology and justify the need to embrace the above technologies as some are capital intensive if they are to surmount the tide that is currently facing service delivery and operations. This study recommends a number of strategies being appropriate to enhance the adoption strategy of retaining Patron 2.0.

All professions and disciplines stumble upon change (internally and externally) to move forward successfully in this information age, change and evolution are necessary and inevitable. The current convergence of aspects of different disciplines such as Information Communication Technology, International Communications Protocols, Managerialism, Human Resource and increasingly flexible web-based services has led to significant changes in the scholarly information environment. These changes, and the opportunities they present, have made the concept of evolving library to reality. This new reality has forced academic libraries to give serious thought on how they can best realign resources to meet the challenges of the library in the 21st Century. Moving forward successfully in this information age, university libraries are deemed to deploy futuristic strategy and policies from other related disciplines if they are to survive and effectively compete within the current dynamic and ever changing trend.

Although the process of adopting, cascading and implementing some of this managerial demands and changes are challenging the library needs work with consistence to ensure that its users benefit from convenient, complete, accurate

and timely services and operations. The University of Nairobi library will need to come up with a conceptual approach that will focus on understanding the areas that inhibits the complete actualization and realization of measurable and sustainable results of the retention of Patron 2.0 in an innovative and creative manner. This can be achieved through elaborated information fluency programmes that will impact competences, skills, knowledge and experiences that will develop a workforce that fully appreciates the importance of continuously and assertively tending to all potential user needs. Again there is an urgent need to establish congruence of working objectives of the various approaches. It is of vital importance to dedicate time and resources to advocate and publicise the library services and operations in the new dispensation of technological change and diverse user expectations. Further, different units in the library should work in pursuit of unifying objectives that relates to the concerted coordinated effort that creates a balance between individuals, groups and the library interests. Remuneration and equity in rewarding employees who go an extra mile to engage users in embedded librarianship by adequately compensating individual and group efforts hence resulting in a more pronounced performance. The respondents felt that a fair discipline culture if sustained could result in systematic approach of providing services, create a propitious environment for innovation and creativity that speedily delivers desired results, ultimately retain Patron 2.0.

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SECTION 2:  

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CITIZEN  
MEDIA AND  
TECHNOLOGIES  

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# Information Needs and the Use of Social Media as Correlates of Information Searching Behaviour of Undergraduate Students in Federal Universities in Nigeria

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## Abstract

*This chapter examines information needs and the use of social media as correlates of information searching behaviour of undergraduate students in Federal Universities in Nigeria. The study on which this chapter is based adopted quantitative research methodology and used a cross-sectional survey research design. The target population of the study was 1,200 undergraduate students randomly selected across six different federal universities to represent the six geopolitical zones in Nigeria. Data was collected using questionnaires and analysed using descriptive statistics. Hypotheses were tested using Pearson Product Moment Correlation (PPMC). The study revealed that the majority of the respondents had access to and used the social media through their mobile phones. Facebook was found to be the most used social media by the majority of the undergraduate students in the universities under study. The findings also revealed that there was a huge gap between social media use for social interaction and its use for academic discussions. Contrary to previous studies, the use of social media was found not to have any negative impact on undergraduate students' information searching behaviour. The implications of the research are twofold. One, the students can understand the potential negative influence social media tools may have on their academic performance. Two, libraries and librarians can use the findings to deploy services utilising social media networking platforms. The originality of this study lies in the fact that it focused on the generation of library and information users whose social media use has significant contribution to their academic development.*

**Keywords:** Information searching, Social media, Undergraduate students, Libraries, Nigeria.

## 1 Introduction

Searching for information is a vital function for human survival. The strategies used to identify information needs and search for such information to meet those needs is described as information seeking behaviour. Research has contributed to a better understanding of the information behaviour of users, especially undergraduate students. This can be attributed to the proliferation and advancement of information and communication technologies (ICTs) which have introduced new ways of searching and using information. According to Sahu & Singh (2010), ICTs have also brought about changes in the very structure of information and its communication. The rise and popularity of social media has been very prominent as has been revealed to have high impact on academic performance, social behaviour, health and privacy issues (Alsaif, 2016). This chapter focuses on the information searching behaviour of undergraduate students. There is little empirical study on this area in Nigeria. Lack of information on this has resulted in students not having the necessary skills to identify the appropriate sources to use in searching for specific types of information and the extent of using the social media to augment their academic information needs.

## 2 Statement of the Problem

Undergraduate students commonly use social media to be keep in touch with friends, share photos, interact with friends, watch movies, remain up-to-date with trending events/news and to occupy free time when they are bored. It is perceived as a social tool with limited use in searching for information for their academic activities (Eke, Omekwu & Odoh, 2014). By implication, undergraduate students have not fully understood the use of the media as an information source that could augment their academic information search activities. This study was further motivated by the study of Kim, Sin & Yoo-Lee (2014) and Tess (2013) who argued that the role of social media in supporting information-seeking behaviour is understudied and not well understood. It is against this background that this study sought to investigate the influence of social media use on the information searching behaviour of undergraduate students in federal universities in Nigeria.

## 3 Research Objectives and Hypotheses

1. To find out the information needs of undergraduate students in the federal universities in Nigeria;
2. To identify the factors influencing the selection of information sources by undergraduate students in the universities under study;
3. To examine the types of social media used by undergraduate students in the universities under study;

4. To analyse the purpose for using social media by undergraduate students in the universities under study;
5. To examine the information searching behaviour of undergraduate students in the universities under study; and
6. To analyse the influence of using social media on the information searching behaviour of undergraduate students in the universities under study.

### **Hypotheses**

**Ho<sub>1</sub>:** There is no significant relationship between information needs and the types of social media use by undergraduate students.

**Ho<sub>2</sub>:** There is no significant relationship between information needs and the purpose for using the social media by undergraduate students.

**Ho<sub>3</sub>:** There is no significant influence in the use of social media and the information searching behaviour of undergraduate students.

### **4 Review of Related Literature**

People need information for almost everything; ranging from information about people, news, research and general information about happenings around the world. As a concept “Information Need” was first coined by Taylor (1962) when he attempted to describe how an inquirer obtains answers following a distinct process. In the field of Information Sciences, information needs is understood to be a gap in the current state of knowledge in a person which results in an urge for an increase in knowledge (Kuhlthau, 1993). Ossai-Onah (2013) perceives an information need as the amount of positive information an individual or group of people needs to have for their work, recreation and other gratifications. Other scholars have defined “Information need” in terms of the search system used. For example, Schneiderman, Byrd & Croft (1997) defined it as the perceived need for information that leads to someone using an information retrieval system in the first place. This means that the situation surrounding an individual in a way influences the type of information needed and sought for. This by implication means not having adequate information at one’s reach may affect a person’s output of work done or task to be carried out.

Considering the nature and characteristics of the study group (undergraduate students), information need in the context of this study is conceived as knowledge/facts which students need during the course of their years of study, in and out of the school environment, online or offline. Undergraduate students have different needs at different times of the day as well as at specific points of time throughout the semester. Mathews (2009) gave the following as the needs that typical students encounter: academic needs, social needs, entertainment and recreational needs, service needs, personal needs, travel needs, rejuvenation needs. While there are certainly other needs, these categories represent the major components that all students require. Through research and past studies, academic information, among other things, was rated as the predominant information required by students (Owolabi, Jimoh & Okpeh, 2010; Ajiboye & Tella, 2007; Kakai, Ikoja-Odongo & Kigongo, 2004). Situations like course work and assignment, preparation for examinations and tests, and general reading to enhance lecture notes constitute a higher percentage of use. In line with these findings therefore, students need and use information primarily for academic purposes.

Having an increased need for academic information to complete their class assignments or research projects, undergraduate students usually will require various types of sources and references. According to Kim and Sin (2007), students’ preferred sources of information are search engines, websites, books, online databases, journals, books, encyclopaedia, OPACs, librarians, and social media. The findings further revealed that students find search engines, websites, and social media convenient and easy to use. This choice can be attributed to the influence of technology as they are surrounded by cell phones, computers and all the necessities of the digital age. For this class of students, factors like accessibility, ease of use, availability and convenience influences their selection of information sources without much emphasis on other evaluative factors like comprehensiveness, accuracy and trustworthiness (Burton & Chadwick, 2000, Kim & Sin, 2007).

Information searching tools over time have undergone major transformations to become more sophisticated and flexible. Some scholars describe this as the necessities of the digital age. Prensky (2001) characterises the proliferation of new and emerging technologies such as social media. Social media are technologies that facilitate the creation and sharing of information, ideas, interests and other forms of expression via virtual communities and networks. Alabdulkareem (2014) and Nwangwa, Yonlonfoun & Omotere (2014) categorised social media tools to include social networking sites (SNS), social bookmarking and sharing tools, blogging and microblogging tools, virtual worlds, presentation sharing tools, audio and video sharing tools, research and writing collaboration tools, project management, meeting and collaboration tools. These tools have the capabilities of educating, informing, entertaining and inflaming the audience. These benefits have led many people to change to social media platforms as the channels through which they search for news, information, business and entertainment. This shift presents considerable opportunities and challenges for academic librarians and educators because students are particularly heavy users of these tools. Although the trustworthiness of information

on these platforms has been questioned, most information searchers particularly students, rely on them as sources of information because they are easily accessible and convenient (Balakrishnan & Gan, 2016; Kim *et al.*, 2014).

In Nigeria, it has been revealed that many undergraduate students are involved in social networking (Adaja & Ayodele, 2013). According to Buhari, Ahmad and HadiAshara (2014), there are over 1000 social networking sites used for social, educational, entertainment, political, fashion, gossip through chatting, photo/video sharing and blogging. Oghenetega, Erimieleagbon and Ugeh (2014) reported that in Nigeria, the use of social media is detrimental to students' academic work as some students were reported to be using this media even while in class, studying, or doing other academic work. Wang, Chen and Liang (2011) also reported issues of negative effects and influence when social media is overused in such a way that does not academically improve learning or its process. These issues and countless other negative influences associated with social media in general have been a cause of concern and triggered research by scholars globally.

The understanding of information searching behaviour for this study was informed by Rowleys' (2015) definition of information searching as a process which people undertake to locate or retrieve specific information to meet an information need, typically, but not always with the aid of a search engine or other information retrieval system. Many of the earlier models of information searching (e.g. Kuhlthau; Marchionini & Wilson) focused on search behaviours in the contexts of information searching in libraries relating to learning or research for both print and online information resources and documents. However, advancements in ICTs such as the web has rendered some of these strategies unsuitable (El-Maamiry, 2017; Orlu, 2016). Because of their familiarity with technology, undergraduate students exhibit an information behaviour that is quite unique characterised by speedy delivery and processing of information, multitasking and functioning optimally in the hyper connected environment in which they live (McCarthy, 2010).

With social media, undergraduate students exhibit an information behaviour that entails collaboration, networking, sharing and interaction such as blogging, asking, and acquisition of opportunistic information, texting, social networking, video conferencing and proxy information seeking (Lenhart, 2015). From researches conducted about these concepts, Azadeh and Ghasemi (2015) and Taylor (2012) consider these characteristics as factors that can influence students' information needs, choice of related information, searching accurate information, and the use of information as important components of information searching. By implication, the library with its strong mediated search support is no longer the primary source of information for undergraduate students as information searching in today's online environment is not a one-way communication but a 'one-to-one, one-to-many or many-to-one' communication through collaboration, networking, sharing and interaction.

## 5 Methodology

Quantitative research methodology using cross-sectional survey research design was adopted for this study. The target population of this study was 1,200 undergraduate students randomly selected from different faculties and departments from the universities under study. A proportionate sample of 10% with random selection of 200 undergraduate students was taken from each university. In all, a total of 1,200 undergraduate students were used for the study, which served as the sample. To support this selection of the sample size, Sambo (2007) and Kamba (2011) in their studies stated that 10% sample size is adequate enough to serve as a unit of analysis for a study that has large population because of time and financial constraints. Questionnaires were the only instrument used for data collection. The collected data was presented and analysed using descriptive statistics while the hypothesis was tested using Pearson Product Moment Correlation.

## 6 Findings and Discussions

A total of 1,200 copies of questionnaire were distributed randomly among sampled students in the universities under study. 853(71.1%) of these were successfully completed, returned and found useable for the purpose of data analysis. The remaining 347 copies of the questionnaires were not returned and accounted for 28.9% which is insignificant when compared with the response rate of 71.1%. Table 1 provides more details on this.

Table 1: Response Rate

S/N	Universities	Geo-Political Zones	Sampled population	No. of Ques. Returned	Percentage of Respondents
1	Bayero University, Kano	North-West	200	181	15.1%
2	Federal University of Gashua	North-East	200	155	12.9%
3	Federal University of Lokoja	North-Central	200	134	11.2%
4	University of Portharcourt	South-South	200	136	11.3%
5	University of Lagos	South-West	200	132	11%
6	Federal University of Technology– Owerri	South-East	200	115	9.6%
	<b>Total</b>		<b>1200</b>	<b>853</b>	<b>71.1%</b>

Source: Field survey, 2017/2018



Results show that more than half (60.51%) of the respondents were males while 39.49% were females. In terms of age, more than half (55.40%) of the respondents were between the ages of 21-25 years; 34.09% were between the ages of 15-20 years; 7.05% were between the ages of 26-30 years; while only 3.46% respondents were above 31 years of age. This connotes that the majority (89.4%) of the respondents were between the ages of 15-25 years which indicates that they are within the digital-age students and can give relevant information to validate the study.

### 6.1 Information Needs of Undergraduate Students in Federal Universities in Nigeria

More than half (66.8%) of the respondents indicated that they needed information for education and research. This was followed by social and service information (25%), recreation and entertainment (21.9%), health and sanitation (20.2%), politics and religion (15.6%) with the least areas of information need being travels and rejuvenation (9.7%). This supports studies such as Baro, Onyenania and Osaheni (2010) where academic information was rated highest among the information needs of undergraduate students.

### 6.2 Factors Influencing the Selection of Information Sources

Result in Table 2 revealed that almost all (97.4%) the respondents indicated usefulness, followed by convenience (91.7%). Further analysis show that accessibility ranked next (90%), followed by trustworthy (84.5%) and only 604(70.8%) based their selections on availability. This corroborates the findings of Lee, Paik and Joo (2012) who asserted that accessibility, ease of use, availability and convenience are factors common to internet use in academia. By implication, the libraries need to engage more with emerging technology considering the low patronage of libraries by digital-age students.

Table 2: Factors Influencing the Selection of Information Sources

S/N	Factors	Frequency	%
1	Accessibility	768	90
2	Easy to Use	651	76.3
3	Availability	604	70.8
4	Convenience	782	91.7
5	Comprehensiveness	539	63.2
6	Efficiency	608	71.3
7	Accuracy	625	73.3
8	Trustworthy	721	84.5
9	Usefulness	831	97.4

### 6.3 Social Media Use of Undergraduate Students

According to Table 3, the majority of students (89.2%) use Facebook, 81.7% use YouTube, 78.5% indicated using Wikipedia, with the least using LinkedIn (7.1%). There were others (62.5%) who reported using other social tools like Yahoo messenger, WhatsApp and Instagram.

The majority (39.8%) of the respondents also attests to using social media very frequently, 34.7% indicated using the tool frequently, while others (25.3%) occasionally. Data on the channels of acmes used showed that more than half (58.5%) indicated using mobile devices, 22.4% use personal computers and 14.5% use cafés while the least proportion (12.8%) use the library to access the social tools.

The findings also show that all the respondents have a social media account especially on social networking sites. This finding corroborates Adaja and Ayodele (2013) who reported that in Nigeria, many youths are found to be involved in social networking.

Another finding shows that, majority (39.8%) of the respondents logged into these social sites very frequently through their mobile devices like smartphones and iPads. This supported Nwangwa *et al.* (2014) that students were found to spend 9 hours of their time daily on social media, a behaviour that needs to be managed properly to ensure that it does not lead to addiction and lack of concentration which may be detrimental to their academic performance. Table 3 presents these findings.

Table 3: Social Media Use of Undergraduate Students

Types of Social Media			Use Frequency			Medium of Access		
Option	N	%	Option	N	%	Option	N	%
Facebook	761	89.2	Very frequently	339	39.8	Personal computer	191	22.4
Twitter	237	27.8	Frequently	296	34.7	Library	109	12.8
LinkedIn	61	7.1	Occasionally	216	25.3	Café	124	14.5
MySpace	73	8.5	Not at all	-	-	Mobile devices	499	58.5
YouTube	697	81.7	Total	853	100	-	-	-
Slideshare	106	12.4						

Types of Social Media			Use Frequency			Medium of Access		
Option	N	%	Option	N	%	Option	N	%
Skype	508	59.6						
Wikipedia	670	78.5						
Blogs	487	57.1						
Others	533	62.5						

#### 6.4 Undergraduate Students' Information Searching Behaviour

The majority (75.3%) of the respondents were engaged in social networking as their preferred strategy for searching information. This was followed by texting (16.5%), then browsing (12.5%). This infers that undergraduate students prefer interactive strategies which entail interaction between parties stressing the importance of networking, interaction and sharing which are all attributes of social media. It also supports Evans & Chi (2008) that many information seeking activities are interwoven in between social interactions. Table 4 presents the findings.

Table 4: Undergraduate Students' Information Searching Behaviour

Behaviour	Frequency	%
Blogging	87	10.2
Browsing	107	12.5
Social Networking	642	75.3
Texting	140	16.5
E-mailing	80	9.4
Telephone Conversation	68	8
Video Conferencing	45	5.3
Tweeting	71	8.3

#### 6.5 Purpose for using Social Media by Undergraduate Students

Figure 1 shows the students' responses about the purpose of using social media. A majority (50.9%) of respondents indicated social interaction as their purpose for using social media. 29.5% said they used social media for Information seeking (29.5%) while 25.3% other respondents indicated that they used social media for information sharing. Other areas indicated by the respondents are to remain up to date with event (19.9%), occupy free time when bored (13.9%) and connecting with classmate for online studies and discussion (11.6%).

The findings reveal that the purpose for which students use social media can be categorised into social interaction, information seeking and sharing, and entertainment. The analysis also revealed a huge gap between social media use for everyday information use and its use for academic discussions. Many scholars hold the view that social media has the potential of augmenting the study life of students but due to lack of proper orientation and investigation, the negative values in Nigeria far outweigh the positive educational values (Oghenetega *et al.*, 2014).

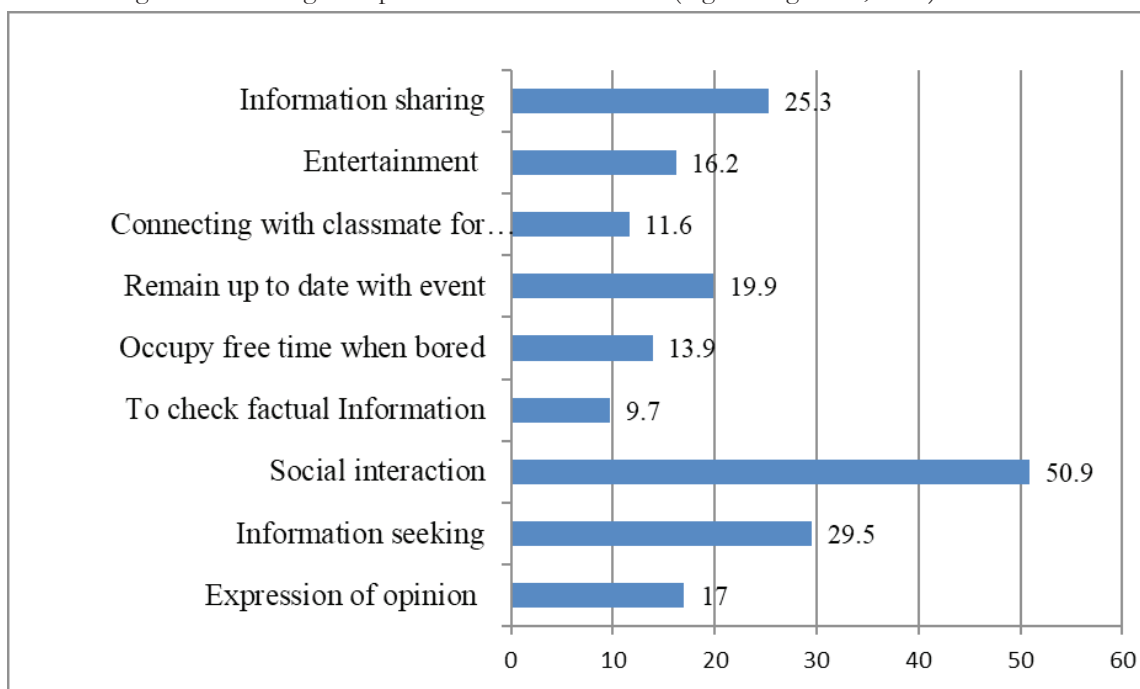


Figure 1: Undergraduates' Purpose of using Social Media

### 6.6 Influence of Social Media Use on the information searching Behaviour of Undergraduate Students

The respondents were asked if the use of social media has negative or positive influence on their information searching behaviour. On information needs, 33.9% strongly agreed to social media being useful, 47% agreed while 19.1% disagreed on social media being useful. Analysing the effects on students' time, 45.1% strongly agreed to social media having negative effects, 37.7% agreed while 17.1% disagreed on social media having negative effect on their time. As an aid to choosing related information, 39.9% strongly agreed to social media being helpful, 58.9% agreed while 1.3% disagreed on social media being helpful as an aid to choosing related information.

On searching skills, 46.7% strongly agreed to social media having a negative influence on their search for accurate information, 37.4% agreed while 15.9% disagreed. Analysis of information use revealed that 40.2% strongly agreed to social media being useful, 23.1% agreed, 33.5% disagreed, while only 3.2% disagreed on social media being useful. This analysis supports previous impact studies on social media (Nwangwa *et al.*, 2014; Akindehin & Akindehin, 2011). Table 5 summarises these findings.

Table 5: Influence of social media use on the information searching behaviour of undergraduate students

Type of Influence	SA	A	D	SD
Useful to my information needs	289 (33.9%)	401 (47%)	163 (19.1%)	-
Have negative effects on time for other activities	385 (45.1%)	322 (37.7%)	146 (17.1%)	-
Helpful in choosing related information	340 (39.9%)	502 (58.9%)	11 (1.3%)	-
Have negative influence on my searching skills as relating to searching for accurate information	398 (46.7%)	319 (37.4%)	136 (15.9%)	-
Not useful to my information use	343 (40.2%)	197 (23.1%)	286 (33.5%)	27 (3.2%)

Key: SA=Strongly Agree; A=Agree; DS=Disagree; SD= Strongly Disagree

### 6.7 Hypothesis Testing

**Ho<sub>1</sub>:** There is no significant relationship between information needs and the types of social media used by undergraduate students.

Analysis shows that there is no positive Correlation Coefficient ( $r=0.448$ ,  $0.313 \square 0.05$ ) between information needs and type of social media used by undergraduate students. Therefore, the null hypothesis (Ho) is accepted.

**Ho<sub>2</sub>:** There is no significant relationship between information needs and the purpose for using the social media by undergraduate students.

Analysis shows that there is a positive Correlation Coefficient ( $r=0.819$ ,  $0.046 \square 0.05$ ) between information needs and the purpose of using social media by undergraduate students. Therefore, the null hypothesis (Ho) is rejected.

**Ho<sub>3</sub>:** There is no significant influence in the use of social media and the information searching behaviour of undergraduate students

Analysis shows that there is no significant influence in the use of social media and the information searching behaviour of undergraduate students ( $r=0.541$ ,  $0.166 \square 0.05$ ). Therefore, the null hypothesis is accepted.

### 7 Conclusion

It is evident to from above findings that most of the undergraduate students spend more time using the social media for social interaction than any other activity. Although a positive relationship was found in relation with academic related information and the purpose for which they use social media, it was also revealed that there was no positive relationship between their information needs and the type of social media they used. The study further revealed that social media use by undergraduate students has no significant influence or has no negative impact on the information searching behaviour of the undergraduate students. The authors conclude that the use of academic libraries by undergraduate students seems dependent on the availability and accessibility of social media.

### 8 Recommendations

Based on the findings of the study, the authors recommend the following:

1. Academic information is basic for undergraduate students. This should be emphasised in institutions of higher learning and reflected in the lecture rooms, libraries and the resources and sources of information made available for use.
2. Academics and librarians are encouraged to teach and support students to independently select, search and obtain information from appropriate sources relevant to their information needs.
3. Aside from social networking tools, libraries should create avenues to equip undergraduates with the skills necessary

to assess and use other research and writing collaboration tools, blogs and presentation sharing tools.

4. The opportunities for social media are boundless but students should focus more on using it for academic purposes rather than for social interactions.
5. Information literacy can be targeted towards orienting and educating the students towards having a positive information searching behaviour so as to improve their academic performance in the digital era.
6. Looking at the level of acceptance of social media by the digital-age students, university management, librarians and lecturers should set machinery in motion to ensure the full adoption and utilisation of the opportunities offered by social media tools in enhancing learning and information searching.

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# Integrating Social Media in Public Relations Practice in Kenya

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## Abstract

*This chapter explores the utilisation of social media by Public Relations (PR) firms and makes recommendations for improvement. The research leading to this chapter sought to answer the following questions: How do PR firms use social media as a tool in their practice? What challenges do PR professionals face while using social media? What strategies can be recommended to ensure effective use of social media in PR? The study employed a qualitative research approach using a multiple case study research design. 10 PR professionals from two PR firms were selected purposively to participate in the study. Data was collected using interviews which were supplemented by content analysis. The collected data was analysed thematically in line with the research questions. The findings of the study suggest that PR firms in Kenya use social media for engagement and interactive communication, brand visibility and content marketing. In regard to challenges, there are no standard policies and guidelines on the use of social media. This is because an organisation's target audience is always engaging on popular social media networks with their favourite brands, connecting with them on different levels. For effective use of social media, the research found that organisations should embrace training, policy review and impact assessment of social media efforts. The study concluded that PR professionals need to develop more strategies to cultivate positive attitudes towards the use of social media. The study recommends that PR firms should employ trained personnel dedicated to managing their social media platforms under the supervision of their Public Relations units.*

**Keywords:** *Policies, public relations, social media, strategic communication*

## 1 Introduction

There are many definitions of Public Relations (PR). The main reason for this is that the industry itself is always changing and adapting to the world and growing power of the media both old and new (Bryer & Zavattin, 2011). This chapter was informed by the definition of PR provided by Grunig and Hunts (1984) model which states that PR is the *management of communication between an organisation and its publics*. PR should therefore be an essential part of the organisational structure that can be truly effective when integrated into the broader business disciplines such as corporate planning, finance and human resource management (Smith and Zook, 2011).

PR is practised in different contexts ranging from government or public affairs to corporate communications in small, medium, large and non-profit organisations. Through their communication, planning and management, PR firms build and enhance their clients' reputation and in addition, build and maintain relationships that are important to their organisation and its goals. Previously, PR practitioners relied entirely on traditional media such as television, radio, newspapers, magazines and outdoor media like billboards to communicate to their audiences without using any form of Internet technology.

Social media gained momentum in Kenya in 2008 when people began to actively use Facebook. Prior to Facebook, popular platforms at the time were MySpace and Yahoo (Naom, 2013). Social media has since become a key tool behind the success of a number of PR strategies and plans given that it has become an extremely important aspect for brands. It has therefore become mandatory for PR professionals to broaden the scope of their organisations by integrating social media into their daily practice. Leading global PR firms with established offices in Nairobi, Kenya such as Apex Porter Novelli, Hill and Knowlton, Ogilvy and Mather, Omnicom Group among others have embraced social media as one of their core tactics in executing their PR plans and campaigns. This has seen the creation of positions directly linked to social media such as digital marketers, big data specialists and Chief Listening Officers (CLO) whose role is to keep a keen eye on an organisations' social media activities.

The history of PR has followed a traditional path up until the emergence of the Internet and the World Wide Web (WWW). As the Internet has grown, so have different PR tools, specifically social media. The introduction of social media to the PR industry as a communication tool has become a major game changer as its extensive use has drastically changed the way people communicate and share information. It is now evident that the rise of social media has presented the PR industry with a new paradigm. The question that comes to mind is how PR practitioners should play when it comes to the most dominant social media platforms in use by Kenyans. This chapter is focused on the impact, handling and management of social media by the PR professionals in Kenya.

Several budding definitions of social media have been offered, both within the communication discipline and across related disciplines such as PR, Information Science, and mass media as social media continues to evolve and its use

changes so does its definition. Definitions typically converge around the notion that social media refer to digital technologies emphasising user-generated content or interaction (Kaplan & Haenlein, 2010). Yanacopulos (2016) gives a more recent definition that social media refers to online media such as texts, photos, messages, videos, blogs, tweets and other platforms. Although corporate websites, chat-rooms, email customer response facilities and electronic news release distribution are now viewed as standard aspects of PR practice, many practitioners are struggling with the impact of new media, and especially the social media.

## **2 Statement of the Research Problem**

Most PR firms in Kenya have embraced social media officially but what sets them apart is the ability to achieve optimal use so as to achieve maximum benefits. If used well, social media offers precise targeting capabilities and remains relatively affordable and accessible compared to traditional PR approaches. This signifies the need for more research to establish how PR professionals can adapt to the ever growing and dynamic social media perspectives to achieve more leverage in their practice. In spite of the need to understand the place of social media in PR in Kenya, literature on the subject remains scarce.

Musau (2017) indicates that social media usage has drastically increased in the recent past thereby generating benefits to business and marketing of products. In Kenya, Facebook, for instance, has 7.1 million active users, YouTube 8 million, Instagram 4 million, Twitter and LinkedIn have 1 million each with Snapchat trailing at 0.25 million. These statistics are according to a report by the Bloggers Association of Kenya (BAKE) on the 'State of the Internet in Kenya, 2017.

A preliminary analysis of the current status of social media incorporation to the PR practice in Kenya indicates that its benefits are yet to be tapped fully considering it is a global phenomenon. According to Richard Edelman, CEO to one of the world's largest independent PR agency, Edelman, social media has altered the nature of how PR practitioners do what they do; it is a shift from pitching to participating, from selling a story to telling a story (Solis and Breakenridge, 2009). However, this is not the case in Kenya as PR is still an undefined black hole in many businesses as many organisations are yet to establish a fully functional PR department. Some organisations still perceive PR as an extension of other departments and in addition fill PR's top management with managers from other fields. The rapid expansion of social media in defining organisational brands and image has therefore resulted in an exponential growth putting a strain to the PR practice. A research gap has therefore been identified regarding the use of social media by PR practitioners in Kenya which this study attempted to fill in.

## **3 Aim and Objectives of the Study**

The aim of the study leading to this chapter was to investigate the utilisation of social media by PR professionals and make recommendations for improvement. The specific objectives of the study were to examine how PR professionals use social media in their PR practice; determine the factors which hinder efficient and effective use of social media in the PR practice; suggest strategies for improving the management and utilisation of social media by PR professionals. A set of questions were chosen to help achieve the objectives of this chapter. The questions were based generally on social media use, challenges and strategies by PR professionals. The questions asked tried to determine whether the PR professionals interviewed were using social media tactics to their full potential. The questions asked were: 1) How do PR firms use social media as a tool in the PR practice? 2) What are the challenges faced by PR professionals while handling social media? 3) What strategies can be recommended to ensure the effective use of social media in PR?

## **4 Methodology**

Kothari (2004) defines research design as the advance planning of the methods to be adopted for collecting the relevant data and the techniques to be used in their analysis, keeping in view the objectives of the research and the availability of staff, time and money. This research was designed as a case study. Jwan and Ong'ondo (2011) refer to a case study as an empirical inquiry that investigates a contemporary phenomenon or object within its real life context.

Data for this chapter was collected using interviews which were supplemented by content analysis. Interviews of all staff were deemed unnecessary as the social media aspects in a PR firms are handled specifically by PR directors, managers and officers. A population is a group of individuals, objects or items from which samples are taken from for measurement (Kombo & Tromp, 2006). The population of this study were PR professionals since they are dominant players in the handling of social media. A representation from these professionals gave an overall picture of the whole organisation as they are the ones who deal with the handling of the social media function directly. Two PR firms with a target population of 30 PR professionals were purposively selected for this study. Purposive sampling technique was employed to identify the 10 respondents who comprised of 2 PR directors, 3 PR managers and 5 PR officers. The selection criteria of the participants were based on individuals' availability, accessibility and knowledge or experience on social media use.

Data Generation techniques used were mainly Interviews, supplemented by Content analysis and observation. Nachmias and Nachmias (2004) define content analysis as any technique used to make inferences through systematic and objective identification of specified characteristics of messages. Qualitative data was then analyzed thematically by aligning the data collected to the objectives and research questions of the study. These sub-themes were later used as sections and sub-sections during report writing. Patton (2002) points out the need to do this in order to manage the data well and be able to bring out the core content of the data collected.

## 5 Findings and Discussions

The key findings of this study are presented and discussed hereunder:

### 5.1 The use of social media by PR professionals in Kenya

The first research question related to how PR firms use social media as a tool in the PR practice. Upon being asked when PR professionals in Kenya adopted social media to their daily practice, 4 respondents indicated that social media was actively adopted to the PR practice around the years 2009/2010 following success stories globally of its benefits as a PR tool. The social media impact and reach runs across various industries and has had a huge and arguably more pointed impact on the PR industry. Social media has afforded individuals an opportunity to display different perspectives of themselves besides allowing various brands to showcase more of what they have to offer.

The author observed that the main social media platforms used by PR professionals in Kenya include YouTube, Facebook, twitter, LinkedIn, Instagram, Snapchat, Periscope, blogs and Search Engine Optimisation. PR professionals use social media to talk about their clients, run campaigns, advertise and market their clients. One respondent noted that:

*“The social media wave has become too large to be ignored as it has made it compulsory for PR practitioners to adapt to the digital age or face dire consequences. Social media can be likened to the Google search engine through which publics acquire most of their information from the various available platforms.”*

The author also realised that thorough planning and strategy is involved when handling social media so as to communicate to the publics’ relevant and useful information. Contradictory to public stereotypes that social media is only for communicating and interacting informally, PR professionals plan and strategise on how best to optimise the various social media platforms to relay a message. One respondent said:

*“Social media content should be able to add value to the target audiences of a PR campaign be it millennials, housewives, teenagers, farmers amongst other groups. PR professionals really need to think through whatever they put on social media to avoid creating controversy for their clients. Strategy is important; our PR firm internally brainstorms clients’ needs from target audience, demographics and any other information before embarking on a social media campaign. Being creative as well as tactical is what drives PR success.”*

Another respondent emphasised that most PR professionals develop monthly themes to be covered on a client’s social media platforms. These themes are then broken down into a weekly calendar of events which are followed up by meetings and reports to keep the status of their clients’ social media presence updated.

PR firms use tools such as Sherlock, Google Analytic and Keyhole to monitor and track the use of social media by the publics. There is need for social media content to be monitored, evaluated and created in real-time and on a regular basis. Data analytics is also critical to building more successful campaigns. The tools monitor whether sentiments are positive or negative hence guide the PR practitioners on what information to control or adjust. One respondent noted:

*“PR practitioners monitor what conversations, sentiments and key influencers are trending which in turn assist in adjusting their strategy. For example, if they notice a key influencer they are not engaging with keeps trending, they then consult them. A case in study is Barrack Obama’s successful 2012 re-election campaign, which was heavily focused on social media data and analytics in order to determine how campaign messages resonated with different audiences.”*

The respondents also explained that social media is a relatively new PR tool that is evolving very fast. Therefore, the need to keep abreast with new developments as a PR professional is critical. One respondent noted that:

*“Unlike before where PR professionals had plenty of time to respond to or address an issue, the emergence of social media has caught PR professionals off-guard on how information is handled especially in the case of breaking news. A situation can arise whereby a client has given controversial remarks on an issue or has been involved in an awkward situation and by the time we as PR professionals are set to respond, the information is already out in the public domain. All that is needed by the publics is to create a twitter #hashtag or post on Facebook or Twitter causing the information to trend and spread like bushfire.”*

Another respondent also noted the very aggressive and diverse nature in the handling of social media by PR professionals.

*“PR professionals are currently working around the clock. The onset of social media requires coverage almost immediately on digital media. Back in the day, PR professionals would give a statement on air or release it in print the next day. Social media has disrupted the field, making PR a faster-paced and more delicate matter. A story may simultaneously require a social media presence besides radio coverage at 10 o’clock and probably TV news from 4 pm, not forgetting sending the story to print publications.”*



One respondent with over 20 years' experience in the PR practice and who has worked for a global PR agency with branches in most African countries such as Uganda, South Africa, Ghana and Zimbabwe indicated that Kenya has indeed made great strides in regard to how PR practitioners handle social media in comparison to other African countries.

## 5.2 Challenges of social media

The other question to answer was about challenges faced by PR professionals while handling social media. All respondents were in agreement that they have faced a myriad of challenges while handling social media. These include:

- 1) 'Fake news' or unconfirmed news that leak out to the public without a clients' consent throwing the PR professionals into a daze hence the immediate need for crisis communication.
- 2) Credibility and reliability of social media influencers on the information that had previously been endorsed by the influencers especially when they are in support of a competitor's product. One respondent pointed out that:  
*"We have had cases where the authenticity of the social media influencer comes into question whereby an influencer could be supporting Brand A today and within six months switches to support Brand B as a result confusing the audiences who may have related with the influencer more when they were supporting Brand A."*
- 3) Not all clients have embraced a social media presence as some still prefer to use traditional media methods. The social media function is still not very clear to some individuals and organisations as some clients, especially from government and parastatals, find it controversial. One respondent said:  
*"In 2017, I handled a client who preferred to communicate to their publics through traditional media methods specifically TV, radio and newspapers. It was such a challenge convincing them to adapt a social media strategy. The need to make organisations understand that social media is not a threat is crucial."*
- 4) The author also noted that the handling of the social media roles and job descriptions is a challenge to the PR practice as it was not clear as to whom handles what as is the case with one PR firm where the social media roles and responsibilities are performed by a graphics designer.
- 5) Another challenge is that PR professionals are limited on the ideas that they may propose to clients as most clients, especially multinationals, normally have an already preconceived plan of how their social media should be hence creativity is limited.
- 6) The author noted that there seems to be no standard policies and guidelines in place in regard to the approach and use of social media in Kenya. There is limited information on guidelines, rules and regulations governing the use of social media posing a challenge when a crisis occurs. Each PR firm has its own way of handling its social media platforms. Most PR firms have established their own policies and guidelines in regard to the handling of social media whereas some clients have also established theirs hence the need to find a middle ground.
- 7) Monitoring of the use and interaction of social media by the publics also came across as another challenge in that PR professionals have been caught off-balance when they realise too late that an issue has come up. One respondent noted that:  
*"There have been incidents that require to be addressed immediately by PR professionals, for instance, trending negatively. The PR practitioners may realise when it is already too late and the issue is being discussed left, right and centre in the public domain. How to manage it becomes a challenge because traditionally with the newspapers, PR professionals had a whole day or a couple more hours to respond to the issue but with social media, the response requires immediate attention."*

## 5.3 Strategies that PR professionals use to achieve effective communication through social media by PR firms

The third question sought to address strategies that if used by PR professionals are likely to improve the management and utilisation of social media in PR firms.

- 1) Use of Influencers: Social media has introduced a new aspect to media; influencers. Social media influencers include opinion makers, celebrities in media, sports or various industries with at least 100,000 followers or less. One respondent noted how these social media influencers with high follower counts come along with big opportunities for PR professionals and the brands they represent. Besides providing an outlet for professionally trained journalists to share breaking news, social media has also introduced a new type of citizen journalist: the influencer. He further gave an example of how an influencer can be used to endorse a product or service offered by an organisation and because of their large online following, adoration and trust from their followers, they will as a result purchase the product hence an increase in sales.
- 2) The need to be alert and ready: There is need to move faster and think quicker by PR professionals as social media has changed the timings of responses given by PR practitioner hugely. A respondent note that:  
*"The 'Golden 24 hours' within which a company needed and was expected to respond to issues has become the 'Golden Hour,' with*

*the arrival of the 24-hour news cycle. We've taken multi-tasking to a whole new level. A PR Officer can be found monitoring a breaking news story on Twitter so that their client can offer commentary at the same time be editing a blog post due to go live, while taking a call from a journalist who has just noticed another client's announcement on LinkedIn or Instagram."*

- 3) Establishing the needs of clients: Clients have very different needs and preferences. This depends on the target audience and also the nature and industry of the organisation. PR professionals are now responsible for managing and protecting the online reputation of their clients via the publication and promotion of additional content and community engagement. One of the respondents reiterated that:

*"PR practitioners need to have a deeper understanding of their target audience and understand the brand thoroughly before recommending what should be done or else the objective of the message may be lost. For example, a message intended for the millennials is better off making use of YouTube or Facebook which is popular amongst the 18-24 age bracket unlike a press release which some millennials may not have heard of."*

- 4) Have a crisis management plan: Reputation management is a very delicate part of PR, especially in times of a crisis. In a worst case scenario, an event can occur that causes a client to receive poor press. One respondent noted that:

*"You don't want to be caught unprepared and floundering in your words and actions as even the most seasoned PR guru can still make PR blunders when a crisis occurs. It is definitely good to have a contingency plan in place on how you would handle bad publicity."*

#### 5.4 Recommendations

The author recommends that there is need by PR professionals to strategies on how best to utilise social media by cultivating more positive attitudes towards its use and application. Based on the findings of this study, the author makes the following recommendations:

- There is need for in-depth training, discussions and research by both PR practitioners and the clients that they handle on how to integrate social media ideas into the larger PR strategy. PR professionals should understand the power of social media and also the damage it can cause. They can take short courses on social media approaches, handling and management that are currently being offered by various institutions in Kenya.
- In line with training, PR practitioners should educate their staff to be feeble and polite when addressing publics through social media. They should avoid using controversial language and mind the content that they share. Information shared should promote the goals, mission and vision of the client.
- The need to further engage social media influencers who will generate genuine engagement between brands and their audience by PR professionals is also critical when handling social media. Influencers should be individuals with integrity and the capability to create long lasting relationships with the brands they are representing, giving them a voice they could never use on their own.
- Considering the negative perceptions surrounding social media by some organisations, the author recommends that PR professionals should keep social media sites updated and professional and in addition come out clearly when explaining the benefits and advantages of social media to their clients. They should strive to do away with the criticism and controversy that turn some clients and organisations away. They should be able to clarify that social media is not just Facebook or twitter as is the discernment of many but includes many other channels such as YouTube, websites and the Search Engine Optimisation. An organisation should aim at being amongst the top 3 when their organisation is searched online.
- The author also recommends that PR professionals should cover only relevant and critical issues about their clients as not all news is news and not all issues require social media attention. Content posted should be relevant to the target audience and in addition relevant to the time posted. PR professionals should therefore apply their content creation and relationship building skills in handling social media as PR provides the strategy and content to explode social media presence. Building a social media brand has become equally important as securing that interview for an organisations CEO with a mainstream media house.
- The author also recommends that PR professionals should consider 'Newsjacking', a term that refers to the strategy of "hijacking" current news and trending topics to promote a brand's message. Newsjacking is the practice of taking advantage of current events or news stories in such a way as to promote or advertise one's product or brand. PR professionals in Kenya should therefore emulate their global counterparts who have mastered the art of news jacking and inject their ideas into news stories so as to get noticed.
- There is also a need to formulate clear and practical policies and guidelines regarding the use of social media. The social media policies and guidelines should be in line with the communication policies of the PR firm. The author in addition suggests the formation of a Social Media Association (SMA) of PR professionals in Kenya that can act as a standard regulatory body and guide on how PR professionals can best utilise and handle this phenomenon.
- On the monitoring of social media, the author recommends that PR professionals adopt current and effective

monitoring tools. The key to achieving maximum returns is to monitor what is trending on social media and create content that engages with it and builds upon it.

- PR firms should look at social media as a different form of revenue stream, if utilised well. PR firms are still evolving and should market themselves as being able to not only offer the traditional mix of PR but create a content strategy for social media becoming a one-stop shop.
- PR professionals need to learn from global social media case studies particularly on success stories, trends and the handling of crisis management. The roles of a spokesperson should come out clearly when it comes to breaking news and crisis management so as to avoid conflicting information.

## 6 Conclusion

The author concludes that social media presents great opportunities for organisations to communicate with their publics if utilised well. There are now boundless opportunities to listen to, understand and engage with audiences and create advocates and communities through social media, something which can be a powerful enabler for brands and organisations.

Following the research objectives and research questions of the study, social media is a tool if used well by PR Professionals can assist on decision making and policies of how organisations engage in relationships with and between publics in communication. As social media is being accepted as an integral aspect of organisational operations in other parts of the world and has continued to grow in the 21st century, PR professionals need to speed up its transition to make organisations realise and appreciate its worth in their success.

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# Community Media and Enhanced Food Security in Rural Kenya

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## Abstract

*The rural community in Kenya constitutes a homogenous population that shares distinct cultural practices. This community constitutes the majority of the country's total population. Communicating effectively to this group requires a good understanding of the varied profiles that constitute the whole unit. Food is a key element in human life. Food-secure environments ensure the availability of, and an adequate access to, sufficient, safe, nutritious food at all times to maintain a healthy and active life. The utilisation of community media of communication enables the individual members of the community to share the common ideals that shape their lives for the common good. A well designed community media framework can be used to ensure food sufficiency in the rural community. This chapter identifies the community media options available and discusses their roles in enhancing the food security in the rural communities in Kenya. Data was collected from purposively sampled focus discussion groups from the four wards in Ugenya Sub-County in Siaya County, Kenya. The collected data was analysed thematically and the findings presented through descriptive statistics. The author recommends strategies to mainstream community media in the propagation of information necessary for enhancing food security in the rural communities in Kenya.*

**Keywords:** *Citizen media, Community information, Rural communities, Food security, Ugenya, Kenya.*

## 1 Introduction and background

The rural community in Kenya constitutes a homogenous population that shares distinct cultural protocols and interests. The commonality of interests for the communities may be based on the sharing of a single geographical location that includes those living in a specific town, village, or neighbourhoods; the economic and social life through trade, marketing, exchange of goods and services; and membership of agricultural groups, churches and other joint ventures. According to the Kenya demographics profile (2018), the rural community in Kenya constitutes 73.5 per cent of the country's total population. The Ugenya Sub County is one portion of the rural community in Kenya.

Food is a key element in human life. Food-secure environments ensure the availability of and an adequate access to sufficient, safe, nutritious food at all times to maintain a healthy and active life. According to World Food Summit (1996), food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security is summarised by Maxwell and Frankenberger (1992:8) in terms of "secure access at all times to sufficient food for a healthy life".

Food production in Kenya is achieved mainly through agricultural activities. Kenya's agricultural sector is dominated by smallholder farmers in rural areas, making it an important sector in food security and poverty reduction. The sector contributed 32.6% gross domestic product (GDP) in 2016. The sector contributes about 27% to GDP through linkages with manufacturing, distribution and other service-related sectors. Agriculture generates about half of Kenya's export earnings, and 18% and 60% of formal and total employment, respectively (KIPPRA 2017).

Information dissemination to community members on measures to ensure food security requires a robust framework that enables the individual community members to equally share the information that shape their lives for the common good. A well designed community media framework can be used to ensure food sufficiency in the rural community. However, communicating effectively to the rural community requires a vibrant understanding of the varied profiles that constitute their unit whole. The distribution of the community within wide distinct areas, without predetermined zoning parameters, means that there are limited activities that all members of the community homogeneously engage in. This means that a model has to be designed that will ensure all the members of the community are able to access information generated and disseminated from the same source but customised to the target communities.

The Government of Kenya, in the national food and nutrition security policy through the Ministry of Agriculture, Livestock and Fisheries (2012), proposed an integrated data/information system and analysis that would incorporate the need to integrate local level knowledge into the existing systems in order to support policy making, that target planning interventions on early warnings in food security and nutritional status. This, however, would be futile unless relevant information from the local community members is gathered and communicated effectively to all the appropriate recipients through channels that would achieve maximum distribution. The national food and nutrition security policy implementation framework (2017-2022), proposes a cross-sectorial approach on information gathering and analysis with a view to developing capacity for both government and non-governmental players in the agricultural and food production sector.

According to the World Association of Community Broadcasters (AMARC, 1988), community radio responds to the needs of the community it serves and contributes to its development within progressive perspectives in favour of social change. Community radio strives to democratise communication through community participation in different forms in accordance with each specific social context. In Kenya, community radios exist across various communities to propagate community values and ideals. For instance, Bulala FM 107.5 in Budalangi, Busia Sub County, was established by the Kenya Meteorological Department in partnership with the local community to mitigate the flooding in the region. The station communicates weather, climate and other developmental information, predictions, warnings and other public-good information to the local rural community.

Community media is characterised by the manner in which it provides the local populations with access to information channels so that their voices can be heard. Similarly, the organisational culture of these media stations stress volunteerism over professionalism and promotes community participation. Furthermore, they embrace market-oriented approaches of operation and ownership that advocate for a service that is non-profit and owned by a community for its own purposes and control (UNESCO, 2001). Ngugi and Kinyua (2014), quoting a study on media in sub-Saharan Africa (BBC World Service Trust), point out that the local commercial radio services grew by an average of 360% between the period of 2000-2006 and that community radio had grown on average by a striking 1,386% over the same period.

In Ugenya, the popular communication model amongst small-scale farmers is a centralised model. Small scale farmers have groups and leaders of these groups act as central sources of information or communication. The leader of the group is selected from amongst the people with the most connections in the group. Ordinarily, that person has a broad perspective of what is going on in the group. All the initial communications are channelled through the leader to the group members which is better in terms of speed and efficiency (Ellis & Fisher, 1994). However, the leader, having the initial information may consciously decide to limit its flow.

Community networks within the society act as a window through which communities receive information for their social, political and economic developments as they provide the basic infrastructure upon which community members access information (Rey-Moreno, 2017). From a technical perspective, community networks relate to large-scale, distributed and decentralised systems composed of many nodes, links, content and services (Braem, 2013). These large, decentralised, dynamic and heterogeneous structures raise challenges in terms of information repackaging to meet their needs. However, food security information, being what it is, should reach all the community members within their defined locations in the nodes. The existing community networks in Ugenya are highly informal with some only locally known to the community members. The outstanding ones include the church groups, local business community, and the non-educated members of the community, among others.

Ugenya Sub-county is one of the six sub-counties comprising Siaya County in western Kenya and is divided into four wards. The four wards are West Ugenya, East Ugenya, Ukwala and North Ugenya. It lies at an altitude of between 1,200 and 1,400 metres above sea level; longitude of 34° 5'E and 34° 14'E; latitude of 0° 7'N and 0° 13'N and covers an area of 322.3 km<sup>2</sup> (KNBS, 2013). The Sub-county's population is estimated at 113,843 people of whom 18,874 are farming families (KNBS, 2009; Smollo, Mosi & Watako, 2017).

## **2 Rationale of the Study**

Food security is a vital cog in the economic growth of any country. The Food and Agriculture Organization (FAO) defines food security as a state “when all people have physical, social and economic access to sufficient, safe, and nutritious food that meets dietary needs and food preference for an active and healthy life at all times” (World Food Summit, 1996). To achieve food security in the rural community, there is need to educate the entire population on the relevant components that would enable them to achieve the desired food security goals. Proper communication channels need to be identified or formulated to respond to the food security challenges. This chapter identifies the relevant communication channels within the rural communities that help to educate the communities on ways of alleviating food insecurity. These communication channels provide the communities with access to information and a voice facilitate community-level debate, opportunity for information and knowledge sharing leading to enhanced input in public decision making. The channels are also used by players in the food security field to educate, market and mobilise the general population towards achieving food security.

## **3 Research Methodology**

The research was based on a case study design of Ugenya Sub-county. A purposively selected sample of 32 members of farming communities was used to create four focus discussion groups drawn equally from the four wards that form the Sub-county. The researcher also conducted key informant interviews with five officers from the Sub-County Agriculture Department. The five officers included all the four ward agricultural extension officers and the Sub-county agricultural officer. Two guides were developed for interviewing key informants and focus group discussions. A separate guide was

used for focus group discussions with members of farmer groups to help in gathering in-depth information regarding the community media options available and to discuss their roles in enhancing the food security in the study area that represent the rural communities in Kenya. Discussions were held with members of the selected groups to ascertain their perceptions, opinions, beliefs, and attitudes towards the concept of using community media to disseminate information on best agricultural practices and how their knowledge could be incorporated into the content to disseminated to general population within the coverage area. The collected data was analysed thematically and the findings presented through descriptive statistics.

## 4 Findings and Discussions

This section presents and discusses the findings of the study according to the objectives of the study.

### 4.1 Communication channels used to disseminate information on food security

The research findings established that a number of communication channels are available with the community. The noted ones included radio communications, short message services, word of mouth, social media and public gatherings. It showed that the majority of the focus group members 19 (59%) preferred radio communication as an ideal tool for exchanging information with members of the community. It was noted that with the radio communication, members are able to receive information directly from the source and ensured all members have the same access quality. Table 1 below summarises the responses.

Table 1: Community media options available

Communication Channel	Ratio	% Percentage
Radio communication	19/32	59
Short Message Services	8/32	25
Word of mouth	15/32	46
Social media (e.g. Facebook)	11/32	34
Public gatherings (Barazas)	14/32	43

*Source: Research findings, 2018*

Only 8(25%) of the respondents preferred the use of Short Message Services (SMS). These were the members of the community who had access and capacity to use mobile phones. Through the short message services, information is relayed to the selected group members from the same source and ensures that only those members selected to receive the messages gain access to the information. In this case, the quality of the information relayed is authenticated by the sender since all the group members are known to the leader who is tasked with the responsibility of sending the message.

The SMS offers a personalised means of delivering information to mobile users. The community uses this channel to distribute information to defined user groups. Through bulk messaging services, all the group users are able to access the same information immediately it is sent out. However, like any other linear communication channel, the interpretation of the message(s) depends on the recipients' understanding of the circumstances upon which the information is relayed.

A significantly large number of group members, 15 (46%), used word of mouth to communicate the information to the members. This channel is relevant especially for those members of the community with low levels of education. The information is passed on to individual members by the group leader who moves from one homestead to the other. Through this model, the leader is able to discuss with the members the content of the information and offer clarification on matters that they may find difficult to understand. Since there is a good rapport between the leader and the individual members, communication is more effective.

The social media platforms such as Facebook accounted for 11(34%) of the respondents. This translates into the ratio of the population under study that were technologically enabled. The community members are able to form group social media platforms controlled and authenticated information is delivered to the members simultaneously. Specialised groups would hold detailed discussions among group members to ensure they share best practices related to food production, preservation, and distribution, among others. Through the social media platforms, members would post the information relevant to food security. The information posted could come from any source so long as it was deemed necessary to support the common interests of the community of ensuring food security amongst the population. If well organised social media platforms could be used to broadcast relevant information in a timely manner to the members. The disadvantage of this mode of communication is that it relies on mobile phone technology. With the low access to electricity in the rural areas and costs of mobile phone, this could be a challenge to most members.

Public gatherings also emerged as a major channel of communicating information at 14(43%). These include church gatherings, political rallies, chiefs' meetings or any other occasion that members of the community find themselves together. Local administrators like Agricultural extension officers use these regular public gatherings that are held weekly to communicate government interventions on food security matters.

#### **4.2 Community media roles in enhancing food security**

Community radio plays a key role in educating the community members through the dissemination of information to the target community members. It enhances the social mobilisation of the general population towards embracing efforts to achieve food security. Through the application of the centralised system of communication, the community leaders are able to use radio communication to ensure all the members gain access to the same information simultaneously. The repackaged information is channelled to the recipients directly through the radio. Call-in sessions allow members of the target community are able to hold discussions on air. The discussions ensure that pertinent issues are clarified for the benefit of all the listeners. The nature of community radio ensure that the listeners participate in the programming thereby ensuring that the content delivered to the listeners is relevant and also avoids challenges brought about by communication barriers.

#### **4.3 Strategies for mainstreaming media in propagation of information**

Rural communities in Kenya are homogenous based on their geographical coverage and the activities they engage in daily. They are also heterogeneous from the standpoint of their education standards. Communitary networks exist across these rural communities that define how the community shares information and the type of information they share. For food security information, there is need to utilise all the available community networks so as to reach all the community members with standard authenticated message pertaining to the best agricultural practices.

The knowledge gap theory reckons that people in high economic status possess more knowledge than their counterparts in low economic status. This is partly because those in higher social statuses have more access and exposure to a wider range of media channels in all media; print, broadcast, electronic and others. Most ordinary Kenyans have access to radio and prefer vernacular stations because they easily identify with the issues under broadcast and there is no language barrier. Most Kenyans on average have only basic education. A few others have low level of education and may find it difficult to participate in national discourse using the prescribed national languages like Kiswahili and English.

For purposes of reaching out to the vast majority of the community members, the radio presenters target the various networks that exist within the community. The stations profile the communities and zone the networks so that links are put in place for directing the relevant agricultural information through these networks. For example, if there are groups of farmers engaged in specific commodity like maize growing, this would be zoned and information packaged to suit their needs. Members of these networks are engaged in discussions that help in propagating information on food security.

### **5 Conclusions and Recommendations**

Communication is a key aspect of all the development activities in the community. Communicating information on food security requires a multifaceted approach in order to effectively accommodate the varied members at the rural community level. Effective communication channels consider all the members of the community, their needs and groupings since the members relate according to their shared interests. To achieve this, strategies need to be put in place to achieve the following:

- 1) There is need for partnership between the community members and the various professional organisations like the meteorological department and agricultural departments and organisations to help in repackaging information for the community.
- 2) Information to be communicated needs to be centrally disseminated to ensure that all the potential consumers receive the same information that is geared towards ensuring food security is achieved.
- 3) There is need to employ various methods of communication like (WhatsApp, Facebook, texting etc.) to be able to incorporate all the members of the community within the various networks that they may belong.
- 4) Certified information channelled through community radios would reach wider population since more members are able to listen as a group to the broadcasted information.

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### About the Author

**Alfred Fredrick Odhiambo** holds a Master of Science degree in Library and Information Studies and Bachelor of Science (Information Sciences) from Moi University, Kenya. He has worked in the acquisition section of the Library of Congress, Nairobi Office, documenting the intellectual output from region for over 25 years. He is also a part-time lecturer in the Department of Information and Knowledge Management at the Technical University of Kenya. He is a trainer on the technical aspects of information organization and management especially Resource Description and Access (RDA). His professional interests include community information with a view to promoting the use of reliable and up-to-date information for decision making on community development. He is currently registered for PhD in Library and Information Studies at the School of Information Sciences, Moi University



# A Bibliometric Analysis of Social Media Research in Eastern Africa, 1998 -2017

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## Abstract

*This chapter is based on a study which examined social media research outputs indexed in Scopus database between 1998 –2017 using bibliometrics analysis. The study adopted a quantitative approach because it gathered large amounts of numerical data which was analysed statistically. Data was collected using content analysis. VOSViewer, Bibexcel and excel were used to analyse the data collected. The findings reveal that the number of publications stagnated from 1998 to 2005. There was an upshot in the number of publications from 2013 when social media topics drew the attention of researchers. The study also showed that the most produced document types were articles (308; 75%) and conference papers (45; 11%). It was also established that the countries with the greatest research output on social media is Kenya with 177 (42.96%), followed by United States and Uganda, with a total of 136 (33.01%) and 110 (26.70%) respectively. It was also evident that the institutions engaged in social media research were largely the first universities to be established in Eastern Africa. These include Makerere University with the highest number of publications (56; 13.59%) followed by the University of Nairobi (28; 6.80%) of all the publications. The study revealed that social media research is receiving remarkable attention. The authors recommend that researchers, scholars, institutions, and countries in the region should continue to collaborate in this area to advance social media research in Eastern Africa and beyond.*

**Keywords:** *Bibliometric Analysis; Content Analysis; Social Media; Knowledge Management; Scopus*

## 1 Introduction

Social media is conceived as a tool for interaction, communications and collaboration. With the availability of many social media platforms globally, the importance of social media in today's socio-economic development cannot be disputed. Although social media offers unique opportunities for socio-economic development, it also presents real dangers. Nevertheless, social media has been rapidly adopted over the past years and has consequently played an increasingly critical role in business, academia and social life of organisations and individuals (Khan, Swar & Lee, 2014). There is a growing consensus that social media innovativeness has influenced the way individuals interact, connect to, communicate, document and share information, seek advice as well as offer guidance and fundamentally collaborate (Amedie, 2015). Although social media has been around for several decades now, its increased usage in developing countries has been witnessed in the 21<sup>st</sup> Century. Social media has over these years evolved with technological advances resulting in a digitised world today. These technologies have altered the very fabric of daily life in the 21<sup>st</sup> Century. Social media research, alike, has not been left out in this wave of change. Studies on social media indicate a considerable increase in social media usage and impact. This explains the continued efforts by researchers to better understand and utilise social media.

The study from which this chapter has been developed focused on Eastern African region. The region is a part of the larger sub-Saharan African region on the African continent. This is a vast region comprising of eleven (11) countries including Kenya, Uganda, Tanzania, Ethiopia, Djibouti, Eritrea, Sudan, Madagascar, Rwanda, Burundi and Somalia. This region's research output over the last twelve (12) years has grown rapidly (Cresswell, 2017). Therefore, a comprehensive overview of social media research in these Eastern African countries in the past twenty (20) years will help shed more light on the current trends and developments and contribute to the body of knowledge as well as inform policy in the area.

## 2 Review of Literature

Social media comprises communication websites, like Facebook, twitter and YouTube, which facilitate relationship to form between users from diverse backgrounds leading to a rich social structure which is impossible to achieve traditionally (Kapoor, Tamilmani, Rana, Patil, Dwivedi & Nerur, 2018). Amedie (2015) adds that the innovativeness of social media has had a great influence on the way people interact, create and share information. Social media usage is actually deeper and goes beyond imagination despite the fact that it seems a new trend to many (Henricks, 2013; Abok & Kwanya, 2016). The myriad benefits of social media have not only attracted users but also researchers with academics and practitioners worldwide exploring social media with great interest over the past few years (Kapoor, Tamilmani, Rana, Patil, Dwivedi & Nerur, 2018).

A number of studies have reviewed social media literature from various perspectives. Gan and Wang (2014) conducted a bibliometric analysis on social media research from the perspective of Library and Information Science from 2002

to 2013 and concluded that social media research steadily increased in the period and almost a half of the total annual publication output in 2012 and 2013 were recorded. Snelson (2016) analysed the quantitative and mixed methods approaches for social media research from 2007 to 2013 and revealed that the publication trends show an overall increase in social media research involving either qualitative or mixed methods. The study also revealed that research on Facebook was the strongest with more publications than any other social media platform. Zyoud, Sweileh, Awang and Al-Jabi (2018) revealed in their study on bibliometric analysis on global trends in research related to social media in psychology from 2004 to 2015 that the number of research publications in social media in the field of psychology showed a steady, fast and upward growth. They also observed that the most common document type was research articles (91.03%) representing 873 out of the total 959 retrieved articles during the period under study.

Mehraliyev, Choi and Koseoglu (2018) conducted a co-authorship analysis of social media research in tourism and hospitality from 2002 to 2016. They found that Rob Law and the Hong Kong Polytechnic University are the most influential author and institutions at 29 articles and 81 articles respectively. This was followed by Marus Schuckert (8 articles) and University of Central Florida (30 articles). The least number of articles was contributed by Xianwei Liu (6 articles) and the Pennsylvania State University (18 articles). Leung, Sun and Bai (2017) conducted a bibliometric analysis of social media research in terms of co-citation and co-word analysis from 2007 to 2016. They found that Word-of-Mouth was the major theoretical foundation of social media research in business while the hospitality/tourism field presented a diverse theoretical foundation. The results also revealed that the comparison of social media research between the two fields highlighted four similarities, including the growth of research over time, the term “social media” gaining popularity, the new trend of social networking sites, and managerial applications as research focus.

Despite there being several studies conducted on social media based on various disciplines and regions as discussed above, there exists, however, no comprehensive analysis of social media research in Eastern Africa.

### 3 Objectives of the study

The specific objectives of the study are to:

1. Investigate the major trends in social media research in terms of growth of literature and productivity;
2. Explore the subject content of social media research so as to determine their influence in shaping social media field;
3. Analyse the major trends and types of social media research collaborations in Eastern Africa;
4. Examine the geographical distribution of social media research outputs in Eastern Africa; and
5. Identify the most productive journals in social media research in Eastern Africa region.

### 4 Methodology

This study employed bibliometrics and content analysis to collect data. The authors did not sample the research articles from among the publications. This is because the study targeted all articles published on social media as captured in the Scopus database between 1998 and 2017. Data was collected from the Scopus database simply because it is the largest abstract and citation database of peer-reviewed literature which includes scientific journals, books and conference proceedings which makes it suitable to provide sufficient data for the research. The results of the search spanned the period between 1998 and 2017 simply because this is the period under which scientific research output in Eastern Africa region recorded rapid growth. A search was conducted within titles, abstracts and keywords using the following Boolean combinations: “Social media” OR “instagram” OR “figshare” OR “academia.edu” OR “impactstory” OR “researchgate” OR “whatsapp” OR “linkedin” OR “social technologies” OR “virtual community” OR “blog” OR “online communication” OR “social network” OR “Web 2.0” OR “social sites” OR “social networking sites” OR “Facebook” OR “Twitter”. A further search within affiliation by country field was conducted using the following Boolean combination: Kenya OR Tanzania OR Uganda OR Ethiopia OR Rwanda OR Burundi OR Sudan OR Somalia OR Madagascar OR Djibouti OR “East Africa” OR “Eastern Africa”. The collected data was then cleaned, analysed through the use of bibexcel, VoSviewer, notepad and Microsoft Excel and presented in tables, charts and social network graphs.

### 5 Results and discussions

This section presents and discusses the findings of the study. It is structured thematically according to the specific objectives of the study.

#### 5.1 Trend of publication

Figure 1 shows the trend or distribution of the total number of publications in the various journals per year. Out of a total of 412 publications on social media during the period 1998 and 2017, the highest number of publications 87

(21.1%) were published in the year 2016 while the lowest number of publications 1 (0.2%) was published in each of the years 1998, 1999 and 2000. The results reveal that the number of publications more or less stagnated from the year 1998 to the year 2005 but there was a sudden surge in the number of publications from the year 2013 indicating that in a short period of time, social media topics had drawn the attention of researchers. Similarly, from the analysis, it is also observed that there was an upshot of publications from the year 2013 whereby the trend of publications increased tremendously as observed in the number of publications during this period. This implies that an upward trend is expected to continue in the near future as attention is quickly shifting to digital communications. It is also evident that social media did not draw many researchers' attention until the mid-2000s. After 2005, social media usage and scholarly work expanded rapidly.

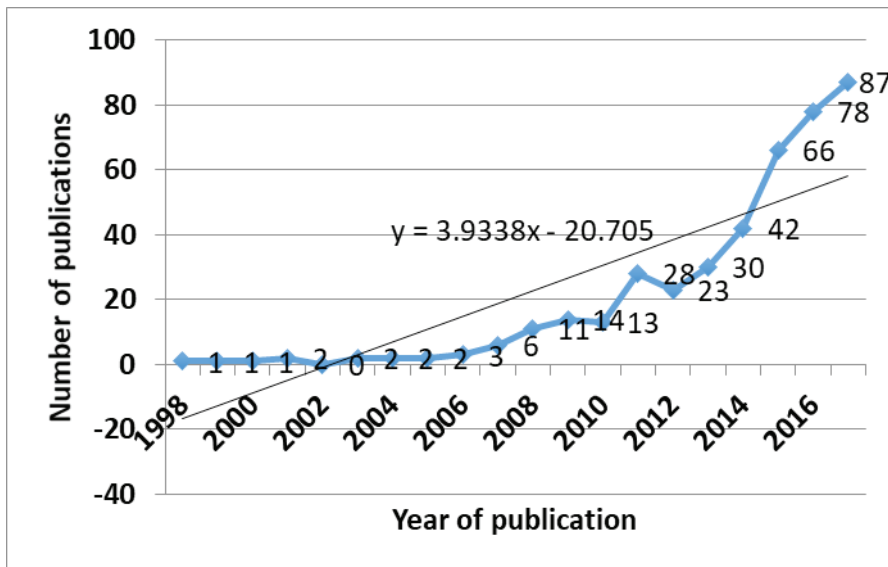


Figure 1: Trend of research publication on social media in eastern Africa, 1998-2017

Source: Research Data

### 5.2 Document types

Figure 2 shows the types of publications identified. These include articles, articles in press, letters, editorials, short survey, notes, reviews, book chapters, or conference papers. The articles constituted the highest number of publications with 308 articles (75%) while conference papers were 45 (11%). Letters and notes constituted the least number of publications with 1 (0%) and 2 (0%) respectively. The high number of articles identified could be due to availability of electronic peer reviewed journals resulting in a sharp increase in the number of articles published.

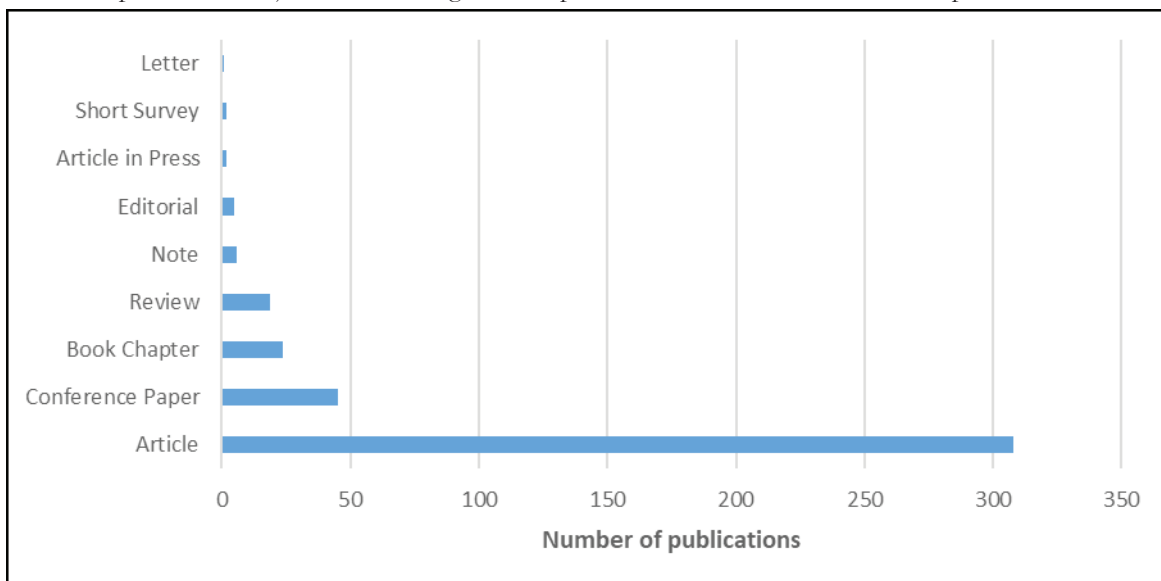


Figure 2: Types of documents published on social media in eastern Africa, 1998-2017

Source: Research Data

### 5.3 Subject content of the social media research

The subject content was determined using the Scopus subject categories and author-supplied keywords.

Figure 3 shows the distribution of the publications Scopus subject-wise. The findings reveal that 141 publications each were from social sciences and medicine respectively; 68 publications from agricultural and biological sciences; 63 publications from computer science; 29 publications from environmental science; 27 publications from biochemistry, genetics and molecular technology; 23 publications from arts and humanity, 21 publications from economics, econometrics and finance; 20 publications from psychology; and 20 publications from immunology and microbiology. Other subject areas with publications included business, management and accounting (17); engineering (15); earth and planetary sciences (14); mathematics (12); nursing (8); veterinary (7); pharmacology, toxicology & pharmaceuticals (7); decision sciences (7); multidisciplinary (6); neuroscience (3); physics and astronomy (2); as well as health professions, energy and chemistry (1). These findings can serve as a basis to compare key research topics on social media in future.

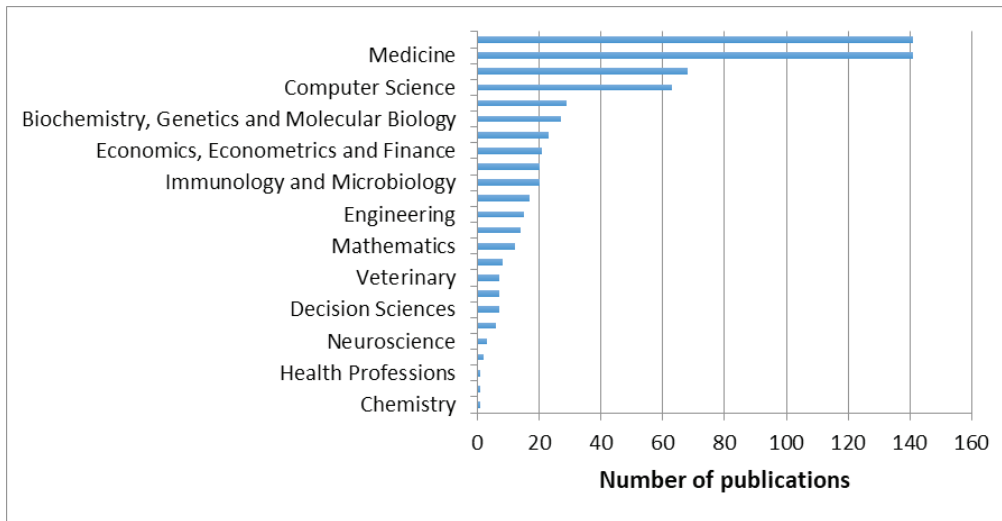


Figure 3: Scopus subject categories supplied on social media in eastern Africa, 1998-2017

Source: Research Data

Figure 4 presents the author-supplied keywords of the publications. The results show that “social networks” is on top of the keywords, followed by Kenya, Uganda and social media. This can offer valuable information or clues to the main keywords published alongside research papers on social media.

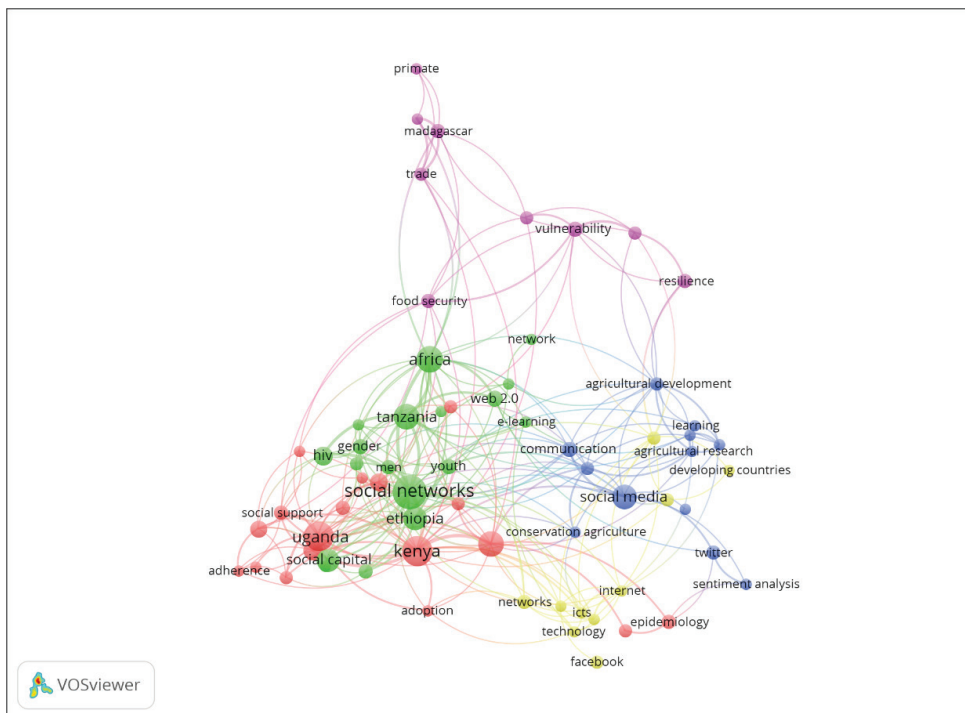
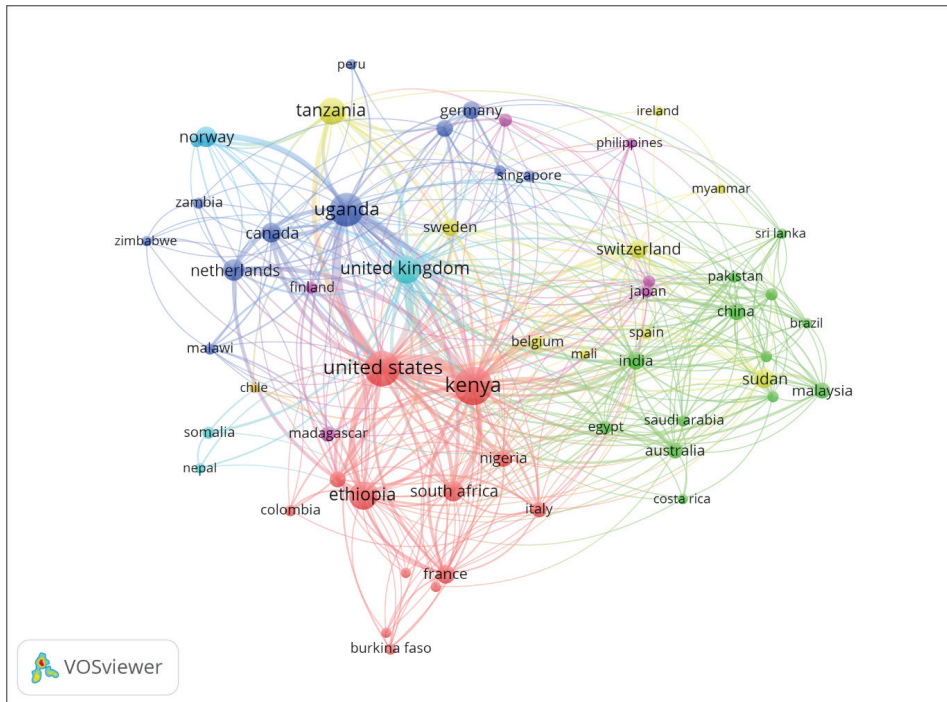


Figure 4: Author-supplied keywords categories on social media in Eastern Africa, 1998-2017

Source: Research Data

**5.4 Research collaboration in social media in Eastern Africa**

Research collaboration was analysed so as to determine countries from which authors conduct research jointly. A total of 58 countries were examined in assessing the degree of collaboration. The distribution of top twenty (20) collaborative countries is shown in Figure 5 and Table 1. The results revealed that the United States, Kenya, Uganda and the United Kingdom demonstrated a high degree of collaboration, with the United States collaborating with 50 countries 273 times while Kenya collaborated with 48 countries 252 times. Uganda collaborated with 43 countries 170 times and the United Kingdom collaborated with 39 countries 142 times. Sudan was bottom in the list having collaborated with 17 countries 27 times. This means that social media research is a global undertaking. However, it was noted that only a small number of countries are collaborating actively in its research. This could be due to technological advancements in those countries as new technologies keep emerging hence more social media tools readily available for use.



**Figure 5: Collaboration by country**

*Source: Research Data*

Both Table 1 and Figure 5 show the collaboration pattern of the publications published by country during the period under study. The largest number of publications was written by the United States, totalling 273 links. This is followed by Kenya, with 252; Uganda with 170 total links and United Kingdom with 142 total links. Norway, Nigeria and Sudan had the least number (29, 29 and 27 respectively) of the total links amongst the countries with the top twenty (20) collaborative links in social media research in Eastern Africa.

Table 1: Top twenty countries with highest collaborative links in social media research in Eastern Africa, 1998-2017

Country	Cluster	Links	Total Links	No. of Documents	No. of Citations
United States	1	50	273	135	2158
Kenya	1	48	252	177	2069
Uganda	3	43	170	110	818
United Kingdom	6	39	142	62	1681
Ethiopia	1	32	80	60	705
Switzerland	4	33	60	16	287
Tanzania	4	18	59	53	592
South Africa	1	21	57	21	692
Canada	3	19	52	19	275
India	2	27	51	12	60
Netherlands	3	17	48	25	249
France	1	21	41	15	100
China	2	26	38	10	49
Australia	2	20	33	8	527
Italy	1	20	32	7	24
Sweden	4	17	31	11	95

Country	Cluster	Links	Total Links	No. of Documents	No. of Citations
Ghana	1	17	31	9	106
Norway	7	10	29	21	174
Nigeria	1	18	29	10	33
Sudan	4	17	27	19	59

Source: Research Data

### 5.5 Geographical and institutional distribution of social media research

Table 2 shows the distribution of publications according to the country of research. The table provides the total number of publications for each country. 83 countries contributed a total of 966 publications on social media research in Eastern Africa. The distribution of top twenty countries is shown in Table 1. Out of the total 966 contributions, the top twenty countries contributed 845 publications. Similarly, the countries with the greatest research output on social media are Kenya with 177 (42.96%) followed by United States and Uganda with a total of 136 (33.01%) and 110 (26.70%) respectively. Belgium was bottom in the top twenty with 5 (1.21%) publications. The geographical distribution of the publications was decided on the basis of institutional affiliations.

Table 2: Top twenty countries researching SM in Eastern Africa, 1998-2017

Country/Territory	No of Publications	% of 412
Kenya	177	42,96
United States	136	33,01
Uganda	110	26,70
United Kingdom	63	15,29
Ethiopia	60	14,56
Tanzania	53	12,86
Netherlands	25	6,07
Norway	21	5,10
South Africa	21	5,10
Canada	19	4,61
Sudan	19	4,61
Switzerland	16	3,88
France	15	3,64
Germany	12	2,91
India	12	2,91
Sweden	11	2,67
China	10	2,43
Nigeria	10	2,43
Rwanda	10	2,43
Ghana	9	2,18
Malaysia	9	2,18
Australia	8	1,94
Italy	7	1,70
Madagascar	7	1,70
Belgium	5	1,21

Source: Research Data

### 5.6 Institutions engaged in social media research in Eastern Africa

Table 3 shows the top twenty-five institutions engaging in social media research in Eastern Africa for the period of 1998-2017. Makerere University had the highest number of publications (56) which accounted for 13.59% of all the publications. It was followed by the University of Nairobi which had 28 (6.80%) of all the publications. The performance of these two universities can be attributed to the fact that they are among the first universities to be established in Eastern Africa.

Table 3: Top 25 institutions researching on social media in Eastern Africa 1998-2017

Institution	Number of publications	% (N=412)
Makerere University	56	13,59
University of Nairobi	28	6,80
Moi University	24	5,83
Addis Ababa University	21	5,10
Kenyatta University	19	4,61
Muhimbili University of Health and Allied Sciences	15	3,64
London School of Hygiene & Tropical Medicine	14	3,40
Kenya Medical Research Institute	13	3,16

Wageningen University and Research Centre	12	2,91
Centers for Disease Control and Prevention	10	2,43
Johns Hopkins Bloomberg School of Public Health	8	1,94
University of California, Berkeley	8	1,94
University of Oxford	8	1,94
University of KwaZulu-Natal	7	1,70
University of California, San Francisco	7	1,70
The University of North Carolina at Chapel Hill	7	1,70
Mbarara University of Science and Technology	7	1,70
Duke University	6	1,46
American University	6	1,46
UCL	6	1,46
Indiana University-Purdue University Indianapolis	6	1,46
The University of Georgia	6	1,46
Massachusetts General Hospital	6	1,46
World Agroforestry Centre	6	1,46
University of Dar es Salaam	6	1,46

Source: Research Data

### 5.7 Journals publishing research on social media in Eastern Africa, 1998-2017

A total of 412 publications on social media were published in 139 journals. A ranking of top twenty journals on the basis of the number of publications contributed is shown in Table 4. The top twenty most productive journals contained 94 (22.82%) of the total publications. The highest number of publications, that is 13(3.16%), was published in *PLOS One*. This was followed by *Social Science and Medicine* with 9 (2.18%).

Table 4: Top 20 journals publishing SM in Eastern Africa, 1998-2017

Name of Journal (SOURCE)	No of Publications	% of 412
Plos One	13	3,16
Social Science And Medicine	9	2,18
AIDS And Behavior	7	1,70
ACM International Conference Proceeding Series	6	1,46
Lecture Notes In Computer Science	6	1,46
African Journal Of AIDS Research	5	1,21
BMC Public Health	5	1,21
AIDS Care Psychological And Socio Medical Aspects Of AIDS HIV	4	0,97
Global Public Health	4	0,97
Health Policy And Planning	4	0,97
Preventive Veterinary Medicine	4	0,97
Agriculture And Human Values	3	0,73
BMC Infectious Diseases	3	0,73
Disasters	3	0,73
Health Research Policy And Systems	3	0,73
Journal Of African Business	3	0,73
Journal Of Agricultural Education And Extension	3	0,73
Journal Of Rural Studies	3	0,73
Lancet	3	0,73
Livestock Research For Rural Development	3	0,73

Source: Research Data

## 6 Conclusions

In this study, several conclusions were drawn based on the findings of the study in line with the study's objectives. Firstly, the number of publications stagnated from the year 1998 through the year 2005 but shot up from the year 2013. This indicated a growing interest on social media research after 2013. This upward trend is expected to continue in the near future as research attention is quickly shifting to digital communications. Secondly, the most produced document types were articles (308; 75%) and conference papers (45; 11%). This may be due to the availability of electronic peer reviewed journals resulting to a sharp increase in the number of articles published. It may also be because research policies favour these types of scholarly publications. Thirdly, an analysis of the keywords used in the publications revealed that all imaginable research disciplines are covered. The results also show that "social networks" is the most used keyword followed by Kenya, Uganda and social media. Fourthly, an analysis of the country collaborations pattern revealed that United States, Kenya, Uganda and the United Kingdom indicated a high degree of collaboration. This implies that social

media research is a global undertaking. Fifthly, the countries with the greatest research output on social media is Kenya followed by United States and Uganda. Sixthly, institutions engaged in social media research were the first universities to be established in Eastern Africa. These include Makerere University and the University of Nairobi.

## 7 Recommendations

The study has revealed that social media research is receiving attention in the scientific communication channels. The authors recommend that researchers, scholars, institutions, and countries in the region should continue to collaborate in this area so as to advance social media research in Eastern Africa. It was also noted that sources publishing social media research are not fully exploited. There is need to increase the number of reputable sources (journals) to publish social media research locally and internationally. This will widen the social media coverage. The authors also recommend that further research be conducted to establish the geographical location and nationality of authors of research output on social media.

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## A review of citizen librarianship in academic libraries in Kenya

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### Abstract

*Citizen librarianship is the involvement of ordinary library users to create, review and share library services and content. Citizen librarianship emerged from the concept of citizen science in which non-experts are actively involved in and contribute to scientific research projects. The purpose of this chapter is to assess the understanding and extent of use of citizen librarianship in academic libraries in Kenya; identify the citizen media used in academic libraries in Kenya; analyse how the academic library users in Kenya interact with citizen media in their library spaces; examine the impact of citizen media on the effectiveness of academic libraries in Kenya; and propose a citizen librarianship model for academic libraries in Kenya. Primary data for the study on which this chapter is based was collected from the web sites of the libraries of all the chartered public and private universities in Kenya. Additional data was collected from key informant interviews with academic library directors and systems librarians in Kenya selected through information-oriented purposive sampling. The findings revealed that the majority of academic librarians in Kenya have never heard of the concepts of citizen science or citizen librarianship. Although citizen librarianship offers an important framework for users' involvement in meeting their own information needs and those of their peers through citizen media, its application in Kenyan academic libraries is low. The findings of this study may be used by academic librarians to adopt citizen librarianship in their institutions.*

**Keywords:** *Citizen Librarianship, Citizen Science, Social Media, Citizen Media, Academic Libraries, Kenya*

### 1 Introduction

The concept of citizen librarianship entails the involvement of ordinary library users to create, review and share library services and content. Citizen librarianship emerged from the concept of citizen science. To be able to put citizen librarianship in context, it is important to first and foremost elaborate the concept of citizen science. Generally speaking, citizen science is perceived as a scholarly undertaking in which non-experts are actively involved in and contribute to scientific research projects. Although the term citizen science has been used in different situations to represent diverse scenarios, a key element of its definition is the participation of ordinary citizens in the scientific process together with professionals. Citizen science is currently viewed to be a modern concept but this is not entirely true because it started in the 19<sup>th</sup> Century when scientific investigations were carried out by scientists such as Charles Darwin in collaboration with amateurs. This collaboration played an important part in Darwin's contribution in biology especially in the area of natural selection.

There have been various discussions over what the concept citizen science should cover in terms of the scope and the discipline in which to domicile it. Irwin (1995) described citizen science as entailing the storage of knowledge within the non-scientific group. He described this as lay, local and traditional knowledge (LLTK). Bruce (2004) suggested a three-part definition of citizen science. The three parts of the definition are 1) the participation of non-scientists in the process of gathering data according to specific scientific protocols and in the process of using and interpreting that data; 2) the engagement of non-scientists in true decision-making about policy issues that have technical or scientific components; and 3) the engagement of research scientists in the democratic and policy process. Bruce's definition has been criticised that it has some overlap in the concepts of scientific research, scientific policy-making and science advocacy. A definition provided in the *Green Paper on Citizen Science* suggested that citizen science refers to the engagement of the general public in scientific research activities whereby citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources. This definition has been perceived to be better and more inclusive. Other definitions of citizen science have been provided by many scholars. Some of these include the process whereby citizens are involved in science as researchers (Kruger & Shannon, 2000), a concept which is also referred to as community science (Carr, 2004); involvement of trained volunteers in scientific studies as field assistants who collect data (Cohn, 2008); and engaging ordinary citizens as scientist-volunteers to collect and/or process data as part of a scientific inquiry (Silvertown, 2009).

Lakshminarayanan (2007) asserts that true citizen science does not involve the conventional scientists using citizens merely as data collectors but rather engaging them as "citizen scientists". Crowston and Wiggins (2011) add that citizen science is a form of research collaboration in which professional scientists engage with members of the public to

accomplish scientific research goals. Citizen science is also often seen as a part of a wider trend of crowd-sourced science or “collaboratories” where a large network of people collaborates after an open call for contribution (Crowston & Wiggins, 2011). The concept of citizen science has gained popularity and become a sort of movement. Its growing popularity has attracted attention to its definition. Consequently, its definition has progressively become polished and simplified. In recognition of its place in common lexicon, *Oxford English Dictionary* officially included a definition of the term in its June 2014 update. The dictionary defines it as scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.

Citizen engagement in scientific and technological projects has been widely seen as providing opportunities for education and communication to reduce the remaining distance between laypeople and science (Gray, Nicosia & Jordan, 2012; Powell & Colin, 2008). It is an effective method of promoting formal and informal science education and public understanding of science. It is counted as a win-win situation where citizens are given an opportunity to contribute to the scientific research projects designed by professional researchers. Prevailing interpretations consider that through their participation, citizens increase their interest in scientific learning (Riesch & Potter, 2014) while contributing to the development of projects of scientists (Silvertown, 2009). Bucheler and Sieg (2011) suggest that the performance of citizen science projects may be increased by turning crowds of individuals into swarms of teams based on collective intelligence and variety of backgrounds.

The benefits accrued from citizen science projects greatly vary. One benefit is the expansion of the sampling efforts in scientific projects. Projects that involve citizens often continue over longer periods and have a larger scale and scope than professional scientists could typically achieve alone (Bishop 2014) because of the short-term nature of scientific research funding. There are some research projects that could provide a clearer understanding of a certain scientific question but requires a lot of funding or skills that scientists require. Involving citizens in such projects enables the teams to collect large data sets with minimal funding. Bollen *et al.* (2014) proposed collective decision making and pooling of research funds driven by algorithms and mathematical models which would, in their opinion, drastically reduce the current high costs of both peer review of research proposals and the time the scientific community spends on writing them instead of researching. Citizen science also has the potential to positively change attitudes towards science. The inclusivity in citizen science can break down that perceived distance in science. Citizen science makes science possible for everyone irrespective of personal, geographical or socio-economic background. Citizen science also creates awareness of scientific issues leading to improved skills. Citizen science results in enhanced efficiency, transparency and reliability. Open access to scientific outputs enhances the transparency and reproducibility of the scientific process (Ioannidis, 2005). This controls scientific fraud since other researchers get an opportunity to replicate or test the data and mine the articles content (Murray-Rust, 2008). In the past, impact factor and peer review have been seen as the measure for outputs for quality research but in the future more open methods and faster feedback is becoming popular as a result of citizen science.

Despite the great potential that citizen science has in making positive impacts on science research and the general public, there are challenges associated with it. The challenges emanate from the kind of the project or the characteristics of the data. One of the most obvious challenges is the varied skill level of the citizen science participants that leads to disparities among data points. For instance, as projects are scaled up, there is concern about the rigor and usability of data collected by citizens who are not formally trained in research science. This can be minimised by leading researchers providing clear directions and expectations to the participants. Feedback mechanism is also important just in case there are questions or there is need for troubleshooting. This can be done in the projects’ websites and usually includes the Frequently Asked Questions (FAQs). There can also be step-by-step training guides. As the project increases in size, the steps of coordination and uniformity become crucial for the usability of the data. There is another challenge of effective communication. The participants may fail to have the big picture or full understanding of the scope and limitations of the research project. Ethical research issues should be communicated, especially, when it touches on research on humans. Another challenge relates to the difficulty of articulating the outcomes of citizen science because of the current lack of capacity for evaluation within the citizen science field (Jordan *et al.*, 2012; Phillips *et al.*, 2012). As the field of citizen science grows and matures, improved strategies and evaluation tools will ensure the desired objectives are achieved. Lastly, it is argued that the greatest strength in citizen science also acts as its greatest weakness. The fact that the science research is not purely done by the experts may lead some to question the validity of the data or even the value of the project in promoting scientific progress. These issues can be addressed by training the citizen scientists properly. As citizen science continues to become part of the science research landscape, it is important to continue refining its best practices.

## 2 Literature Review

As explained earlier, citizen librarianship is the involvement of ordinary library users to create, review and share library services and content. Citizen librarianship entails the use of citizen (social) media to facilitate ordinary library users

to perform roles which were conventionally reserved for librarians. The concept is emerging through the realisation that citizens themselves can play a role in determining the flow of credible information, which is the foundation of librarianship (Brandtzaeg & Luder, 2008). Citizen librarianship is paralleled with citizen journalism which entails the participation of lay people in collecting, organising and disseminating media content through social media. Ockerbloom (2007) explains that citizen librarianship has been practised for long since different people within and without library organisations have participated in library activities such as collecting, describing, organising, making accessible, helping people find and use, and preserving diverse information resources alongside professional librarians. However, he points out that with the emergence of the social media, it has become easier for people to work as citizen librarians using digital media and technologies.

According to Ockerbloom (2007), citizen librarians stretch the library services beyond the library walls to communities who would have hitherto not been reached easily. He explains that citizen librarians are able to give more customised services and collections than professional librarians can because of their presence in the communities. He emphasises that although there is room for creativity, citizen librarians should be willing to adopt and apply best practices which have been developed by libraries throughout the years. This view reinforces the principles of Library 2.0 which emphasise user-centred approaches in designing and delivering library services. Thus, progressive libraries are expected to facilitate their users to create and share content; enhance the presence of the users in the library environment through socially-rich activities; solicit and guarantee the involvement of users in changing their libraries and not vice versa (Kwanya *et al.*, 2013). Miller (2006) recommended that libraries should focus less on secured inventory systems which are selected and managed largely by the librarians but more on collaborative discovery systems which are designed or selected and managed by both librarians and users in a mutually beneficial partnership.

Ockerbloom (2007) clarifies that not everyone active on social media can be a librarian. He explains that people who are willing to adopt principled methods for collecting, describing, and disseminating information resources as a service for their communities can be facilitated to act as citizen librarians. Kwanya *et al.* (2013) proposed that librarians can strengthen the capacity of the library users to contribute effectively in the conceptualisation and delivery of information services through comprehensive information literacy services going beyond library orientations. Kibe and Kwanya (2015) suggest that librarians can work with library volunteers to promote and deliver library services and products to their peers. Describing such volunteers as knowledge ambassadors, Kibe and Kwanya (2015) explain that using them can increase the usage of library resources as well as deepen user participation in the design, development and deployment of library services and products. Similar benefits are highlighted by Cho (2008) who points out that an active and empowered library user is a significant component of progressive library environments. He stresses that with information and ideas flowing in both directions –from the library to the user and from the user to the library – library services offered in a participative library environment have the ability to evolve and improve on a constant and rapid basis. Thus, the user becomes an active participant, co-creator, builder and consultant of library services and products.

Citizen librarianship can be a strategy of enhancing the usefulness and relevance of libraries at a time that many potential library users are actively seeking alternative sources of information. In this context, citizen librarianship can be used as a means of increasing the participation of users in designing and delivering library services. It can provide a framework for democratising the library and in a way create a library for the people and by the people. Such a library is likely to meet the unique needs of most, if not all, members of the communities they serve in a better way than traditional libraries. Kwanya *et al.* (2013) explain that many libraries find it difficult to meet all the needs of all their users. This is largely because of resource constraints. So, libraries essentially focus on providing services or resources needed by the majority of the users thereby ignoring the needs of the minority. Kwanya (2011) suggests that libraries can meet the unique needs of users by promoting self-service. This way, the library users and their peers collaborate with the librarians to create, collect or share resources needed by minority users. This approach is not only effective but is also cost-friendly. Therefore, citizen librarianship has the potential of enabling libraries to meet the needs of their peripheral users by collaborating with them in identifying and satisfying those needs.

Ockerbloom (2007) explains that citizen libraries have the potential of opening library resources to virtually everyone (open access libraries) using social media and other digital networks thereby enlightening the world, making it easier for people to collectively create and share knowledge, enabling diverse forms of production and commerce; enabling the community to add to information resources by contributing content in print, digital and multimedia formats; facilitating extensive and effective sharing of library resources and products such as content, metadata and infrastructure as a cost-sharing mechanism aimed to reduce the expenses associated with library operations. Recognising the growing prominence of calls for freedom of information as well as information rights, embracing a service model which espouses user participation is one of the strategies which stand a chance of enhancing compliance with legislative and policy requirements of libraries especially those funded using public resources.

According to Das (2014), citizen librarianship may be realised through remodelling the use of library spaces to draw the participation of citizens in helping to deliver the library mandate. He emphasises that in the context of public libraries,

it is easier to involve communities by ensuring the library is a true “people’s university”. For instance, he proposes that libraries can create spaces in which communities as citizen librarians can experiment with artefacts, equipment and software. Thus, the library space may be used by ordinary citizens to learn, share and create knowledge as citizen librarians. He emphasises that the citizen librarian is an empowered group of people who are not only consumers but are also creators and disseminators of knowledge. For this to work effectively, he emphasises that library spaces should be reconfigured around broader education and research needs and less around the management of typical collections.

### 3 Rationale and methodology of study

Literature on citizen librarianship is limited. The authors hardly found any comprehensive scholarly work on the subject. This is perhaps an indication of low interest on the participation of citizens in designing and delivering library services. Blyberg (2006) as well as Kwanya (2011) argued that whereas librarians may be willing to cede or share control over some of their services, they are reluctant to open up others like cataloguing and knowledge organisation processes. It is also possible that the apparent lack of literature on the subject is a pointer to a silent resistance to the realisation of its ideals. Since citizen librarianship is anchored on the principle of collaboration and reduction of controls, professional librarians may be reluctant to embrace it because it will reduce their power over information. Kwanya *et al.* (2014) pointed out that most librarians are comfortable acting as the bridges between their patrons and the information they need. They act as intermediaries thereby acting as gatekeepers to information and information resources. The modern library users, on the other hand, prefer disintermediation as a means of removing barriers to library services and products (Kwanya *et al.*, 2012).

Since the reasons for the lacklustre presence of information on citizen librarianship is unclear, it is not possible to assess its suitability or otherwise to library communities. Academic and research libraries are some of the most liberal library typologies. The liberal principle is derived from the spirit of academic freedom which universities espouse (Kwanya, 2011). Therefore, academic and research libraries have the greatest potential to embrace citizen librarianship. The purpose of this study is to contribute to the efforts of promoting citizen librarianship by drawing the attention of librarians to it. Specifically, this chapter assesses the understanding and extent of use of citizen librarianship in academic libraries in Kenya; identifies the citizen media used in academic libraries in Kenya; analyses how the academic library users in Kenya interact with citizen media in their library spaces; examines the impact of citizen media on the effectiveness of academic libraries in Kenya; and proposes a citizen librarianship model for academic libraries in Kenya.

Primary data on the citizen media used by academic libraries, how they are used as well as the impact of their use was collected from the web sites of the libraries of all the 49 chartered public and private universities in Kenya. Data on the perception and understanding of citizen librarianship and its application in academic libraries in Kenya was collected through key informant interviews with 25 academic library directors and systems librarians in the 49 chartered universities Kenya selected through information-oriented purposive sampling.

### 4 Findings and discussions

The authors purposed to interview 25 academic library directors and systems librarians in academic libraries in Kenya. However, only 19 were successfully interviewed representing a response rate of 76 per cent. The majority (58.8%) had never heard of the concept of citizen science. These findings confirm that the concept is new to most of the academic librarians in Kenya. The authors observed that whereas the number of librarians in Kenya who are unaware of citizen science may be higher than in other countries, the concept is generally new to librarians globally. For instance, Pors (2010) reported that the concept was implemented in libraries in Denmark from 2007. Goulding (2009) also insinuates that citizen science was introduced in libraries in the United Kingdom around the year 2007. Recognising the fact that the two cases date more than ten years ago, the situation in Kenya should create great concern for librarians in the country.

#### 4.1 Understanding of the concept of citizen science among academic librarians in Kenya

Asked to explain their understanding of citizen science, those who reported to have heard of the concept described it as shown hereunder:

*“Research by members of the general public under supervision of professional researchers”*

*“This is a relationship between citizens, science and the technology”*

*“It refers to the participation of the public (lay people) in scientific research”*

*“Citizen Science is the collection and analysis of data relating to natural things happening in the world”*

*“This is the use of social media to acquire and gain information and knowledge”*

These findings indicate that the respondents who had come across the concept generally understood what it is. Considered together, they define citizen science as an approach which entails an active involvement of lay people in

scientific activities under the supervision of professional scientists. The definitions also identify social media as one of the important sets of tools used to facilitate the participation of lay people in science. It is also evident from the definitions that citizen science involves scientists developing a relationship with the citizens. This emphasis is important because not all citizens can participate in all scientific studies. Therefore, scientists need to identify and cultivate a relationship with citizens who have the potential to contribute effectively to scientific endeavour.

#### **4.2 Understanding of the concept of citizen librarianship among academic librarians in Kenya**

Asked whether they were familiar with the concept of citizen librarianship, the majority (52.9%) answered in the affirmative. It is noteworthy that this number is less than those who had not heard of citizen science. This finding implies that some (5.9%) of the librarians know about citizen librarianship but do not understand that it is actually anchored on citizen science. An understanding of the principles and characteristics of citizen science are important for libraries deploying citizen librarianship. The authors encourage librarians to explore citizen science as a means of contextualising their citizen librarianship projects.

Those who were familiar with citizen librarianship defined it as follows:

*“Use of common social media platforms to satisfy ever increasing users’ needs”*

*“Blogging”*

*“Application of technology in librarianship”*

*“It is a scenario where ordinary people support librarianship by giving feedback on issues and providing relevant information”*

*“It is the use of social media to communicate on information on library”*

*“The practice by non-professional librarians to create, organise and distribute content to serve the needs of a particular community. It may also mean the same practice done in a non-conventional way to serve the needs of a given user group or groups”*

These definitions emphasise the participation of non-librarians in supporting libraries to perform their core functions. It involves the participation of lay people, such as library users, in collecting, organising and sharing information. Again, the role of social media and related technologies is evident in the definitions. The authors conclude that citizen librarianship is indeed the application of the concept of citizen science to the library environment largely through social media technologies.

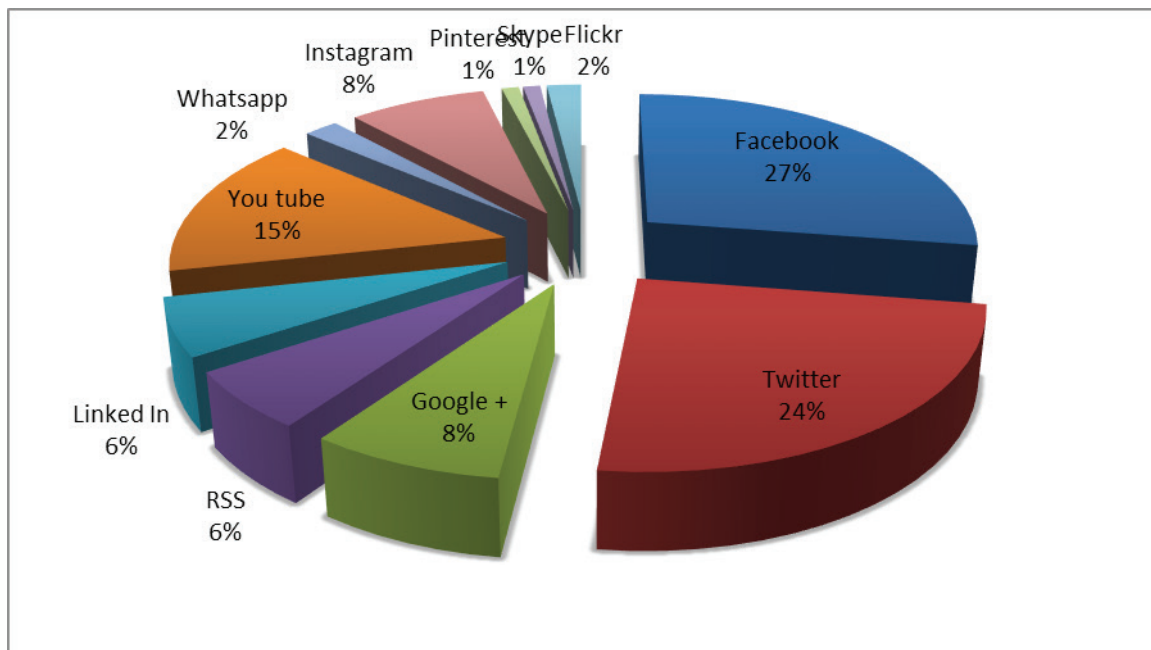
#### **4.3 Extent of use of citizen librarianship in academic libraries in Kenya**

The respondents were asked to name academic libraries they know which use citizen librarianship. Five (5) of the respondents explained that they did not know any academic libraries in Kenya using citizen librarianship while six (6) did not know whether or not any academic libraries in Kenya are applying the concept. This implies that the majority (58%) of the respondents were unaware of the use of citizen librarianship by academic libraries in Kenya. Some of the academic libraries identified to be using citizen librarianship include United States International University (USIU), University of Nairobi, Kenyatta University, Pwani University, Kabarak University, Catholic University of Eastern Africa, the Technical University of Kenya, South Eastern Kenya University, Cooperative University of Kenya, and Kenya Highlands University.

When asked to explain how they knew the cited academic libraries are using citizen science, they said that the university libraries used different types of social media. According to them the use of social media was an adequate evidence of the application of the philosophy of citizen librarianship. An analysis of the web sites of the 49 chartered universities in Kenya revealed that 38 of them have social media accounts while 11 have no social media sites. This indicates that the majority (78%) of the university libraries have social media presence.

#### **4.4 Social media used by academic libraries in Kenya**

Of all the social media used, Facebook emerged as the most popular at 27% followed closely by Twitter at 24%. It was surprising to come across applications such as Pinterest and Flickr, which are associated more with images. A few institutions indicated they had Whatsapp accounts as well. However, it was not easy to test if they were indeed being used and to what extent. Figure 1 presents the social media used by academic libraries in Kenya as revealed by an analysis of their official web sites.



**Figure 1: Social media used by academic libraries in Kenya**

*Source: Research Data*

Individual libraries have attempted to create their own social media sites. However, these were limited, with only 4 Facebook accounts, 3 on Twitter, and 1 each on RSS, Linked-In and Google+. Kenyatta University was found to have the most active social media sites linked to their library. At the time of the analysis, the sites had been recently updated giving an indication that posting is done regularly, with the less used sites such as YouTube, Google+ registering very old posts. This, however, could be attributed to the fact that they are more useful with posting videos and photos of major functions such as graduations which take place only once in a while or just annually as would be case with graduation ceremonies. It was, however, noted that the majority of the posts were from the university administration and the students commenting on the posts. The students hardly initiated any posts and there were very few shares on Facebook or re-tweets on Twitter. The likes registered were at a minimum of 1,500 and a maximum of over 151,000 with a matching number of followers. Four (4) institutions gave the indications that they had the social media sites but upon clicking on the links they were either dead links or they pointed to totally different web sites.

#### 4.5 Impact of citizen librarianship on academic libraries in Kenya

When asked to assess the impact of citizen librarianship on the service delivery by academic libraries in Kenya, the respondents stated as reported verbatim hereunder:

*“Brings the user near to the library”*

*“Reaching many users remotely”*

*“Not very much of an impact since many people are yet to adopt it fully”*

*“It helps library to collect and make important information accessible to users”*

*“It increases awareness of all library materials to the library patrons”*

*“The impact is minimal. The social media is mostly used for marketing and awareness purposes. It however has potential impact owing to the high number of millennial patrons using the library services”*

On the importance of citizen librarianship to the effective delivery of academic library services, the majority (54.3%) of the respondents held the view that it is either of high or very high importance; 31.3 per cent said it is of moderate importance, while 12.5 per cent said it is of low importance. Asked to suggest ways academic libraries in Kenya may enhance the use of citizen librarianship, the respondents provided the suggestions reported hereunder verbatim.

*“Publicise it during library orientation or using posters”*

*“Market the social media”*

*“Encourage constant communication through these media”*

*“Create awareness and orientation to new staff and students”*

*“Sensitise staff members on the relevance of using social media to collect feedback”*

*“Let the libraries understand the concept of citizen librarianship and how effectively they can utilise it”*

*“Introduce the use of social media, assigning staff the sole responsibility of getting what users are saying and responding to their concerns; ensure users are encouraged to use it without fear of victimisation”*

*“By having active content managers who have the passion and time to add value to online information services; improving on the platforms used. For example, Facebook may not be good enough for content management. A blog or wiki may be a better option”*

The suggestions above revolve around improving the use of citizen media in the libraries. Another suggestion is on creating awareness about the value of citizen media for the delivery of information services in academic libraries in Kenya. Citizen media originally emerged as platforms for social networking and were not perceived as critical tools for scholarly communication. It is now evident that scholarly communication is really about conceptualising, conducting and reporting research projects. Social networking and interactions play a pivotal role in this process. The other suggestions are reported verbatim hereunder.

*“Reference librarians should take charge of and respond to users’ queries in a timely and accurate manner”*

*“Assign specific library staff to interact with and handle social media aspects”*

*“Engage with users and build communities through strategic social media”*

*“Improve the overall infrastructure to support optimal use of social media”*

*“The social media selected for citizen librarianship should be active all the time and should contain relevant information about services offered and any new development”*

*“Draw clear policies on service delivery and create awareness on the same among librarians”*

*“Provide a platform for reliable feedback by users which can be used by libraries to improve on their services. Citizen media provide platforms where constructive discussions can be held by a wide variety of people from all over”*

*“Conduct workshops and seminars through KLISC [national library consortia] and let academic librarians be aware of the value of using citizen media for service delivery”*

*“Use citizen media to communicate to the library patrons about new arrivals, both print and electronic media”*

*“Citizen media can be used in announcing new titles, disseminating relevant information, implementing good suggestions provided by users; information literacy purposes (topical content, guides, etc.); disseminating grey literature; conducting user surveys and providing feedback of the same; and supplementing the institution’s web site, for example, by providing links on the web site and providing content that cannot be covered by the web site alone”.*

#### **4.6 Citizen librarianship framework for academic libraries in Kenya**

To benefit effectively from citizen librarianship, academic libraries in Kenya should consider taking the following actions:

1. Understand the principal tenets of citizen science and its association with citizen librarianship. They should also appreciate the role of user participation towards the realisation of effective service delivery in academic libraries. This can be achieved through structured workshops and training on the topic. A good understanding of citizen science is an important determinant of an effective conceptualisation of citizen librarianship.
2. Conduct a survey of the existing and emerging citizen media and identify those that have a high potential of application in academic libraries. Knowing that citizen media emerge rapidly, the librarians are encouraged to develop and apply appropriate selection criteria to identify the media which are suitable to their contexts. The criteria could include the features, usability, associated costs, and popularity amongst the community of users, among other issues.
3. Develop a comprehensive citizen librarianship strategy for academic libraries. The strategy should include an analysis of the linkage between the overall corporate strategy of the parent institution, the library’s strategic plan as well as the proposed citizen librarianship. It should spell out the aims and objectives of using citizen librarianship as well as how to realise them through detailed work plans and allocation of resources.
4. Create a position in the library for a citizen librarian. The holder of the position should be responsible for the day-to-day implementation of the citizen librarianship strategy and plans. The officer should have a combination of ICT and public relations skills. Libraries which are not able to hire officers dedicated to this function should redeploy existing staff accordingly to cover it. In either case, appropriate training should be offered to the new or redeployed officer to be able to handle the tasks of the new office.
5. Develop a citizen media policy stipulating the rights and obligations of the parent institution, librarians and user community. The policy should provide guidance on ethical considerations and implications of using citizen media to deliver information services in academic libraries. It should also guarantee the library users of their safety in digital citizen spaces within and outside the physical library.
6. Implement citizen librarianship strategy incrementally according to the approved work plans. This should be done

while also assessing the performance and/or suitability of the strategy. Academic libraries are encouraged to make any adjustments to both the strategy and work plans as they deem fit. However, they are cautioned to give ample space for implementation before making drastic changes.

## 5 Conclusion

Citizen librarianship is a new phenomenon in the academic library context. However, it is an essential development meant to buttress user-centric approaches to the design and deployment of information services in academic libraries. In Kenya, it is a recent entrant to the academic library arena. No wonder the majority of the librarians have never heard of it or its anchoring concept of citizen science. Those who have heard of the concept are able to explain it as the involvement of lay people in delivering paraprofessional services. In academic libraries, patrons are no longer considered as mere users but as partners in the conceptualisation and deployment of information services. Indeed, the respondents asserted that citizen librarianship is of great importance to the realisation of effective service delivery in academic libraries in Kenya. Therefore, citizen librarianship offers an important framework for users' involvement in meeting their own information needs and those of their peers through citizen media. The findings of this study may be used by academic librarians to adopt citizen librarianship in their institutions.

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# Media Repression in Kenya: Evaluating Government's Authoritarian Tendencies on Broadcasting in the Digital Era

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## Abstract

*Media freedom is necessary for a democratic society. Free media offer a platform for public discourse on issues important to the public. This chapter evaluates authoritarian tendencies of government on broadcasting in Kenya. On January 30, 2018, independent and private broadcast media in Kenya were shut down by the Communications Authority of Kenya because of broadcasting live the swearing in of Raila Odinga as the people's president. This chapter responds to the following questions: What is the implication of the shutting down of independent and private TV stations in Kenya? Was the government's action justifiable by any law? What was the role played by online alternative media during the shutdown? Mass Society theory views media as having negative influence over the citizenry from the point of view of government and therefore media should be controlled. Another school of thought, the libertarian supports a free environment for the media. John Milton wrote *Areopagitica* – a speech for the liberty of unlicensed printing – to the parliament of England, which was published in 1644. Milton opposed censorship or prior restraint of the press. The author used content analysis and interviews to collect data for this chapter. Data gathered informs that the government of Kenya has consistently created an environment of media control through legislation, threats, business sabotage and use of force. The State has created institutions, some contradictory to the Constitution of Kenya, like Communications Authority of Kenya, which is strategically created to suppress the media and broadcast in particular. The chapter recommends for Kenya best world practices in media regulation.*

**Keywords:** *Media Repression, Prior restraint, Alternative media, Media law and regulation.*

## 1 Introduction

Media freedom and regulation have dominated academic discourses worldwide for centuries drawing scholars from diverse fields such as communication and media, law and ethics, political science, anthropology and sociology. Media freedom is central for building strong democracies, promoting civic participation and the rule of law, and encouraging human development and security. The media should therefore not be unnecessarily restricted while performing their duties. "We must emphasise that free media, which are essential in upholding democratic societies, should not be hindered" (Schmidt, 2007:7).

Governments and media interact on several occasions. The relationship between government and media remains important because the media is crucial for building and maintaining power, through their role as watchdogs of the society. The media watch over, on behalf of society, the use of the limited resources by the state in service to all citizens. The government, on the other hand, addresses communication inequalities in terms of media ownership and other human rights issues in the public interest.

In such interaction between media and governments, democratic states may choose to pursue positive policies to enhance cultural diversity and political pluralism based on principles such as universality, equality of access, freedom of expression, freedom of the media, privacy and respect for human rights. Dictatorial regimes, on the contrary, pursue negative policies to prevent what they may consider negative outcomes that are associated with content they deem harmful to the regime or state power (Iosifidis, Steemers & Sussman, 2016).

Ferree in Davenport (2010) views repression as the use of physical sanctions against an individual or organisation in order to deter specific activities and/or beliefs perceived to be challenging to government personnel, practices or institutions. Gohdes (2014) informs that state repression is the violation of one or more of the basic human rights written into the International Covenant on Civil and Political Rights. Media repression occurs when governments implement policies and actions upon media to deter them from engaging in criticism of the state. In dictatorial regimes, news media are used to reinforce the power of the governing elite and to deter criticism of the government by independent journalists through official government censorship, state ownership of the main radio and television channels, legal restrictions on freedom of expression and publication and limited competition. (Noris, 2006).

On January 30, 2018, the government of Kenya shut down independent and private broadcast media for seven days because they aired live the swearing in of Raila Odinga as the people's president. The shutdown was one of the major gags the media in Kenya have experienced since independence in 1963. The Communications Authority of Kenya (CA) had earlier warned media against covering the event at Uhuru Park in Nairobi live. Raila Odinga had rejected election

results declaring Uhuru Kenyatta the president. Odinga announced he would be sworn in as the people's president. Uhuru Kenyatta was sworn in as President of the Republic of Kenya after a second election which the opposition boycotted. CA shut down media which broadcast the event live.

Four days prior to the meeting, the Editor's Guild protested that some media managers and selected editors met in State House with President Uhuru Kenyatta, his deputy and the Attorney General and other senior government officials where the president expressly threatened to shut down and revoke the licenses of any media house that would broadcast the planned swearing-in of Nasa leaders Raila Odinga and Kalonzo Musyoka live (Daily Nation, 2018). The shutdown was a major backward step in media freedom in Kenya. However, the same private media were streaming their live broadcasts online. Internet use in Kenya was at that time 88 per cent, according to the Communications Authority of Kenya. This means that the shutting down did not translate to total blockage of access to the information about the event. Citizens accessed information on the swearing in through YouTube and other social media platforms. There were also smaller information providers like community radio and TV stations that disseminated the information during the shutdown.

## **2 Research Problem**

The January 2018 TV shutdown by the government was a way of state repression on media. The Constitution of Kenya (2010) guarantees freedom of the media in Article 34. "The State shall not exercise control over or interfere with any person engaged in broadcasting, the production or circulation of any publication or the dissemination of information by any medium; or penalise any person for any opinion or view or the content of any broadcast, publication or dissemination".

The Constitution articulates circumstances which limit media freedom such as propaganda for war, incitement to violence, hate speech, advocacy to hatred that constitutes ethnic incitement, vilification of others, or incitement to cause harm; discrimination on any ground including race, sex, pregnancy, marital status, health status, ethnic or social origin, colour, age, disability, religion, conscience, belief, culture, dress, language or birth. This chapter interrogates the government's action in comparison to the ideals espoused by the particular social system in which it operates.

## **3 Research Objectives and Questions**

The general objective of the study anchoring this chapter was to evaluate Kenya government's dictatorial tendencies on broadcasting in the digital era. The specific objectives were to: establish the justification of government's shutdown of independent television stations in Kenya; determine the legal and industrial implications of the shutting down independent television stations in Kenya; and to find out the role played by social media in disseminating information during the shutdown. This chapter responded to the questions: Did the government act within the law when shutting down TV stations in Kenya? How can the government justify its action? What is the implication of the shutdown of independent and private TV stations in Kenya? What was the role played by online alternative media during the shutdown? Does the government action conform to the best world practices?

## **4 Theoretical framework**

A normative media theory explains how a media system should operate in order to conform to or realise a set of ideal social values. As such, its ontology argues that what is known is situational. In other words, what is real or knowable about a media system is real or knowable only for the specific social system in which that system exists. An investigation on media repression can be attained by studying the system in which this repression occurs. Its epistemology, how knowledge is developed and advanced, is based in comparative analysis—we can only judge and therefore understand the worth of a given media system in comparison to the ideal espoused by the particular social system in which it operates. (Baran & Davis 2011).

Esser & Strömbäck (2014) introduce Mediatisation theory which explains that an increasing degree society is submitted to, or becomes dependent on, the media and the media's logic. Mediatisation may also refer to "development towards increasing media influence".

Technological Determinism theory, on the other hand holds that technological development determines cultural and social change. It asserts that communication technology inventions cause cultural change (the way people conduct themselves in society). The theory is associated with Marshall McLuhan. Technology changes the way people think and how they interact with others. Most interpretations of technological determinism share two general ideas: that the development of technology itself follows a predictable, traceable path largely beyond cultural or political influence, and that technology in turn has "effects" on societies that are inherent, rather than socially conditioned or produced because that society organises itself to support and further develop a technology once it has been introduced. (Murphie, and Potts, 2003)

McLuhan argued that in the modern electronic era people worldwide had interconnectivity because they could all tune

into events as they unfolded in any part of the world. He dubbed this aspect of the electronic media ‘the global village.’ In this global village, all people have an ‘electronic interdependence. (Danesi, 2013)

## 5 Methodology

This study leading to this chapter used qualitative research method. Its design was content analysis and interviews. Content reviewed for this chapter consisted of four pieces of legislation which prescribe media regulation in Kenya and Kenya Information and Communication Technology (ICT) Policy. The pieces of legislation reviewed were the Media Council Act (2013), the Kenya Information and Communication (Amendment) Act (2013), Parliamentary Powers and Privileges Act (2014), and The Preservation of Public Security Act (Revised 2012). The purpose of analysing these secondary sources was to establish whether there was any legislative backing for the government action in shutting down the independent and private television stations. The review also yielded information about government’s tendencies in repression of media. This analysis also aimed at establishing the trends in creating an environment for freedom and/or restraint of freedom of media in Kenya since the promulgation of the Constitution of Kenya in 2010.

The researcher interviewed private and independent media owners or their representatives to address the question on the basis of shutting down TV stations by government for a week. The respondents were purposefully selected from the media houses affected. The media owners and representatives gave insights into the relationship between media and the government at the time of shutting down the TV stations. Further, government officials were interviewed to obtain the justification of their actions. The data obtained from both content analysis and interviews was classified and analysed based on themes that respond to the objectives of the chapter. The data obtained from content review was triangulated with the data obtained through interviews to respond to the three questions guiding this research.

## 6 Findings

In disregard of Article 34 of the Constitution of Kenya (2010), that parliament shall enact legislation that provides for the establishment of a body which among other issues will set media standards and regulate and monitor compliance with those standards, Kenyan Parliament passed two laws which form parallel regulatory bodies of the media – The Media Council of Kenya (MCK) and Communications Authority of Kenya (CAK). These regulatory bodies are established by two controversial pieces of legislation, The Media Council Act (2013) and The Kenya Information, and Communications (Amendment) Act (2013).

The constitution expressly articulates a “legislation that provides” – meaning singular. The enactment of two parallel pieces of legislation; the Media Council Act (2013) and the Kenya Information and Communications (Amendment) Act (2013), did not conform to the constitutional provisions for media regulation in Kenya. The intention of the constitution was a self-regulation typology in Kenya. From the two pieces of legislation were born two regulatory bodies; the Media Council of Kenya and the Communications Authority of Kenya. Both bodies claim legitimacy from the same section of the constitution.

The Media Council Act (2013) establishes the Media Council of Kenya whose main mandate is to promote and protect the freedom and independence of the media; prescribe standards for journalists, media practitioners and media enterprises and ensure the protection of the rights and privileges of journalists in the performance of their duties. The body is further mandated to promote and enhance ethical and professional standards among journalists and media enterprises; advise government or the relevant regulatory authority on matters relating to professional, education and the training of journalists and other media practitioners.

Another role of the Media Council of Kenya is to set standards, in consultation with the relevant training institutions, for professional, education and training of journalists; accrediting journalists practicing in Kenya; establish media standards and regulate and monitor compliance with the media standards; facilitate resolution of disputes between the government and the media and between the public and the media and inter-media. In exercising its powers, the Media Council and every person to whom the law applies is required to safeguard the provisions of Article 33(2) of the Constitution – shun propaganda for war, incitement to violence, hate speech and advocacy of hatred that constitutes ethnic incitement, vilification of others and incitement to cause harm.

The Media Council should ensure that the freedom and independence of the media is exercised in a manner that respects the rights and reputation of others. The Council is required to further ensure that the protection of national security, public order, public health and public morals is safeguarded.

The source of finances for the Media Council of Kenya is mainly parliamentary allocation in the national budget and monies from any other sources including donations. The allocation of finances by Parliament is not concomitant with the provisions of the Constitution of the establishment of a body independent of control by government. This is one of the ways in which the government of Kenya controls the media and disenfranchises them of self-regulation. One who pays the piper calls the tune.

The Act further establishes the Complaints Commission whose mandate is to mediate or adjudicate in disputes, ensure adherence to high standards, achieve speedy, impartial and effective settlements. The composition of the commission which is led by a person who has held a judicial office or has been an advocate of the High Court of Kenya for 10 years draws membership from a wide area mainly media. Punitive measures that could be taken against an offender include the commission recommending to the Media Council the suspension or removal from the register of the journalist involved; impose a fine of not more than KES500, 000 (USD5000) on any respondent media enterprise and a fine of not more than KES100, 000 (USD 1000) of any journalist adjudged to have violated the Act or the code of conduct. The punitive measures are high as to instill fear among journalists and media operators.

The Code of Conduct for the Practice of Journalism has been appended to the Media Council Act, making it law. This move by the State is against the best practices in the world. Codes of conduct are generated and modified depending on the needs arising in society. By making it law, the State was signalling to journalists that they shall be prosecuted for breaking the law. In essence, codes of conduct are not law but professional ethical guidelines.

The Kenya Information and Communications (Amendment) Act 2013 (KICA) establishes the Communications Authority of Kenya (CAK), a body that is expected to be independent and free of control by government, political or commercial interests in the exercise of its powers and in the performance of its functions. In fulfilling its mandate, the Authority is guided by the values and principles of public service in Article 232(1) of the Constitution. These are values and principles of the public service – therefore, CA is a civil service body, meaning government institution. Evidently, this body cannot claim to be independent and free of control by government.

The Act contradicts itself when it is established as a civil service body and at the same time as a body “independent and free of control by government, political or commercial interests in the exercise of its powers and in the performance of its functions”. The Act defines media as “broadcast electronic and other types of media but does not include print and book publishing”.

The KICA establishes a tribunal called Communications and Multimedia Appeals Tribunal. The chairperson of the tribunal, unlike that of the Complaints Commission established by the Media Council Act, must meet the qualifications of a judge of a superior court and two others who qualify to be appointed as judge of the high Court. The Complaints Commission is to be chaired by a person who has held a judicial office or has been an advocate of the High Court of Kenya for 10 years and it draws membership from a wide area, mainly media. The mandate of the commission is to receive and hear complaints from aggrieved parties in regard to media and journalists’ misconduct, anything done against a journalist or media enterprise that limits or interferes with the constitutional freedom of expression.

The law states: “Without prejudice to the functions of the Authority or the Media Council, the Authority or the Council may take up a complaint on its own initiative, and forward the same to the Tribunal for determination, where in its opinion the complaint has public interest implications”. In the Media Council Act, the Commission may refer a complaint to Multimedia Tribunal, where the Commission determines that the complaint relates to a matter which falls within the mandate of the tribunal. Section 14 of the Kenya Information and Communication (Amendment) Act 2013 gives the Communications Authority of Kenya powers to administer the broadcasting content; developing media standards and regulating and monitoring compliance with those standards. This section challenges the constitutional mandate for parliament to enact legislation that allows for the formation of a body which is perceived to be the Media Council of Kenya. Some of the penalties that can be imposed on offenders include a fine of not more than KES20 million (USD200, 000) on any media enterprise and a fine of not more than KES 500,000 (USD5, 000) on any journalist adjudged of violating the Act. The Tribunal may also recommend the suspension or removal from the register the journalist involved. Such harsh punitive measures are a symptomatic of dictatorial regimes.

The State, in formulating these competing laws and establishment of competing institutions – The Media Council Act and the Kenya Information and Communication (Amendment) Act (2013) as well as the Media Council of Kenya and the Communications Authority is an indication of how the state laid the foundation and systematic mechanism for media control. This violates the constitution and the international best practices of freedom and restriction of media. The establishment of the Media Council of Kenya and the Communications Authority of Kenya negates the international standards and self-regulation of media. The Camden Principles on Freedom of Expression and Equality (2009) prescribes for states to formulate public policy and regulatory framework that respect the fundamental principles that any regulation of the media should only be undertaken by bodies which are independent of the government, which are publicly accountable and which operate independently.

### **6.1 Parliamentary Powers and Privileges Act (2014) and the Preservation of Public Security Act (2012)**

The right of access to information under Article 35 and the freedom of media under Article 34 of the Constitution of Kenya 2010 is limited by the Parliamentary Powers and Privileges Act (2014). The purpose of this limitation is to “facilitate the immunities of the House (Parliament) and (its) committees”. The other purpose, according to the law, is

“for facilitating the freedom of speech and debate as set out in Article 117 of the Constitution” (Section 25). Article 117 of the Constitution provides for freedom of speech and debate in parliament, its powers, privileges and immunities for the purpose of orderly and effective discharge of business in parliament.

The Parliamentary Powers and Privileges Act (2014) prohibits transmission of information by electronic means (broadcast, televise or otherwise) of the proceedings of a House (Senate or National Assembly) or a committee of either house except by order or with permission of the Speaker or chairman of the committees “and in accordance with the Standing Orders and the conditions and directions determined by the Speaker”. Any offender will be liable to civil or criminal proceedings. The penalty on conviction is a fine not exceeding KES500, 000 (USD 5000 or to a term of imprisonment not exceeding two years or to both. The law restricts journalists from freely reporting parliament proceedings. The exorbitant fines are meant to instill fear among journalists and media operators. The law therefore is an impediment of freedom of media.

The Preservation of Public Security Act (Revised 2012) empowers the president to declare a state of the preservation of public security by notice published in the *Gazette* (the official government gazette). Situations of preservation of public security may arise in the defense of the territory and people of Kenya; the security and fundamental rights and freedoms of the individual; the security and safety of persons and property; the prevention and suppression of rebellion, mutiny, violence, intimidation, disorder and crime, and unlawful attempts and conspiracies to overthrow the government or the Constitution; the maintenance of administrative justice; the provision of a sufficiency of the supply and services essential to the life and well-being of the community, their equitable distribution and availability of fair prices; and the provision of administrative and remedial measures during periods of actual or apprehensible national danger or calamity, or in consequence of any disaster or destruction arising from natural causes.

Regulations for the preservation of public security may make provision for imposition of restriction of movement provided that no person shall be restricted on account of his political beliefs or activities. The law provides for the censorship, control or the prohibition of the communication of any information, including any publication or document and the prevention of the dissemination of false reports.

Data obtained from interviews show that there were two strands of views on the shutting down of independent and private television stations in Kenya for a week. Respondents gave varied opinions on the shutdown. Those from media and supporters of the Opposition reported that there was no justification of government action while those in government and supporters of the ruling Jubilee Party supported the government’s action on the TV stations.

Those who supported the shutdown explained that the action was necessary because the meeting was subversive and aimed at causing war in the country. Respondents who opposed the shutdown on the other hand explained that the government should have stopped the meeting from taking place if it was illegal instead of shutting down television stations. “The role of media is to inform the citizens about what is happening around them and if they failed to do so, the media would lose credibility. Live broadcasts were not manipulated and the media were doing what is right for them to do,” a respondent said.

The majority of the respondents viewed the government action as one way of media repression. A respondent said: “The government’s action was a signal to media that if they don’t comply, they would face the consequences. The government was out to intimidate the media and of course it succeeded in doing so”. Another equally repressive action by government on media was a withdrawal of advertisements in 2017. Respondents cited the withdrawal of advertisements on private media by government as a way of telling the media that the government was in charge and that their editorial content should portray it positively. Such dictatorial tendencies by government of Kenya have negated the international standard practices as enshrined in the Universal Declaration of Human Rights (1948), The Camden Principles on Freedom of Expression and Equality (2008), United Nations Educational, Scientific and Cultural Organisation (UNESCO) Article II requires media to exercise accuracy of facts and to appraise events objectively.

Respondents reported that the action and victimisation of some media houses which prompted one to seek court intervention divided Media Owners Association, which was considered a score by the government over media owners. Even after the opening of some of the TV stations, Citizen TV remained shut because of the court petition. The other victims of shut-down – NTV and KTN – were forced to abide by “other conditions” given by government. A respondent said: “Those who did not go to court held persistent talks with State House for reinstatement and terms and conditions were given, which they abided by”.

The shutdown of TV stations barred citizens from accessing reliable and credible information about the event at Uhuru Park. Respondents said they relied on any information the accessed either online or unreliable and untrustworthy media.

Respondents from the media and consumers of media products said the government violated the Constitution and other laws which govern media operations in the country. “The government violated the Constitution and other laws in its action to shut down TV stations. There was no threat to security at all as witnessed in the peaceful meeting at Uhuru Park”, a respondent said. On the other hand, respondents in government said that the government intended to stop any negative reaction from citizens if the swearing in was broadcast live.

## 6.2 Streaming Online

The Internet became the alternative source of information during the shutdown of TV stations. The Internet has given the world easy distribution and access of information. However, there were concerns among respondents that TV, radio and newspapers are more trusted than individual messages sent online. Newspapers are different from the rest because their messages are delayed. As a respondent said, “Information received on TV is a confirmation and an actualisation of what is received through social media”.

Although the TV stations were shut down, some of the citizens could access live broadcast online. However, the respondents said that due to the elitist nature of access to the Internet, the flow of information was hindered by the complexity of the information access. Some of the complexities are network outreach of service providers which is not yet countrywide. Some areas are not covered to access the Internet while others are serviced but with weak signal.

In some areas, there is lack of electricity supply. People in such places sparingly use their mobile gadgets in order to preserve battery charge for longer use. Television is more useful because one battery can serve masses to view such a popular event like swearing in of Raila Odinga as the people’s president.

Access in terms of bundles and airtime was a major limitation of viewing live broadcast online. Television is advantageous because such expenses are not required to view for long hours. This factor was cited by the respondents as one of the major impediments to access to live broadcast online.

## 6.3 Losses incurred

Media houses affected by the shutdown incurred losses in their business. Without anticipating the shutdown, media organisations and TV stations in this regard, had taken advertisements from their clients. The advertisements did not run. Even when the media explained to their customers about the streaming the advertisements online, they insisted their contracts were for TV broadcast. Some advertisers incurred massive losses due to the shutdown.

Technically, the flow of information and especially motion pictures are slow to transmit and access over the Internet. This fact impeded access of advertisement by some of the target clientele. Online platforms presented challenges of access by poorly connected or less serviced areas. Furthermore, not all target audiences for advertisements have presence online. Sometimes online services are down.

The police camped outside media houses in wait to arrest journalists and editors who attempted to broadcast the Uhuru Park meeting live. By so doing the government cascaded down its threats and actual damage to the media to individual workers in the media industry. “This was one of the highest episodes of media repression in the country,” said a respondent.

## 7 Conclusions and Recommendations

This chapter analysed the government’s authoritarian tendencies on broadcasting in Kenya and the repression of media in the digital age. The findings show that the Constitution of Kenya (2010) provides for freedom of the media (Article 34). This media freedom is not absolute and the constitution spells out the limitations while giving parliament the power to enact legislation that will form a body that will set standards for media and monitor compliance to the standards.

Parliament, contrary to the constitutional provisions, enacted two pieces of legislation – The Media Council Act (2013) and The Kenya Information and Communications (Amendment) Act (2013). The supposedly independent bodies are the Media Council of Kenya (MCK) and the Communications Authority of Kenya (CAK). The MCK is funded by government while CA is established as a civil service organisation, therefore government. The two main pieces of legislation were meant to operationalise Article 34 of the constitution for self-regulation of the media. However, being government controlled, government interference is manifested in the two pieces of legislation.

The international treaties and declarations guarantee freedom of media and specify areas where restraint needs to be observed by both media and regulators. However, this does not in any way qualify the shutting down of TV stations or restraining publishing or broadcast. John Milton argues that prior restraint makes the universe uninformed and therefore illiterate.

The Clamping down of TV stations by the government of Kenya was illegal and unnecessary. The action was illegal because it was against the constitution and other laws governing media in Kenya. The legality also extends to the establishment of the body concerned – CAK. CAK cannot claim to be independent while it is established as a civil service organisation. CAK is not the intended body in Article 34 of the Constitution of Kenya 2010. The body is meant to license only broadcast and regulate telecommunication not self-regulate the media.

Data collected from this study shows that the government has systematically and successfully created an environment of media control. The shutting down of TV stations was one way of showing the media that the government was in

charge. The action came after the government stopping advertisement to private media therefore denying them revenue of about 30 per cent of their collections.

In regard to the use of social media, this chapter finds streaming news online as a powerful alternative to TV and other traditional news media. The findings are concomitant with the theory of technological determinism. Technology organises us, according to McLuhan (2005). However, issues of global divide like access and infrastructure are impeding the effectiveness of communication through social media. Its elitist nature also shows that some people may not access information because of lack of airtime and/or internet bundles.

The following are recommendations drawn from the findings of this study:

1. The government should follow the law when dealing with the media. The Constitution of Kenya 2010 and international statutes provide for freedom of the media and circumstances under which they can be restrained. Violation of the law by the state to achieve short term selfish interests only portrays a repressive regime.
2. Prior restraint of media has been a subject of debate since the time of John Milton (1644) and world practices of media freedom have clearly spelt out circumstances and nature of restraint. The government is expected to adhere to the world best practices of media policy and regulation.
3. Online streaming of information is critical in this digital age. The government has a duty to ensure that there is network coverage in all parts of the country for easy access to data and voice online. Service providers should, on their part, cover areas that do not have regular and reliable services.
4. As dictatorial political regimes enact laws that aim at controlling online communication, such laws should be guided by the public interest.

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# Management of Social Media Records at the Bulawayo City Council, Zimbabwe

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## Abstract

*The study on which this chapter is based investigated how content generated on social media was being managed at the Bulawayo City Council, a local government authority in Zimbabwe. The study applied a qualitative research methodology using a case study research design. The population of the study was derived from the Bulawayo City Council. The sample consisted of records officers, public relations staff, and Information Technology (IT) practitioners. A total of 15 questionnaires were distributed to the respondents and two interviews were conducted. The study also analysed content from the social media sites as well as the official website of the Bulawayo City Council. The study found that the Bulawayo City Council does not have a social media policy to govern the use of social media. Similarly, there was lack of collaboration amongst the Information Technology (IT), Public Relations (PR) departments and the records managers in the management of social media content. Furthermore, the local authority did not apply any records management practices in managing the social media content. This weakened its ability to manage social media content as records. However, there were some efforts made to preserve social media content. Considering the levels of usage of social media platforms by the Bulawayo City Council to reach out to citizens and its stakeholders at large, the local authority can develop a greater capacity for open government encouraging wider participation by citizens by developing procedures for the capture and preservation of social media content to contribute to the corporate memory of the organisation.*

**Keywords:** *Social media, Local government, Records management, Bulawayo City Council.*

## 1 Introduction

Social media refers to the various activities integrating web technology, social interaction and user-generated content. Social media includes blogs, wikis, microblogs (Twitter), social networks (Facebook), photo libraries (Flickr, Instagram), location-based services (Foursquare), and video sharing sites (YouTube, Vimeo) amongst others (Kentucky Government, 2015). The social media platforms are generated using Web 2.0 technology which facilitates conversation, communication and user-generated content (Evans, Franks & Chen, 2018). Individuals are able to collaborate, create, organise, edit, comment on, and share content through social media, resulting in the creation of public records (Kentucky Government, 2015). Social media platforms are browser-based, cloud-located, mobile-compatible and largely proprietary systems that allow users to contribute content in a setting where they may have limited control over data or access; as such, these platforms create new records and information management challenges (Evans *et al.*, 2018).

Archival and records management literature recognise the fact that blogs, social networking applications, wikis, and micro-blogs should be managed pursuant to records management standards and best practices (Bailey, 2008; Bailey, 2009; Barnes & Barnes, 2009; Cunningham & Wilkins, 2009; Dearstyne, 2007; Stuart & Bromage, 2010 as cited in Doran, 2015). The professional literature has also addressed the need to update records management policies in order to manage the unique and dynamic content those social media platforms provide (Doran, 2015). However, there are challenges associated with managing social media records as articulated by Doran (2015). The challenges include the lack of policies addressing social media records, uncertainty about what constitutes a record in a social media environment; difficulty capturing social media records for management in electronic recordkeeping applications; and difficulty controlling information within third party applications or cloud computing environments. NARA Bulletin (2014) also stated that social media records management is slightly different from the conventional records management, especially because of the dynamic and collaborative nature of the content being managed. It also poses some unique challenges such as keeping records of content in a multichannel and multi-location collaborative environment, managing ownership issues as record lies with social media sites, determining the type of records retention schedules, how to apply legal holds, and how to secure and preserve them (NARA Bulletin, 2014). Records on these sites are frequently updated and need an effective capture mechanism to ensure their authenticity and availability (NARA Bulletin, 2014).

There are a few guarantees of longevity in social media systems and when one's data is gone from these applications, it is gone (NSW Government, 2012). Di Bianca (2014) adds that a slightly different problem with social media, which is often neglected, is the possible occurrence of an online service provider that gets shut down and is in bankruptcy. What would happen to the organisation's information if Facebook, for example, went bankrupt? Therefore, where it is relevant, active plans have to be made to export data from these external platforms and bring the same into corporate systems (NSW Government, 2012).

The arguments which have been raised above from various scholars echo the records management challenges associated with the difficulty of managing social media content. This chapter explores how Bulawayo City Council can manage its social media content through proper records management practices. Latham (2015) suggests that agencies should develop a social media strategy and framework of policy and procedures to ensure business information generated through social media is consistently identified, captured, maintained, and accessible over time through proper records management practices in order to cater for the records management risks associated with the use of social media. Iron Mountain (2012) adds that by giving one's social media records equal importance and employing a comprehensive approach to securing and managing all the organisational records, one can gain efficiencies, protect reputation and improve the ability to respond to both legal and compliance concerns. Lack of an overarching strategy for an agency's use of social media can lead to information loss, duplication of process, and increased risk exposure (Iron Mountain, 2012).

## 2 Statement of the Problem

A rapidly growing number of local authorities are turning to the use of social media to communicate with stakeholders. A study conducted by Iron Mountain (2012) suggests that 76% of businesses regard communications by social media as formal business records. Social media platforms present local authorities with a real opportunity to connect more closely with customers, prospects and partners to whom they can broadcast information, encourage participation, self-promoter, collect feedback and facilitate decision making (Iron mountain, 2012). Bulawayo City Council is currently embracing social media platforms like Facebook, Twitter, Instagram and YouTube to communicate and engage with the public. At the local authority, there seems to be limited appreciation of records management practices in the management of social media content. The continuous use of these platforms without understanding the records management issues has implications on security, privacy, compliance, preservation, determining retention and disposal, facilitating transfer or capture (Duranti, 2010; NARA Bulletin, 2014; Franks, 2010 and Kentucky Government, 2015). Most importantly, there are implications associated with accuracy, reliability and authenticity of those records. An organization faces the risk of legal and liability issues that may arise due to the complexity of interacting with the contracting party, service provider and data centre where storage occurs all reside in separate jurisdictions as well as a slew of records management challenges. Therefore, this chapter explores how Bulawayo City Council's social media content could be managed through proper records management practices in order for it to remain authentic, reliable, and usable.

## 3 Research Objectives and Scope

The objectives of the study on which this chapter is based were to:

1. Establish the level of social media usage by Bulawayo City Council;
2. Find out if Bulawayo City Council had a social media policy;
3. Determine if there was any collaboration between the records office and other stakeholders in the management of social media content;
4. Analyse the measures used to preserve social media records;
5. Identify the challenges Bulawayo City Council faces in managing social media records;
6. Determine the strategies used to integrate social media content with records management practices.

The study was conducted at Bulawayo City Council in the Town Clerk and Chamber Secretary departments where the offices responsible for the generation of social media are situated. The targeted population included the public relations officers, the records officers as well as the IT staff.

## 4 Research Methodology

The study adopted a qualitative research methodology in order to get an insightful analysis of how Bulawayo City Council makes use of social media platforms. A case study research design was chosen in order to get a holistic and in-depth understanding of issues outlined in the objectives of the study. Purposive sampling was used to identify a total of 17 respondents who were involved in social media content management. Questionnaires were used to gather data from 15 respondents. Interviews were used to collect data from 2 respondents from the PR office, as they are involved in generating and responding to the content on social media. Thus, they were in the best position to answer questions on how social media communication is happening and describe the challenges faced. The study also analysed content in the social media sites as well as the official website of the Bulawayo City Council. Creswell (2009) describes data analysis and interpretation as the procedures followed in the presentation, analysis and interpretation of research finding of a particular study. Data gathered from interviews, questionnaires and content analysis was presented, interpreted and discussed according to the research objectives and the research questions. The presentation of results is done concurrently with the discussion of findings.

## 5 Research Findings

Questionnaires were distributed to the IT department and the records management staff. A total of fifteen (15) questionnaires were distributed. Of the 15 questionnaires, ten (10) questionnaires were distributed to the IT department while five (5) were issued to the records staff. Of the ten (10) distributed to the IT department, only seven (7) were returned and the other three (3) were not returned. All the five (5) distributed to the records staff were returned. The findings of the questionnaires from the different sections were grouped together so that the responses of the respondents could complement each other. Out of the 15 dispatched questionnaires, a total of 12 (80%), were returned. The senior Public Relations officer and the Assistant Public relations officer were interviewed.

### 5.1 Level of social media usage by BCC

The study sought to find out the level of social media usage by Bulawayo City Council. Of the 12 questionnaires returned, all (100%) of the respondents agreed that Bulawayo City Council is utilising social media to communicate with the public. The respondents were aware of almost all the social media platforms that the local authority was utilising. These included Facebook, Twitter, Instagram, YouTube and LinkedIn. According to Ndlovu (2018), Bulawayo City Council was the first local authority in Zimbabwe to facilitate live streaming of council meetings in February 2018.

### 5.2 Recognising social media content as official records

In addition to determining the levels of social media usage, the respondents were also asked whether Bulawayo City Council regards the content generated on social media as official records. All the respondents agreed that they regarded social media content as records. One of the interview respondents stated as below:

*“Information posted on social media is extracted from the physical files or records thereby making them a continuation of the record”.*

Social media content meets the definition of a record. According to the National Archives of Zimbabwe Act (1986), a record is not content-specific; a record may be in any format. All records, including those generated through the use of social media, must be managed in accordance with proper records management principles. Table 1 illustrates the statistics of Bulawayo City Council’s social media use obtained through content analysis.

Table 1: Statistics of Bulawayo City Council’s social media interactions

Statistics of BCC Social Media Usage (as at 28-05-2018)				
Platform	Launch Date	Number of followers liking a social media post	Number followers commenting to a post	Number of followers asking for information
Facebook	May 2013	25 to 700	10 to 100	05 to 65
Twitter	April 2014	10 to 300	10 to 50	20 to 30
Instagram	August 2015	10 to 150	10 to 40	0

According to the statistics given in Table 1, about 300 users are following the posts made by Bulawayo City Council in its social media pages. This shows that a number of individuals are following Bulawayo City Council’s social media pages probably to keep up with any developments within the organisation. The statistics also show that the audience is interacting with Bulawayo City Council through commenting and posting queries hence it is not one way communication. These online interactions lead to new information being added in the form of comments and these are new records being created.

The questionnaire responses revealed that the type of information communicated is strictly business and included public notices, updates on projects, service delivery queries and tenders, amongst others. The interview responses further highlighted that the information communicated in these platforms contributes and aids in enhancing service delivery as ideas of individuals are harnessed, contributions are made and information is easily disseminated to respective stakeholders. In similar studies, Doran (2015) and Mosweu (2016) also made use of social media statistics and images from social sites to demonstrate the use and importance of social media use by federal agencies and the Botswana government.

### 5.3 Social media policy

One of the major aims of the study was to find out if Bulawayo City Council has a social media policy. The majority of the respondents, 8(67%), stated that there was no social media policy whilst the other 4(33%) stated that they were not sure of the existence of a policy. The majority of the respondents also stated that social media administration was the responsibility of the PR department.

The non-existence of a social media policy may imply that Bulawayo City Council does not have a formalised approach to the management of social media content. As such, it is likely to face records management challenges. In a similar study, Doran (2015) noted that policies and procedures must be updated frequently to match the technologies being utilised by the organisation.

A social media policy states the roles and responsibilities, the routine of capture, security, privacy and copyright issues that need to be considered in the use of social media (National Archives of Australia, 2014). Furthermore, the respondents interviewed stated that social media administration lies directly with the PR Department as it is the communication channel for the Bulawayo City Council and that the PR office staff are the users of the information gathered from the social media platforms.

#### 5.4 Measures used to preserve social media content

The study also sought to find out the measures in place for preserving social media content. Of the seven (7) questionnaires obtained from the IT department, five (5) of the respondents stated that there was preservation of social media content while two (2) of the respondents stated that there was no preservation of social media records.

The majority of the respondents pointed out that there is preservation of social media content although indirectly. The responses revealed that the Bulawayo City Council information posted online is filtered using various software to safeguard it against unauthorised manipulations. Therefore, since social media is also online information, these measures are also applicable in social media. The interviews further revealed that preservation is done through sending some of the information to online archives utilising archiving options embedded in Google known as 'self-archiving' services. However, such preservation and security measures did not involve any input from the records managers. Thus as much as the organisation is utilising self-archiving services offered by platforms such as Google, Twitter and Facebook, there is no guarantee on how long the information will be kept. As such, records managers are expected to interpret the policies and provisions of these web applications. In the case where preservation is by capture to an offline database, records managers are expected to continuously upgrade the file formats for them to be readable over time. In a similar study, Mosweu (2016) suggested that unlike in the traditional way of managing records, governance of liquid communications may require the development of distinct infrastructure and appropriate legislative framework to regulate its sustainable use and preservation.

#### 5.5 Collaboration amongst stakeholders involved in the management of social media content

All the departments (IT, PR department and the records office) were asked if they collaborated in managing social media content. This question was also asked during the interviews. The results are in Table 2.

Table 2: Collaboration between stakeholders in social media (N=12)

Collaboration between departments	Yes	% Response	No	% Response
IT & PR	5	71%	2	29%
IT & RM	0	0	7	100%
RM & PR	0	0	5	100%
RM& IT	0	0	5	100%

The majority of the respondents stated that collaborations were only happening between the PR and the IT departments. This meant that there were no collaborations with the records department. However, these two departments PR and IT were only interested in the primary values of information whereas records management was concerned with both the primary and secondary values. As such, records managers must present the principles of records management that must be applied to the management of social media content from the creation stage up until ultimate disposal of records. One of the respondents during the interviews stated as follows:

*"The only collaboration that exists between the records management staff and PR is that when content is created by the PR department, before it is posted on social media, such information goes to the records office for filing, then the PR proceeds to post content online. This ensures the creation of a backup copy of the information that goes online".*

However, Franks (2010) suggests that after posting, the record is edited through comments, twits back, and tagging amongst others. As such, new information is added. This means that content that resides on social media record is never static.

Under the same objective of collaboration amongst various stakeholders in the management of social media content, the study sought to find out the role of records managers in the management of social media content. The question was posed to all the five (5) records management staff and they all pointed out that records managers were not part of the management of social media content. One of the respondents explained why records managers were not involved in the management of social media content thus:

*"There is no electronic records management in our department. PR department is tasked with taking care of social media content as it is responsible for communications in the department and is the one generating the content on social media".*

On the other hand, one of the interview respondents stated that:

*"BCC is not aware of how records managers should be involved since social media is a technical thing".*

Rastogi (2014) argues that social media records management need not be a task of the PR staff as they might not be familiar with the management of social media content in accordance to proper records management procedures, as they are not trained in the field. For example, the PR office might be concerned about the short-term values of information like responses of the stakeholders and the dissemination of information yet records managers are concerned more about the longevity of the information in its original format.

### 5.6 Challenges faced in managing social media content

The study sought to find out if Bulawayo City Council had faced any challenges in the management of social media content. From responses obtained, it seemed there were no major challenges faced at the time of conducting the study. However, through content analysis, the researchers observed the presence of false posts on social media which translates to the challenge of authenticating social media communications. This is illustrated by Figure 1.

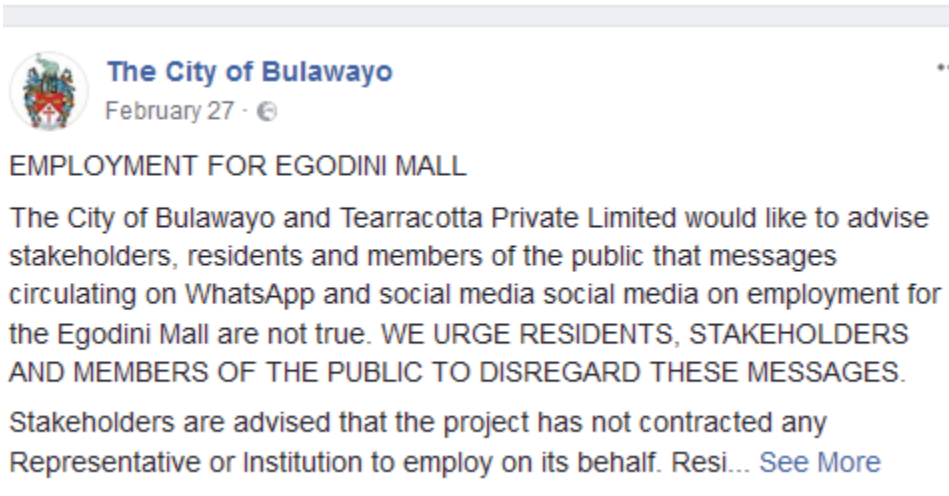


Figure1: A screenshot highlighting one of the challenges associated with social media usage by Bulawayo City Council

The screenshot shows one of the challenges of social media use which is the issue of false posts leading to difficulty in authenticating the social media pages. This may lead to security concerns. Mosweu (2016) suggests that the major challenge of liquid communication is authenticating information. If the organisation cannot authenticate its social media pages or information, the audience may lose trust and end up not following the social media pages. However, the respondents seemed ignorant of the major records management implications to managing social media content. Some of these issues include security, privacy, compliance, determining retention and disposal, facilitating transfer or capture and, most importantly, the accuracy, reliability and authenticity of those records.

### 5.7 Strategies to integrate social media with records management practices

The main objective of the study was to determine if social media management could be integrated with records management practices. Therefore, records managers were asked if the management of social media content could be embedded into records management activities and 80% stated that it was possible while 20% disagreed.

The majority of the respondents agreed that the social media management, including capturing of social media content, embedding metadata during generation and after capture, drafting of retention and disposal schedules, appraisal, authenticating and embedding security measures for social media content amongst others could be done through the records office. The records managers who agreed to the integration also suggested that it would be much easier if there was an electronic records management system being utilised in their department. The interview further confirmed that the PR department was willing to integrate records management in social media management, only if they were educated first.

## 6 Conclusion

The study found out that information on social media contributes to enhancing service delivery at Bulawayo City Council. The study therefore concluded that Bulawayo City Council is fully utilising social media to reach out to its stakeholders. Thus, the local authority valued social media content as records. However, it lacks a social media policy and does not apply any records management practices in the management of social media content. The role of the records office in managing social media content is very limited.

## 7 Recommendations

The study recommends that policies and strategies should be designed specifically to clarify long-term preservation of information and recordkeeping roles and responsibilities to ensure social media content are identified, managed and captured. Some strategies that can be used by the Bulawayo City Council to capture and archive social media content include the use of web crawling or other software to create local versions of sites; web capture tools to capture social media content and migrate to other formats and use of platform specific Application Programming Interfaces (APIs) to pull content. The local authority should promote strong collaborations between all stakeholders in social media. A good practice for government agencies is to establish an internal social media working group with records management staff, web managers, communications staff, social media managers, information technology staff, privacy and information security staff, and other relevant stakeholders (Kentucky, 2015). Considering the levels of use of social media platforms by the Bulawayo City Council to reach out to citizens and its stakeholders at large, the local authority can develop a greater capacity for open government encouraging wider participation by citizens including developing procedures for the capture and preservation of social media content to contribute to the corporate memory of the organisation.

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SECTION 3:

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BIG DATA

SYSTEMS

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# A Technology, Organisation, Environment (TOE) Based Framework for Big Data Analytics (BDA) Adoption in Healthcare in African Countries

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## Abstract

*One of the key responsibilities of a government is to provide quality, efficient and affordable healthcare services to its citizens. Evidence-based research and practice shows that the adoption of big data analytics (BDA) systems that extract useful insights from available medical data can improve healthcare services. The number of BDA systems available in healthcare has been increasing over the past few years but the level of their adoption by African countries remains low. According to the World Health Organisation (WHO), only 6 out of 54 countries in Africa have made efforts to adopt BDA systems in their healthcare services. As a result of this low rate of diffusion, BDA adoption models and automated assessment tools that fit the African context are lacking. Additionally, literature on BDA systems adoption in healthcare in Africa is scarce because researchers have predominantly focused on the technical aspects of system development. Therefore, this chapter proposes a BDA system adoption framework for improving healthcare services in African countries. The proposed model was developed by examining the factors that influence the adoption of BDA in public healthcare services by evaluating their relevance vis-a-vis the requirements of a BDA system using the Technology, Organisation, Environment (TOE) adoption theory in order to conceptualise an adoption framework that suits African countries. Political and regulatory context was added to the framework to complement the three initial contexts that constitute the TOE theory as a means of emphasising the role of the government in healthcare service delivery. This chapter is part of a broader research thesis on Burundi's public hospitals. The adoption framework was used to develop an automated adoption tool called "The Adoption Readiness Assessment Tool (ARAT)".*

**Keywords:** *Big data analytics, Healthcare, TOE (Technology, Organisation, Environment).*

## 1 Introduction

The World Health Organization (WHO) acknowledges the fact that Africa is confronting the world's most dramatic public health crisis. In its 2018 global annual report, WHO published statistics showing that Africa has the highest rates in maternal mortality, under-five mortality, HIV infection and malaria infection. WHO statistics also showed that Africa has the lowest rate of coverage of healthcare services on the globe.

Research and practice has shown that the adoption of Big Data Analytics (BDA) systems that comprise of a centralised Electronic Health Records (EHR) database and a real-time data analysis system that extracts useful insights from the medical data can significantly address the challenges faced by many healthcare services in Africa. These systems can provide decision makers with insights that would enable them increase access to efficient healthcare services, medicines, vaccines as well as reliable and affordable laboratory and diagnosis services.

Firms have been investing more in analytics to gain knowledge that they can use to improve planning, business processes and operations (Sheppard and Marden, 2016). McAfee and Brynjolfsson (2012), define big data as high volume, velocity and variety information assets that demand cost-effective, innovative forms of information processing for improved insight and decision making. BDA consists of analysing big data with the aim of providing a path to extract new knowledge or create value which has the potential to change markets, organisations, and government due to the large-scale nature of today's information (Mayer-Schonberger and Cukier, 2013).

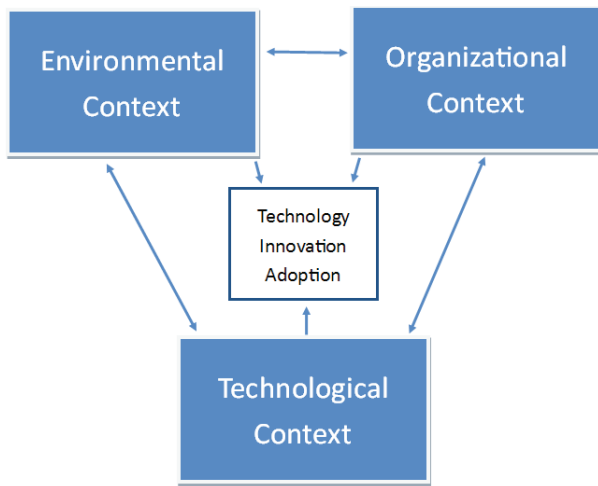
The insights gained using BDA systems can be used to reduce avoidable overuse of resources and fraud by analysing large historical datasets to detect anomalies and patterns. (McDonald, 2017). Additionally, the BDA system can be used to identify weak links in the quality chain by analysing patients' collection rates (i.e., the amount of money paid by patients after the facility provides an invoice), managing patients' movements in different departments, and monitoring how resources are used and their supply chain (Bresnick, 2017).

Burinskiene and Pipiriene (2013) underscore the need to assess the ability of an organisation or a government to adopt a new information system (IS) to determine if they can respond to challenges adequately. Unfortunately, previous studies by Nam, D. W., Kang, D. and Kim, S. H. (2015) and Mars and Seebregts (2008) were focused mostly on the firm/organisation and on technological aspects. Consequently, BDA adoption models and automated assessment tools that address the African context are lacking partly due to the researchers' predominant focus on the technical aspects and

system development (Nayem, 2016). It is important that African governments find appropriate adoption models to implement BDA systems successfully in public healthcare services.

**2 Theoretical Framework**

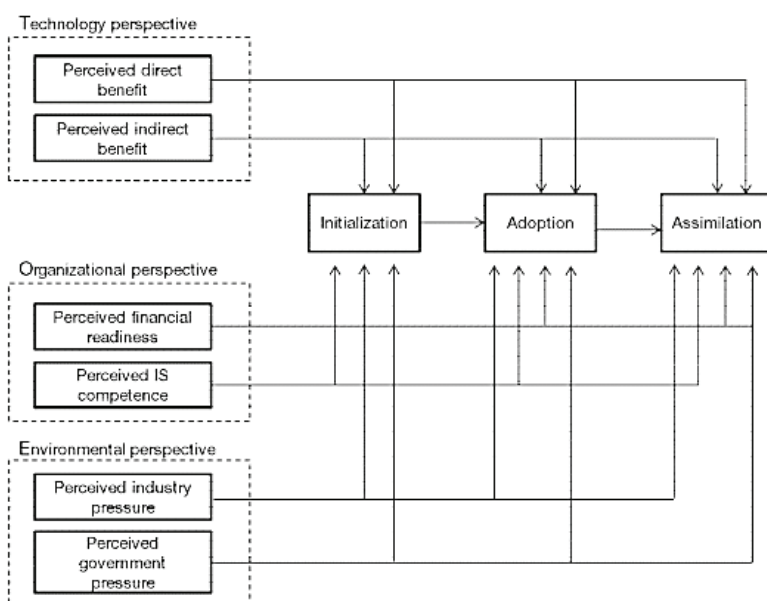
The Technology, Organisation, Environment (TOE) adoption theory has been used in multiple information systems adoption studies like Enterprise Resource Planning (ERP), e-commerce and patients’ tracking with Radio Frequency Identification (RFID) (Mckinnie, 2016). It provides a proven framework to study information systems adoption across a variety of innovations. The TOE theory identifies three main contexts that influence the process of adoption and implementation of a technological innovation in an organisation: Technological context, Organisational context, and Environmental context as shown in Figure 1 (Oliveira, T. and Martins. 2011). The technological context describes the internal and external technologies relevant to the firm. The Organisational context describes attributes about the organisation such as scope, size, and the managerial structure. The environmental context is the arena in which the organisation conducts its business, its industry, competitors.



**Figure 1: Technology, Organisation, Environment (TOE) adoption theory**

Source: Oliveira et al. (2011)

A study done by Nam, D. W., Kang, D., and Kim, S. H. (2015) proposed an adoption process of BDA using the TOE adoption theory. As shown in the Figure 2, the authors added a pre-adoption and a post-adoption stage to deal with the awareness and the evaluation phases. This helps in demonstrating the relevance of the TOE adoption theory to BDA adoption studies.



**Figure 2: Adoption process for BDA**

Source: Dal-Woo et al. (2015)

### 3 Adoption Requirements for BDA in Healthcare

The factors that influence the adoption of a technology innovation vary depending on the technology itself and the context in which it is being considered. In order to establish the factors to be included in the proposed adoption framework, an understanding of the requirements of a BDA system in healthcare services is necessary.

#### 3.1 Technological requirements

One of the first questions that need to be answered before adopting a BDA system is how to select the appropriate hardware for the system. The ideal selection of hardware must provide a balance between performance and affordability. Equally important is a consideration of existing hardware and software applications already in use in the organisation. Since this chapter implies adoption on a national scale, and not just in one organisation, the main technical aspects to consider are hereunder as suggested by Nayem (2016), Mars and Seebregts (2008) and Shariq *et al.* (2007):

- The national network infrastructure for the interconnection of the ministry and each healthcare facility.
- The storage infrastructure for the collection of the data in the health facilities and in the ministry for the centralised data storage; and
- The processing infrastructure which supports data classification and analysis in order to provide useful insights gained from the data collected from the healthcare facilities.

A BDA system collects data from existing systems. This means that the healthcare facilities must have software applications that support collection of information from patients and stores them as health records. Additionally, the facilities must be connected to the ministry via a reliable connection for it to collect information in real-time, store it in a centralised database and analyse it with the aim of providing useful insights.

#### 3.2 Organisational requirements

The success of a technology innovation adoption in any organisation does not rely only on the technical aspects of the innovation but also on critical organisational aspects. The following are the organisational requirements to take into consideration in order to successfully implement a BDA system in healthcare as suggested by Dutta, Thierry and Bruno L. (2015):

- The stakeholders: all the stakeholders should be identified. In this case, all the health workers in the facilities and the ministry of health are to be considered. This identification includes categorisation by role in order to define the level of access to the data for each stakeholder.
- The organisation's culture: the organisation must be willing to accept a cultural shift which expects data-driven and fact-based decisions. The leadership needs to prioritise optimisation the organisation's performance through quantitative measurements.

According to Sanders, D., Burton, D., and Protti, D (2013), any organisation that wants to adopt a BDA system must fulfil the following requirements:

- The organisation must use data-driven methods that are linked to its strategic priority.
- The leadership of the organisation must give its full support to the initiative and provide all the necessary resources.
- The organisation must guarantee the production and distribution of reports internally and externally.
- The administration of the organisation must partner with the ICT department to define the data needed and grant access to data in an efficient and effective manner.
- The organisation has to set data governance standards.
- The organisation must capture data in a timely manner.
- The organisation should employ skilled and experienced staff.
- The organisation should embrace innovative initiatives promoted by its leadership.
- The organisation should share information with patients.

#### 3.3 Environmental requirements

The environmental requirements reflect the external environment of the organisation. Healthcare facilities in this study refers to all healthcare institutions and organisations (McKinnie, 2016). Big Data Analytics systems require a strong collaboration between these entities and the proper way to achieve this is for them to build trust and improve their way of sharing information. Another environmental requirement discussed by McKinnie (2016) is the willingness to adapt to the pressure from competitors. In order to ensure that the adoption of a BDA system on a national level is successful in the public healthcare sector, the facilities must work on similar standards and technologies to facilitate interoperability

and sharing of information. In African countries one of the main reasons for slow or even blocked adoption of BDA systems is that they usually require external financial and technical support (Kalyan, 2015). Consequently, external support is almost unavoidable for the adoption to take place.

### 3.3 Political and regulatory requirements

Any information technology that is to be adopted by a government involves the consideration of a number of major political and regulatory factors. According to the World Economic Forum (WEF) Global IT report of 2015 (Schwab, Martin & Samans, 2015), one of the main requirements for a BDA adoption to be successful in a government entity is political stability and security. It further stipulates the need for laws on the protection of intellectual property. This is crucial because the adoption of a BDA system implies the sharing of personal medical data of thousands, even millions, of patients between healthcare facilities. In addition, Kalyan (2015) stresses the need for the government to put in place low tax rates on new technologies as well as implement supportive policies and regulations on information technologies in healthcare.

## 4 Methodology

Qualitative research methodology was used for this study. The research approach used was deductive content analysis. The TOE adoption theory was used as the theoretical framework for the study. To collect data a literature search (desktop research) was conducted using the following keywords: “Big data analytics”, “Big data analytics adoption”, “Big data analytics adoption in healthcare”, “Big data analytics adoption in Africa” and “healthcare”. The data collected was then categorised using a deductive coding approach by putting them into predefined adoption contexts from the TOE adoption theory. Figure 4 displays the number of papers that were reviewed.

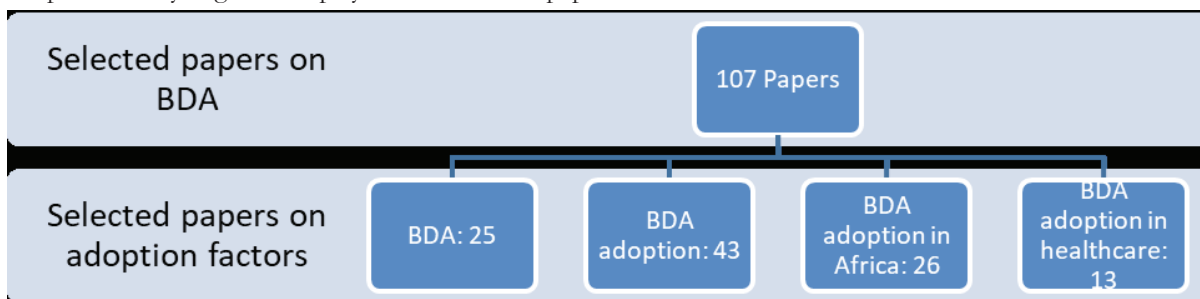


Figure 4: Number of papers reviewed

Source: Research data

After reviewing the 107 papers purposefully chosen, the selected adoption factors in the framework (technological, organisational and environmental) were found in only five papers: Nayem (2016), Mars and Seebregts (2008), Shariq *et al.* (2007) and Dutta *et al.* 2015).

## 5 The TOE-based BDA adoption model for healthcare

The TOE framework provides a proven framework that supports studies of information systems adoption across a variety of innovations and expands the adoption debate beyond technological aspects and integrates perspectives of the organisation and the external environmental aspects. Since this chapter is on public healthcare services, it involves the government directly. Therefore, another context is added to emphasise the role of the government in the adoption process. The new TOE-based adoption model has four main contexts: 1) Technical, 2) Organisational, 3) Environmental, and 4) Political and regulatory.

In each context, factors vary depending on the attributes of the organisation and the technology itself. Therefore, the factors established below are put into the context of the study by evaluating their relevance and categorising each one of them into the four adoption contexts of the adoption framework. The difference between environmental and political and regulatory context is that the environmental context addresses factors at the health facility level while political and regulatory focus is at the government level. The importance of this new context is to establish the difference between the adoption at the health facility level and at the ministry of health (government) level.

### 5.1 Technological factors

Factors addressing all the technological issues that deal with country's telecommunication infrastructure, available ICT infrastructures in the healthcare facilities, electricity production capacity of the country, interoperability of the existing systems and security issues are outlined in Table 2 showing how relevant they are to the study by explaining why they should be considered.

Table 2: Adoption technological factors

FACTOR	REFERENCE	RELEVANCE
Compatibility	Rahman(2016)	This factor helps in evaluating if the existing techniques used would be compatible with the system to be adopted.
Connectivity	Mars and Seebregts (2008)	This factor evaluates the level of Internet usage, the level of interconnectivity between the hospitals and the ministry of health. This is critical because the BDA system collects data from distant hospitals which need a reliable interconnection.
Consumer sensitivity	Khoja <i>et al.</i> (2007)	The BDA system would be effective if the ministry and the hospitals are conscious of its importance.
Electricity production	Dutta <i>et al.</i> (2015)	Electricity is one of the basic needs that must be provided to assure the success of the adoption of any information system.
Fixed broadband	Dutta <i>et al.</i> (2015)	This factor evaluates the existing metropolitan networks in the country. A BDA system requires a permanent network that has a very high availability ratio and a country-wide coverage.
Interoperability between healthcare facilities and standards of interoperability	Mars and Seebregts (2008)	To facilitate the collection of data and the analysis, standards are a requirement that must be fulfilled.
Public health informatics (ICTs, public health information systems)	Mars and Seebregts (2008)	BDA systems collect data from existing information systems. So this factor evaluates the existing systems, if there are any.
Real-time decision making	Rahman(2016)	This factor evaluates how fast the BDA system can generate reports. They are best known to be real-time.
Security and privacy issues	Rahman(2016)	Health records are personal information that requires high level of privacy and strict security measures.

Source: Research Data

## 5.2 Organisational factors

Factors addressing issues related to the awareness of BDA, demographic variables, the availability of ICT training programmes at the health facilities' level and at the ministry of health level, the availability of financial resources, and the health facility's management attitude towards the adoption of BDA are given in Table 3. The table also explains why these factors were selected and why they are relevant to the study.

Table 3: Adoption organisational factors

FACTOR	REFERENCE	RELEVANCE
Awareness about the innovation	Khoja <i>et al.</i> (2007)	The first step in adopting a new technology is to make sure that the organisation adopting it is aware of it.
Demographic variables	Dutta <i>et al.</i> (2015)	This factor evaluates the demographic variables to see if the intended system is needed or is relevant.
E-health capacity building of healthcare workers	Mars and Seebregts (2008)	This factor evaluates how often the employees who will use the system are trained.
IT knowledge	Mars and Seebregts (2008)	BDA systems need a certain level of ICT knowledge. So this factor evaluates if the ICT officers are qualified.
Leadership attitude towards the innovation	England <i>et al.</i> (2000)	Does the ministry support the adoption of the new technology?
Organisational culture	England <i>et al.</i> (2000)	This factor evaluates if the use of ICT is included in the hospital's and ministry's culture.
Resource availability (finances)	Dutta <i>et al.</i> (2015)	Adopting a new technology requires resources.
Size	England <i>et al.</i> (2000)	What is the number of employees in the hospitals?
Top management support	England <i>et al.</i> (2000)	To successfully adopt a new technology, the ministry must be willing to support the adoption of the system financially.
Training and experience	Dutta <i>et al.</i> (2015)	BDA systems require employees that already have ICT usage experience or training.
Trust in the use of ICT	Khoja <i>et al.</i> (2007)	The BDA system will only be effective if the users (hospitals and the ministry of health) trust it.

Source: Research Data

## 5.3 Environmental factors

Table 4 shows the factors that address environmental issues at the health facilities' level. These factors deal with matters like the access to health records by patients, information sharing between health facilities, and contributions in technology innovations by healthcare providers.

Table 4: Adoption environmental factors

FACTORS	REFERENCE	RELEVANCE
Access to information by patients and health workers	Mars and Seebregts (2008)	One of the functionalities of EHR centralised databases is to allow patients to access their health records.
Communication with other organisations	Khoja <i>et al.</i> (2007)	Insights gained from the collected data using the BDA system are not only useful to the ministry but also to its national and international partners.
Competitive pressure	Khoja <i>et al.</i> (2007)	This factor evaluates the pressure coming from other competitors that have already started using BDA systems.
External environment	Khoja <i>et al.</i> (2007)	Using the same technologies strengthens the partnerships between neighbouring countries.
External pressure	Khoja <i>et al.</i> (2007)	This factor evaluates if there is any regional or international connectivity of healthcare institutions.
External resources	Dutta <i>et al.</i> (2015)	The adoption of a new technology, like a BDA system, most of the time requires external financial support for African countries.
Government pressure	Dutta <i>et al.</i> (2015)	Any pressure coming from the central government can push the adoption of the BDA system.
Involvement of healthcare providers in innovation	Shariq <i>et al.</i> (2007)	This factor evaluates if healthcare providers (hospitals) contribute to the technological innovation.
Outside support	Dutta <i>et al.</i> (2015)	The adoption of the BDA system for African countries may require external technical support.
Sharing of data between healthcare facilities	Shariq <i>et al.</i> (2007)	This factor evaluates the level at which hospitals share information among them.

Source: Research data

#### 5.4 Political and regulatory factors

This category of adoption factors was added to the initial three categories that constitute the TOE adoption theory. This category was added in order to emphasise the role of the government in the adoption process and to establish the difference between the organisational adoption tasks that need to be done at the ministry of health level and at the health facility level. The factors in Table 5 address issues about health records protection policies, tax rates on new technology and the importance that the government give to new technologies in healthcare.

Table 5: Adoption political and regulatory factors

FACTORS	REFERENCE	RELEVANCE
Intellectual property protection	Dutta <i>et al.</i> (2015)	Health records are very sensitive information. They need to be under strict protection and privacy policies.
Procedures to enforce a contract	Dutta <i>et al.</i> (2015)	BDA systems are developed by big companies. Buying them sometimes involves a long administrative process.
Tax rate	Dutta <i>et al.</i> (2015)	The tax rates on new technologies can impact the adoption of the system.
Importance of ICT to the government vision of the future	Dutta <i>et al.</i> (2015)	Evaluates if the government includes the using ICT in healthcare in its vision for the future.
Government success in ICT promotion	Dutta <i>et al.</i> (2015)	The adoption of the BDA system may be influenced by previous technology adoptions.
National e-Health policies	Mars and Seebregts (2008)	Having an e-Health policy is very important before adopting a BDA system to assure that it is used in a well-defined environment.

#### 5.5 Summarised TOE-based adoption framework

Figure 4 is a summary of the new TOE-based adoption framework displaying each context with its respective factors.

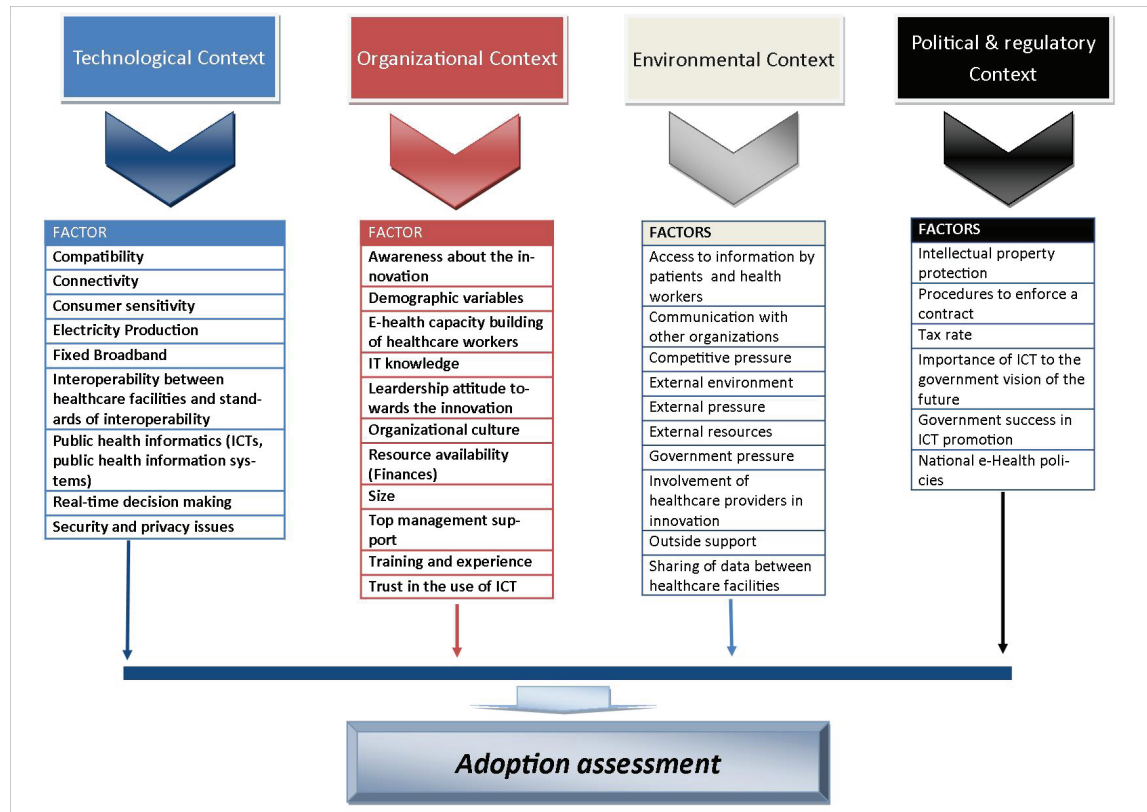


Figure 4: The new TOE-based adoption framework with factors

Source: Research data

## 6 Discussion

The findings of the study established the importance of considering adoption of BDA not only from the technological and organisational viewpoints but also from environmental and political viewpoints. This adds a new context, political and regulatory, to highlight the role of the government in the adoption process. Some of the factors chosen for the TOE adoption framework can be used for BDA adoption in other sectors while others are specific to the healthcare sector. The health-specific factors include health records privacy and security issues; policies related to access to personal health records by patients; as well as e-health policies and healthcare workers training capacities. The findings on the requirements of BDA in public healthcare services show that the following requirements need to be fulfilled:

- There should be national coverage of telecommunication infrastructures to ensure reliable communication
- Appropriate e-health policies ought to be developed.
- Sufficient ICT training programmes should be made available
- There should be government support of the adoption process;
- Access to financial resources
- Adherence to health records collection and storage standards.

This proposed TOE-based adoption framework can be used to assess the BDA adoption readiness of African countries. In application of the model, the factors are attributed metrics to measure the level of readiness in adopting BDA. This chapter is part of a research thesis done on BDA adoption in Burundi's public hospitals. The adoption framework was used to develop an automated web-based assessment tool that is available on GitHub, a web-based hosting platform (under the name Adoption Readiness Assessment Tool (ARAT)).

## 7 Conclusions

The discussion of the findings proves that there is no perfect adoption model with factors that can be used in every adoption study. Consequently, the adoption factors were chosen from different studies to develop a general framework that requires a customisation only when setting the metrics. Moreover, the existing adoption models are limited to the firm level which ignores the role of the government. Therefore, the TOE-based adoption framework in Figure 4 emphasises the major role that governments play and by adding the political and regulatory context.

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# Facilitating Big Data Utility in Kenya

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## Abstract

*Big Data has captured the interest of many professionals and researchers across the globe. This chapter explores the level of appreciation and utilisation of Big Data in day-to-day public and private business analytics in Kenya. The main objective of this chapter, therefore is to explore how the adoption and utility of Big Data, in Kenya's public and private agencies, can be facilitated to enhance service delivery in Kenya. The chapter uses content analysis methodology to review industry, academic and other literature on Big Data in Kenya. Findings indicate that Big Data utility can play a big role in predicting business trends and also in enhancing efficiency, productivity, transparency, citizens' well-being, economic growth, and national security. Factors challenging the adoption and utility of Big Data in Kenya are discussed and recommendations on how to mitigate these challenges are provided.*

**Keywords:** *Big Data, Utility, Decision making, Kenya, Africa.*

## 1 Introduction

In March 2015, African leaders met in Addis Ababa, under the auspices of the United Nations Economic Commission for Africa (UNECA) and agreed to call for a data revolution in Africa. The commission, in its Africa Data Consensus document, defines a data revolution as the “the process of embracing a wide range of data communities and diverse range of data sources, tools, and innovative technologies, to provide disaggregated data for decision-making, service delivery and citizen engagement” (UNECA, 2015). This call came as a response to three realities prevalent on the African continent. First, the realisation that data is crucial in the formulation of effective policies that are necessary in achieving the African development agenda. Second, the realisation that most African governments still rely on data collected using traditional strategies and formats. Third, the neglect or ignorance of the value of digital data better referred to as Big Data.

The objective of this chapter is to explore how the adoption and utility of Big Data in day-to-day business analytics, by both public and private agencies, can be facilitated in order to enhance service delivery in Kenya. To achieve this objective, several specific aims are pursued. The first specific aim is to define what Big Data is, its characteristics, and its sources. The second aim is to highlight the benefits of Big Data by identifying industries which are utilising this kind of data in Kenya. The third aim is to discuss the current challenges encountered in Big Data adoption in Kenya and how propose ways these challenges can be mitigated. The authors hope that such a discussion will serve to demonstrate and emphasise opportunities that Big Data presents in as far as resource allocation, better understanding of problems and real-time decision making in Kenya, both in the public and private sectors, is concerned.

## 2 Definition and Characteristics of Big Data

Big Data has been defined both as a noun and as a verb. As a noun, Big Data refers to datasets whose size or type is beyond the ability of traditional relational databases to capture, manage, and process the data with low-latency, (IBM, 2018). As a verb, Big Data refers to a process that is used when traditional data mining and handling techniques cannot uncover the insights and meaning of the underlying data (Techopedia Inc., 2018). In combination, both the noun and verb define Big Data as a concept used to mean massive quantities of both structured and unstructured data that cannot be effectively processed with traditional database and software techniques and therefore needs special analysis tools (Sagiroglu & Sinanc, 2013).

The term Big Data is said to have been first used by John Mashey<sup>3</sup>, Chief Computer Scientist at Silicon Graphics Inc. (SGI) in 1994 during his conference presentation titled: Big Data and the Next Wave of Infrastrass. Laney (2001) identified volume, variety and velocity, as the characteristics that distinguish Big Data from other types of data. These characteristics later came to be referred to as the three ‘V’s of Big data, (Kitchin & Lauriault, 2014; Kshetri, 2014; Pandey & Dhoundiyal, 2015; Fredriksson, 2017). Katal, Wazid and Goudar (2013) and Mishra (2014) provide two additional characteristics of Big Data; complexity and value.

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3 John Marshey is the first known computer technologist to use the term Big Data. He first used the term in 1994 and popularised it during the June 15 - 19 1998 USENIX Annual Technical Conference held at Marriott Hotel in New Orleans, Louisiana USA. Source; <https://www.slideshare.net/amhey/big-data-yesterday-today-and-tomorrow-by-john-mashey-techviser>

The characteristic of volume means that Big Data exists in great capacities, sizes and bulk. Consequently, it is not reported in megabyte or gigabyte of data, as handled by most computers, but in terabytes, petabytes and even zettabytes. As predicted by the International Data Corp (IDC), data creation will reach a total of 163 zettabytes by the year 2025 (Reinsel, Gantz & Rydning, 2017). Velocity of Big Data refers to the speed, rate, rapidity and swiftness at which data is generated, gathered and acted upon (Singh, Srivastava & Johri, 2014). In regard to variety, Big Data includes a varied measure of the richness, diversity, assortment, multiplicity, types and range of data representation which exists as text, documents, emails, videos, audio files, web pages, and social media messages and still images audio, and video (Oracle, 2018). The Variety of Big Data also includes both traditional data and digital data that is structured, unstructured, and semi-structured data (Sagiroglu & Sinanc, 2013). Big Data complexity refers to the difficulty, intricacy, complication and the density of data. It refers to the level of difficulty faced when trying to translate it into business value. The other characteristic of Big Data is value. Big Data is meaningless unless organisations can derive business value from it. When properly analysed, Big Data can reveal people's opinions, thoughts, behaviour, preferences and choices in the socioeconomic world they live in. The issue then is how to mine and analyse this data so as to make sense of it all.

Big data analytics is the process of examining large and varied data sets to uncover relationships which can help organisations to make more-informed business decisions. This data can be collected from sensors and devices that are used daily at home, in the work place and for commercial activities such as smart phones, tablets, security cameras, machines and many others. These sensors and devices collect data in the form of photographs, texts, video/audio, networks, web log files, web searches and pages, emails, transactional applications like ATMs, and social media sites (IBM, 2018; Marr, 2018; Mishra, 2014; Pavolotsky, 2012). Big Data analytics use advanced analytic techniques, such as Hadoop, to analyse very large, diverse data sets that include structured, semi-structured and unstructured data, from different sources, and in different sizes (IBM, 2018; Marr, 2018).

### 3 Problem Statement

The use of digital technologies in sub-Saharan Africa has tremendously increased in the past couple of decades more so in Kenya. According to Internet World Stats (2018) Kenya, a country of about 51 million people has experienced a 21,564% increase in Internet usage from 200,000 users in the year 2000 to 43 million users in 2018. Despite this rapid expansion, few companies are actually utilising Big Data to improve their businesses and services (TechnMoran, 2018; UNECA, 2015). Given that the volume of digital data created by users both in Kenya in particular and Africa in general is fast expanding it is imperative to seek for ways to harness this resource (Partnership for Finance in a Digital Africa, 2018).

The problem this chapter is interested in is the underutilisation of Big Data in Kenya. The main objective of this chapter therefore is to explore how the adoption and utility of Big Data by Kenya's public and private agencies can be facilitated. This necessitates a discussion focused on the benefits of Big Data, its adoption and utilisation challenges, and how to mitigate these challenges and thus facilitate its utility in Kenya.

### 4 Facilitating Big Data Utility in Kenya: Benefits

Synonyms of the term facilitate include; to ease, enable, simplify, assist, aid and expedite. The question is: *why should we facilitate Big Data utility in Kenya?* The benefits associated with the utility of Big Data provide the rationale for facilitating its use in Kenya. Rational choice theory states that human beings are self-interested rational thinkers who, when confronted with a decision, will seek to maximise their benefits and reduce their costs. Rationalism in Big Data Utility requires an objective calculation of all the possible benefits, be they social, economic and political values that will be derived from utilising such data. The utility and adoption of Big Data in everyday analytics and decision making could afford a wealth of benefits.

One of the key benefits of Big Data is its ability to predict trends. According to Marr (2018), the predictive capability of Big Data enables decision-makers to understand and target customers, understand and optimise business processes and improve science and research. These benefits can be enjoyed by both private and public organisations. In the private sector, companies are now using Big Data to more accurately predict what specific segments of customers will want to buy their products and when, thus improving how companies design and deliver their goods and services in a more responsive, effective and efficient manner (Marr, 2018; Singh *et al.*, 2014). Additionally, Big Data can help firms to make and deliver new products to the market at a faster and less costly manner. In the public sector, Big Data is known to significantly boost productivity and increase efficiency (Kim, Trimi and Chung, 2014; Singh *et al.*, 2014), facilitate public policy decision making (Fredrickson *et al.*, 2017; Henninger, 2013), facilitate democracy (Fredriksson *et al.*, 2017), contribute in improving national security (Wainainah, 2017) as well as tackling poverty (Mellado, 2018).

## 5 Methodology

The methodology applied in this chapter entails content analysis of relevant literature related to Big Data utility in Kenya. The analysis was limited to 2013 and 2018. According to Lin (2009) “literature research methodology is to read through, analyse and sort literatures in order to identify the essential attribute of materials” (p. 179). Given that literature methodology is the basis of this chapter, the sources of the information were from Kenya’s Ministry of Information, Communications and Technology (MICT), and periodicals that contained cases related to Big Data utility and challenges in Kenya. This is because literature on Big Data in Kenya is quite limited and the MICT, having the mandate to pursue technological revolution in Kenya, was a good resource. Literature from Africa and other parts of the world is also referenced to emphasise arguments raised in the Kenyan literature. The research sought to answer the question; how can Big Data utility in Kenya be facilitated? The purpose was to explore the phenomenon of Big Data.

## 6 Findings and Discussions

This section is organised into three sub-sections; Big Data adoption and utility in Kenya; Big Data adoption and utilisation challenges in Kenya; Strategies to Facilitate Big Data Utility in Kenya.

### 6.1 Big Data adoption and utility in Kenya

The Government of Kenya (GoK) is increasingly requiring accurate, timely and accessible data to make informed decisions so as to formulate responsive, appropriate, effective and timely policies that will solve the development needs. Although the benefits of Big Data utility are yet to be experienced, it is the faith that Big Data utility will bring convenience and better service delivery that is driving the push for its adoption.

As a participant in the International Telecommunication Union (ITU), Kenya is now actively engaged in exploring innovative ways of using Big data through the Big Data pilot program, (Omondi, 2016). The GoK has implemented electronic systems in various state departments and other state-owned institutions to improve public service delivery (MICT, 2017, p. 29). Recently, the National Land Information Management System (NLIMS), in the Ministry of Lands, was launched to automate land administration and management processes. In the education sector, the Ministry of Education has launched the National Education Management Information System (NEMIS) to digitally register students and track the performance of the education system (Ministry of Education, 2018). In the security sector, the National Intelligence Service (NIS) relies on the use of Big Data for communication surveillance and collection of intelligence which translates to improved national security (Wainainah, 2017). To enhance revenue collection, the government has adopted the iTax online system enabling the Kenya Revenue Authority to minimise tax fraud and evasion, thus is more efficient in tax administration.

Another example is the invention of Mpesa (mobile money services) in 2007, which has put Kenya on the world map as “an African ICT hub” (MICT, 2017, p. 29). Furthermore, with mobile phones companies collaborating with the banking sector, new mobile banking products have emerged and most bills, from public and private institutions ranging from electricity, water, insurance, travel and health insurance and social security contributions, among others, can now be paid via mobile phone platforms (MICT, 2017, p. 30). Additionally, the Credit Reference Bureau (CRB) in Kenya combines huge data sets from banks, financial institutions and utility service providers (Kenya Power, water services, phone companies) to track customers’ financial records so as to assess their creditworthiness. As a result, CRB is able to provide full-file credit information to various companies. Although these cases are not exhaustive, they serve to demonstrate that digitalisation of services, both public and private, is taking place. As a result of this digitisation and automation of government services, the government is generating, using and storing data that is voluminous, different variety and of high value, essentially this is Big Data.

### 6.2 Big Data adoption and utilisation challenges in Kenya

Literature review disclosed that there is limited use and application of Big Data in Kenya despite the commercial benefits and convenience attributed to it (MICT, 2017). Additionally, research on Big Data utility facilitation in Kenya is scarce. The challenges, as revealed by the literature, of Big Data adoption and utilisation in Kenya can be categorised into; Big Data analytics, lack of analytical skills, storage and transport, financial costs, ethical concerns, legislation, sharing and access of data and data culture.

**6.2.1 Big Data Analytics:** The characteristics of Big Data, particularly its volume, velocity and variety, present unique challenges to organisations on how to harness and use it (Mellado, 2018). The challenge of analysing big volumes of data, coming in at high speed and in different formats has been attributed to lack of appropriate technology (MICT, 2017). According to MICT, many organisations still rely on traditional data collection strategies and even old computer programs to process data. Such traditional systems are not capable of performing the necessary analytics on the data that is constantly in motion, from a variety of sources and in different formats. The greater the volume of data being

collected and shared, the more difficult it is to mine, fuse, and effectively use the data in a timely manner (RAND Corporation, 2014; Zicari, 2013).

In Kenya Big Data analytics is a challenge for many organisations because of the requirement of different devices to generate data about the same individual, and each collection is saved independently in different, unconnected devices and in different formats that require different analytical tools and devices to convert each data format into readable usable formats (Pavolotsky, 2012). This complexity and need for integration can overwhelm companies that lack proper facilitation and they are likely to respond by simply ignoring the data.

**6.2.2 Lack of analytical skills:** to analyse and interpret Big Data is a major challenge for both developed and developing countries. Given the increasing demand for qualified and skilled people in Big Data analytics, there is an acute shortage in skilled labour, (Singh et al., 2014; Kim, Trimi, & Chung, 2014; Villars, Olofson & Eastwood, 2011). Effective and accelerated adoption and utilisation of Big Data requires Kenyan organisations to hire people with the required skills or to train available staff and this is expensive. The GoK acknowledges that investments to develop the necessary human resources have not been sufficient (MICT, 2017). The skill output the local universities and colleges are achieving is insufficient to meet the current and future skill needs in the Big Data analytics sector.

**6.2.3 Storage and transport issues:** Many organisations in Africa lack adequate and sufficient storage mediums for Big Data, (Fredriksson et al., 2017; Mishra, 2014), and Kenya is no exception. The utilisation of Big Data is hindered by the continuous loss of data that could not be stored due to lack of sufficient storage. Many organisations end up discarding the data after a certain period to create room in their servers for current data. Although there is an option to use cloud computing for storage, adoption of this solution has been marginal due to ethical and custodial concerns as the providers of cloud computing storage services in the country are foreign companies.

**6.2.4 High financial costs:** In order to timely capture, store, manage, and analyse data that exists in great capacities and varieties, there is need for new software and hardware which are expensive (Villars *et al.*, 2011). Such costs could be scaring firms and institutions from adopting Big Data in their daily commercial activities. Big Data requires exceptional technologies to efficiently process large quantities of data within tolerable times. Additionally, companies are constantly being challenged to keep up with technology for analysis purposes, and this also means getting and keeping the right skills. All these come at a price. The other expensive venture is recruiting and retaining skilled people, to operate this technology. Skilled personnel are rare to find and retain due to high demand for their skills. Thus their wages must be competitive. In the public sector, MICT (2017) acknowledges that lack of finances/revenue for country governments has hindered their adoption of ICT.

**6.2.5 Ethics:** In regards to *ethical concerns*, these arise when data is collected and used without the consent of contributors which consequently jeopardises their privacy, security, and rights (Kshetri, 2014; Kernaghan, 2014; Marr, 2018; MICT, 2017). Individuals and organisations in Kenya are specifically concerned about these ethical issues. Therefore, the challenge for the Kenyan governments is to put in place necessary legislation to effectively manage the Big Data revolution while protecting the technology consumers, both individuals and institutions, from unethical business practices. Unlike developed countries that have legislation on Big Data utility that protects consumers from unethical practices, African countries such as Kenya, Nigeria, and South Africa are yet to pass such laws.

**6.2.6 Sharing and access of data:** The limited sharing of data among Kenya's public institutions is the reason why GoK has developed a Government Common Core Network (GCCN) which is:

*"Meant to serve as a shared and secure interoperable Government-wide ICT architecture. The system will not only integrate work processes and information flows, but also improve inter-ministerial sharing of databases and exchange of information to eliminate duplication and redundancies; improve public access to Government services and ensure responsiveness in reporting, monitoring and evaluation"* (MICT, 2017, p. 25).

Although the desired level of sharing among institution is yet to be achieved, these efforts indicate that a sharing problem exists in Kenya's public service delivery which can be resolved using information systems. However, the main obstacle to the adoption and utility of Big Data in Kenya are culture based. Although not mentioned by MICT (2017), a weak data valuation culture is detrimental to the achievement of Big Data utility in Kenya. Ignorance, fear and reluctance of appropriate authorities, such as managers may derail adoption and utility of Big Data Analytics both in the private and public sectors. Moreover, organisation refrain from adopting and utilising Big Data because they believe that such data lacks real meaning in their day to day business activities and decisions.

## 9 Recommendations

The study makes the following recommendations to facilitate Big Data Utility in Kenya:

**9.1 Appropriate legislation:** This is necessary to address and manage privacy, security, and property rights violations by companies. Kenya needs to pass laws on access to information and data protection. Such laws will protect consumers

and require organisations to protect data within their possession from theft and unethical use. Another area that needs proper legislation is on the issues of justice and accountability. A person that feels violated by a company's unethical use and depiction of their information needs to have a way to seek justice (World Economic Forum, 2018). However, legislators need to be cautious that that legislation does not restrict the utilisation of Big Data benefits. This is being experienced in the medical field, where strict privacy regulations are hindering medical breakthroughs of both doctors and pharmacists (Geum-deok, 2017). The challenge, therefore, according to Geum-deok is to balance contradicting consumer needs of privacy and security with those of improved services especially in the health sector.

**9.2 Increased affordability:** Although GoK, through MICT, is purposing to support country governments to adopt and utilise Big Data by giving them revenue, more can still be done. Kenya can make Big Data Analytics affordable by finding ways to acquire these technologies at reduced prices, or subsidise entrepreneurs to purchase such technology. Another strategy is encouraging *Big Data entrepreneurship*. In Kenya, legislators also need to deliberate on how legislation can enable entrepreneurial individuals to own and monetise their own Big Data analytics competencies. From individuals to companies, those that are able to commercialise their analytic services should be supported both financially and through policy instruments such as laws and subsidies. Moreover, what governments need to do is reduce the bureaucracy associated with business-startups. The process should be simplified enough to allow entrepreneurship.

**9.3 Increase Collaborations:** African institutions, business leaders and experts in Big Data analytics need to forge and practice collaborative working relations so that they can share, access and help each other in adopting and utilising Big Data. Such collaborations could and should be between countries, within the continent and with expatriates from other parts of the world so that skills and information can flow efficiently to allow for the data revolution in Kenya to occur. According to NGdata (2018), public private collaborations would energise the economy as private companies utilise public data such as censuses to comprehensively understand and predict where and how they should invest. Creation of such collaborations may lead to the reduction of costs related to collecting, storing and analysing Big Data.

**9.4 Skill generation:** Additionally, Kenya needs to strategise on how to increase skill development in Big Data analytics so as to facilitate its adoption. Encouragingly the ICT Master plan (MICT, 2017) suggests mechanism for developing and sustaining high-end talent by removing the skills gap between industry requirements and the capabilities of the local workforce. This includes reducing the need for foreign expertise in ICT projects, retaining current high-end talent, and creating a mechanism for effective skills transfer and training (MICT, 2017, p. 30). Universities in Kenya need to start training students on Big Data and Big Data Analytics and its use to find solutions to social problems as a sophisticated economy requires specialists who are skilled in Big Data techniques (Mellado, 2018).

**9.5 Create awareness of the utility of Big Data:** The African continent often lags behind the rest of the world when it comes to embracing innovation (Mellado, 2018). This could be because of ignorance. Thus government should be at the forefront of encouraging and supporting enterprises willing to adopt Big Data, and to make others aware of the benefits of this resource as a way to encourage its use and application. Governments can also require their regional (county) governments to digitalise their services which will lead to Big Data utility.

## 10 Conclusion

From the review provided herein, the adoption and utilisation of Big Data, by both private and public sectors, may contribute to more convenience and improved consumer based service delivery. However, it seems that its adoption and utilisation is challenged by the technical limitations to handle the volume, variety and velocity of the data; lack of analytical skills; storage and transport issues; inadequacy in Big Data management; prohibitive financial costs for the purchase of new software and hardware; ethical concerns in the collection and management of Big Data; lack of appropriate legislation; reluctance by different agencies to share available data; and lack of appreciation of the value of Big Data.

To facilitate the adoption and utility of Big Data in Kenya several strategies are recommended. First, proper legislation is necessary to address ethical issues of privacy, security and the provision of justice and accountability. Secondly, the use of Big Data should be made affordable and also to encourage entrepreneurship in this field. Thirdly, collaborations between experts and organisations should be encouraged to enhance reciprocity and reduce costs. Fourthly, is the need to invest in training and developing more experts in ICT and Big Data analytics. Lastly, GoK needs to create awareness on potential and value of Big Data in improving the efficiency and effectiveness of service delivery. Committing to overcome these challenges and facilitating the adoption and utility of Big Data will engage a data revolution in Africa which will enable the formulation of appropriate, responsive and efficient policies to realise Africa's development agenda.

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## Social Media Content Management Strategies at the National Police Service, Kenya

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### Abstract

*This chapter analyses the strategies used by the National Police Service (NPS) in Kenya to manage its social media content. The study from which the chapter is extracted investigated the types of social media content generated by the NPS, evaluated the competencies of the staff managing social media content, examined the policies NPS applies to social media content management, as well as analysed the challenges NPS face in managing social media content and suggest ways to overcome them. In this study, the authors focused on three social media platforms used by the NPS to interact with the general public, namely, Twitter, Facebook and the organisation's blog. Focus Group Discussions (FDGs) were used to collect data. The participants in the FGD were purposively selected from human resource, communications, information technology, and records management departments in cooperation with the Human Resource Manager. The workshops lasted 5–6 hours a day for 4 days. Three researchers were present, one working as a moderator and two as observers, who focused on the verbal and non-verbal interaction and on crucial phases of the discussions. The study found that NPS uses a variety of tools to manage its social media content but lack competent staff to deal with them. The NPS also does not have a policy on managing social media content. Most of the staff managing records have inadequate skills to manage social media contents due to limited IT skills. The organisation needs to develop policies and procedures for the management of social media content and train its staff on use of ICTs to support social media content management.*

**Keywords:** *Social media, Social media content, Posts, Strategies, National Police Service.*

### 1 Introduction

According to Kwanya and Stilwell (2015), the origin of the term social media is fuzzy with many people claiming to have coined it. However, there seems to be a consensus that the term was coined in America Online (AOL) in the early 1990s around the time the company developed Instant Messenger which enabled registered users to communicate in real time (Bercovici, 2010). Many definitions of the term exist but it is generally perceived as any online platform or channel which disseminates user generated content and facilitates extensive user participation. Consequently, social media tools and techniques are permanently changing the way information is created and passed across societies and around the world (Smith, 2009). Safko (2010) defines social media simply as the media humans use to be social. He explains further that social media is how humans use emerging technologies to effectively reach out and connect to the other human beings, create a relationship, build trust and be there for each other. Kaplan and Haenlein (2010) define social media as a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content. Thus, they perceive social media as comprising of technological platforms, tools and applications which people use to share content, opinions, insights, experiences and perspectives.

Although social media is ever growing and ever evolving, its basic tenets remain the same. People have been creating or joining groups of other like-minded persons for ages. Therefore, social media are about how humans reach out and connect to other humans, create a relationship and build trust necessary to create a closely knit unit. Thus social media is construed to be the collection of online communication channels dedicated to community-based input, interaction, content sharing and collaboration and is a reflection of the ordinary conversations happening every day in people's lives offline in the markets, village paths, churches and households. Nonetheless, social media augments and escalates the breadth and depth of the conversations. Agichtein *et al.* (2008) argue that social media is different from the traditional media in terms of quality, reach, frequency, usability, immediacy and permanence. Kietzmann (2011) proposes a social media honeycomb which consists of the participants' identity, conversations, sharing, presence awareness, relationships, reputation and groups.

According to Lietsala and Sirkkunen (2008) social media exhibit certain key characteristics. These include unlimited space to share content; involvement of the participants in the networks to create, share or evaluate all or most of the content; anchoring on social interactions; linking of content with other external media; and interlinking of users to each other. Tesorero (2013) suggests that most social media platforms encourage feedback and contributions from all the participants; are open to feedback and participation through voting, commenting or sharing of content; facilitate conversation; allow communities to form quickly and communicate effectively; as well as thrive on their connectedness and making use of links, resources and people. Saxena (2013) adds that social media platforms generally provide free web space for the community members to create content on; give the users unique identities by which they become known



online; enable the users to build profiles which are used to connect them to the other users having similar interests; encourage the users to post both personal and professional information onto the platforms; enable conversations by giving the users the right and tools to comment on posts by other members; and time-stamp all posts to make them easy to follow. On his part, Dube (2007) explains that social media are user-based, interactive, and community-driven, thrive on relationships, and enrich communication with emotional support and assurance which other techno-based communication approaches do not facilitate.

Social media currently exist in several categories according to their areas of application. According to Safko (2010), the categories include social networking, publishing, photo sharing, audio management, videos, microblogging, livecasting, virtual world, gaming, productivity applications, aggregation, syndication, searching, mobile communication, and interpersonal relationships. Grahl (2014) proposes six categories of social media: social networks, bookmarking sites, social news, media sharing, microblogging and blog forums. Some examples of social media tools include Facebook, twitter, Google+, hi5, LinkedIn, MyLife, blogs, flickr, YouTube, howcast, MySpace, Picasa, vimeo, buffer, dig, Instagram, Pinterest, Quora, SlideShare, StumbleUpon, yelp, fotolog, GetGlue, MEETin, tribe.net, virb, yammer, and scribd, among others.

Nielsen (2012) reports that most people spend more time on social media than on the other media categories; time spent on social media continues to increase exponentially; the use of mobile devices to connect to social media is increasing rapidly; social media has overtaken pornography as the prominent activity on the Internet; one out of eight spouses in the United States first met on social media while one out of every five divorce cases have been blamed on social media. Social media have had an impact on personal and professional relationships; culture and society; economics and commerce; empowerment of the masses; creation, use and sharing of new knowledge; created new ethical and legal issues relating to information management and use (Curtis, 2013). The members of user communities in social media need to disclose as much information about them as possible to enhance their acceptance and interaction on these platforms. Appropriate user disclosure enables the users to enhance their personal identity; manage or maintain a relationship; seek approval and support from the other members; obtain benefits and information from others; express feelings, thoughts and experiences; and create enjoyment and pleasure (Bazarova and Choi, 2014).

## **2 Contextual Information**

The creation of the Kenya National Police Service (NPS) is provided for by the Constitution of Kenya, the National Police Service Act (2011) and the National Police Service Commission Act (2011). In accordance with the legal provisions above, the National Police Service consists of the 1) Kenya Police Service; 2) Administrative Police Service; and 3) Directorate of Criminal Investigation. The mission of the NPS is to provide professional and people-centred police service through community partnership and upholding the rule of law for a safe and secure society.

According to Article 244 of the Constitution, the NPS shall strive for the highest standards of professionalism and discipline among its members; prevent corruption and promote practices which encourage transparency and accountability; comply with constitutional standards of human rights and fundamental freedoms; and train staff to the highest possible standards of competence, integrity, respect for human rights, fundamental freedoms and dignity, as well as foster and promote relationships with the broader society. The priority areas of the NPS include: 1) implementation of reforms in the Service; 2) strengthening of policy regime; 3) development of physical facilities; 4) application of ICT in policing work; 5) improvement of staff welfare in terms of housing, salaries and allowances; 6) capacity building and enhancement of the skills of the officers; 7) research and development in crime areas; and 8) changing the image and culture of the police service.

## **3 Rationale and Methodology of the Study**

Very few scholarly studies have been conducted on the Kenya National Police Service. Some of the existing studies include the influence of leadership development training on the performance of the National Police Service in Kenya (Mwangi, 2018); effect of workforce diversity on the performance of the National Police Service in Nakuru County, Kenya (Kathimba and Anyieni, 2018); security sector reforms influencing the transformation of the national police service, Nairobi and Kiambu counties, Kenya (Muthondeki, 2017); factors affecting change management in the disciplined forces in Kenya: a case study of National Police Service Commission (Mulyungi, 2017); implementation of gender mainstreaming policies at the National Police Service, case study of Administration Police Training College, Nairobi County, Kenya (Njoka, 2017); and determinants of employee job satisfaction in the public security sector in Kenya: a case of National Police Service (Kemboi, 2016). Other studies have covered challenges associated with strategy implementation (Mutua, 2016); employee perception of strategic change management (Ojwang, 2016); challenges associated with strategy implementation (Otieno, 2015); policies on employee performance (Ndanyi, 2015; Kipkirui, 2014); factors influencing service delivery (Ngugi *et al.*, 2012); and the role of employee welfare services on the performance of the NPS staff (Nyakundi *et al.*, 2012; Nyamwamu *et al.* 2012).

It is evident from the foregoing that the existing studies focus on strategy implementation, service delivery, employee welfare, and performance. No study has been conducted on public communication and its role in enhancing service delivery by the NPS. It is also clear from the literature review that no study has been conducted on the use of emerging new media by the NPS to support its strategic and operational activities. Recognising the fact the NPS has embraced community policing, the use of social media to engage with the public is at the core of its strategy in delivering its mandate. There is need, therefore, to assess how social media content generated by the NPS platforms is managed as a means of enhancing its capacity to deliver its services effectively. The current study was designed to address this gap in literature. The objectives of the current study were to find out the types of social media content generated by the NPS; evaluate the competencies of the NPS staff managing social media content; examine policies in place for social media content management; as well as to determine the challenges the NPS faces in managing social media content and to suggest possible solutions for the same.

This study applied a qualitative research design. The researchers used a focus group design, but narrowed further on a workshop approach. The workshops consisted of 16 employees from NPS who deal with records. The participants were purposively selected from communications, human resource, information technology, and records management departments in cooperation with the Human Resource Manager. The FGDs lasted 5-6 hours a day for 4 days. Three researchers were present, one working as moderator and two as observers, who focused on the verbal and non-verbal interaction and on crucial phases of the discussions. The collected data was analysed thematically.

## 4 Findings and Discussions

The findings of the study are presented and discussed hereunder according to the objectives of the study.

### 4.1 Type of social media content created by NPS

Content creation is one of the most important communication strategies used by the NPS to reach out to its publics. It emerged from the FGDs that the NPS uses three main types of social media to create content and disseminate it to the public. These are Facebook, Twitter and Web blogs. The type of content created by NPS as mentioned by the participants includes photographs, videos, online commentary, and tweets. The content includes original information that they post through the NPS social media sites, but some originate from the people they interact with. The participants had the following to say about content creation:

*“It is unrealistic to create content that is original at all times. Therefore, we share posts that have been created by the public if it is of importance to the functions of the NPS. Approximately 60% – 80% of content created at the NPS comprises content shared and interactions. The NPS regards all content and links created through our social networks whether original or shared as appropriate so long as the content aligns with our agency guidelines.”*

During the discussion it emerged that not every employee at the NPS may post anything on social media sites used for interacting with the public (Twitter, blogs and Facebook) without approval since the NPS has a strict communication policy. Updating the social media information at the NPS meant for the public is mainly the responsibility of the Communications Officer with the assistance from the ICT personnel. However, there are social media tools for internal interaction such as WhatsApp which can be used by any employee to communicate internally.

### 4.2 Tools used in managing social media content

The tools used include cloud-based backup systems like Backupify, cloud-based information services such as Social Safe and Archive Social, social media monitoring or dashboard tools, general third party, cloud-based reporting tools like Storify, RSS feed and use of Screenshots.

#### 4.2.1 Cloud-based backup systems

The ICT staff present identified the use of cloud-based backup systems like Backupify which offers free, basic online services and support a wide variety of social media applications. They noted that:

*“Information can be regularly exported and brought back into corporate control. Some can be exported in open, non-proprietary formats, for example, generation of Twitter reports in PDF. They can automatically export information out of social media applications but downloading the information out of the cloud is not.”*

*“These services can be applied to a range of social media channels, including Google apps. However, these tools are just back up tools, not information management tools. Their interfaces and data exports are designed to satisfy IT and backup requirements, not organisations or information management needs.”*

*“Downloading and capturing of content into corporate systems must still be performed as a manual, scheduled process and the same legacy data will generally be downloaded each time you do a backup, resulting in significant amounts of duplication for high transaction accounts. These services also change. Hence we don't rely on them much”*

#### 4.2.2 Local backup systems

While commenting on the use of local backup system Digi.me, one of the ICT staff mentioned the following:

*“We use local backup systems such as Digi.me to support a wide variety of social media applications. We take snapshot copies of our data and load them onto local servers. However, this information is flat and not dynamically available to reuse or repurpose...”*

#### 4.2.3 Social media monitoring or dashboard tools

The participants indicated that they know of the application of many third-party, cloud-based tools that are free, such as HootSuite which can help them to aggregate information from several social media channels. But their application by the NPS was limited as indicated by one of the ICT staff:

*“These tools can piggyback information management needs on the back of existing reporting or monitoring arrangements, provide reporting and listening services to monitor the effectiveness and impact of social media presence. However, they have limited information accessibility if a log-in is required to view or use and data exportability of their information needs to be verified. There may also be limits on the reporting and analysis information that is available for export and can be expensive to deploy and maintain. We, therefore, rarely use them.”*

#### 4.2.4 Reporting tools embedded on social media application

All the records management and ICT staff were aware of and made use of reporting tools that come with social media application, such as Facebook activity logs to manage their social media content. These tools generally exported social media content to PDF and other widely open, accessible formats. They also capture all activities that occur on social media sites. However, they noted that the export needs to be manually performed and information is flat and not dynamically available to reuse or repurpose.

#### 4.2.5 Analytic tools

Analytic tools such as Google Analytics or blog software analytics were identified as available tools that are free, online services. They have proved useful for monitoring blog use, search engine terms, referring sites, top posts and pages, hence the reason for their popularity. They allow information to be exported. Their application is limited though. For example, it may not export reports in business-ready formats. Because of this, they need to be supported with screenshots, written reports or other ways of capturing the business information. The excerpt below documents this.

*“To help us with reporting on correspondence, our ICT web team showed us how to access the comprehensive and free details about the traffic on our site on Google Analytics. This helped enormously when our seniors ask for regular progress updates on open public submissions. This helps us keep them up-to-date based on the comments that are being received so we can make decisions and monitor progress. Regular reporting also gives us the opportunity to reflect as a team, and to think about deploying further strategies when communicating with the public.”*

#### 4.2.6 Screenshots

This is also another strategy which was noted as popular among Records Management, ICT staff and Communications Officers. They explained that:

*“The screenshot images provide an exact representation of the content as it appeared in the social media application and have been submitted as evidence in legal cases but the information is flat and not dynamically available for reuse or repurpose. For active accounts, there is a significant cost in staff time since information needs to be manually updated. It requires regular staff commitment to keep up to date.”*

#### 4.2.7 RSS feed

This was another technique whose usage was noted among the ICT staff. They indicated that it is useful for a range of social media applications. It is useful for auto-populating Twitter and Facebook based on blog updates. It can be configured to send an email containing a complete blog post, or tweet or comment among others to a designated account. It allows NPS, when seeking information from the community or consulting via social media, to direct people back to its organisational blog to provide feedback. The NPS blog was set up with an RSS feed so that any comments received on it were emailed automatically to relevant staff. Thus, staff can capture these emails into the corporate records system based on existing processes and procedures. However, it was reported by the participants that its application on emails requires manual intervention to capture it into corporate systems for accessibility and usability. As such it was tedious to use and hence not popular.

#### 4.2.9 Reports of pre-scheduled posts

This is information compiled by the communications officers, the records managers and ICT staff as part of process of developing and authorising social media posts at the NPS. Information is not an exact representation of what was posted on social media sites but is an approved record of what was authorised for posting.

When prodded further, the participants explained that the most strategic way they manage their social media content was to leave them in their native social media application. The reason given by most participants was that no separate information management effort was required. The participants also indicated that additional software or applications software was not required as captured below.

*“Staff using the application only needs to know how to access and use the information it contains, therefore, short term value information is not likely to be at risk. However, long term value or high accountability information is at risk because of the projected frequency of system change. Another risk is on-going information accessibility because information remains under the control of an external third party. It limits corporate information accessibility if a log-in is required to view or use the data.”*

#### 4.2.10 Use of Application Programming Interface (APIs)

The NPS uses APIs to regularly export information from social media applications. It was noted that information is regularly exported into corporate system thereby bringing corporate information back into corporate control. Therefore, exported information can be fed into relevant systems and processes. The APIs can also change and so API-based export strategies may require on-going update. In addition, different APIs is required for each social media channel. The tools mentioned by the staff include Archive Social, Brolly, PageFreezer, and Social SafeGuard. These types of social media archiving services can capture content from a variety of social media platforms, including Facebook, LinkedIn, Twitter, Instagram, Google+, Pinterest and YouTube. The participants, however, indicated that this is done by the technical team in ICT because it requires technical knowledge which most did not possess.

#### 4.2.11 Purpose-built software tool

The authors inquired whether the NPS uses purposefully built or tailor-made software to manage the organisation's social media content. The participants indicated that they are aware of software that can be designed to meet specific business requirements and can be designed to integrate and share information within business applications. Although they noted that such software can provide a comprehensive and accountable recordkeeping solution and can allow information capture and management through automation, the NPS was yet to acquire any. However, they were aware of a plan to do so. The hindrance to acquisition was noted by the Communications Officer as follows:

*“The use of this software involves initial purchase and subsequent licensing costs. It takes NPS time and money to implement effectively. It may also pose a challenge to constantly upgrade since social media applications and approaches change rapidly.”*

### 4.3 Competencies of the staff managing social media content

In order to support records compliance, social media content must be properly archived and be producible. To also ensure the authenticity of the record, the associated metadata must be captured. However, it is important to note that the majority of the records staff that deal with both printed and electronic records (especially social media records) at NPS do not understand how to capture and retain metadata that validates the authenticity of the communication since they lack ICT skills.

During the discussion some of the records managers had this to say:

*“Handling electronic records, especially social media, make us stressed. Some of us, until recently, did not know that social media are records.”*

*“It is not easy to manage and supervise the creation of social media content since most of us have not had adequate training in IT and the volume of the records created through electronic means is enormous! We heavily depend on the IT staff to support us manage electronic records since they are the ones with the requisite skills and knowledge”*

Technology should make life easier for the records team, and help people in the records and related department to follow the regulatory rules, makes communication and preservation of the records safe and secure, and enhance automated capture of social media records. However, if most of the people who handle electronic records are IT illiterate then it becomes not only a challenge to the staff but to the entire organization to manage their social media generated content. The Human Resource representative opined that:

*“We have taken note that the three departments (IT, HR and Records) need to work together and share skills and learn from each other in order to effectively manage records at NPS. We are planning to offer a joint training for all the staff dealing with records irrespective of their departments so that they share experiences and learn from each other and from outside the organisation”*

The sentiments above were also expressed by the communications officers who are currently in charge of all outwards communications at NPS.

### 4.4 Policies in place for social media content management

It emerged that there is no specific in-house social media management policies and adoption of international standards (such as ISO standards) on such has not been done. More than a half of the participants reported that the organisation has formal policies for records and information management. However, they do not adequately cover social media content management. The policies are also not consistently applied. The dynamic nature and growth of social media content is making it even more challenging to keep policies relevant, current and compliant.

The participants said they were unaware that they are legally liable for their social media content. All the participants described the social media content as “unmanaged and chaotic.” They cannot classify and index user-created records at the time of their creation or later on in their life cycle.

#### 4.5 Challenges of social media content management

Several findings and clear themes emerged from the FGDs. For instance, the NPS communication officers and records managers had a shared view that social media content management was not allocated budget like traditional recorded media. They indicated that social media tools were not given priority in the form of resources and budgets. They also held a similar view that they have no clear guidelines when dealing with strategy to manage social media content since no policies were in place. Lack of staff training and capacity building on social media content management was mentioned as well. Also prominently mentioned is the discrepancy in handling social media records between ICT professionals, Records and Information Management (RIM) professionals and Human Resource within the organisation. Without this type of unified and collaborative approach, the organisation is at a risk of regulatory non-compliance, loss of important records, failure to meet eDiscovery demands in a reasonable time period and other challenges that can lead to fines, penalties and damage to the organisation's reputation and productivity.

#### 5 Conclusion and Recommendations

The study found that the NPS uses a variety of tools to manage its social media content but lack competent staff to deal with them. The NPS also does not have a policy on managing social media content. Most of the staff managing records have inadequate skills to manage social media contents due to limited IT skills. In order for the NPS to get control over the management of their social media records, it is important to understand that these records are part of a much bigger organisational picture. Social media records must be managed in the context of all records management within the organisation. The researcher recommends that the following should be done at NPS:

1. Organise regular social media trainings and sensitisation programmes between IT professionals and RIM professionals and other staff within NPS.
2. The NPS should focus on the adoption best practices for on creation, storage, security and privacy of data and individual identity by addressing how and where social media records are stored, how long they are kept, where they are kept, how they are disposed of, how they are tagged and how they are accessed.
3. The NPS should create in-house policies on social media content management and they should be in line with the International Standards (such ISO Standards) best practices.

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# Strategies for Research Data Management (RDM) at the Technical University of Kenya

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## Abstract

*Due to the emergence of big data, academic libraries have been prompted to develop Research Data Management (RDM) strategies to manage data emanating from research output. This chapter assesses the strategies adopted in managing research data at the Technical University of Kenya. In addition, varieties of research data, approaches to the management of research data and challenges experienced in managing research data are explored. A qualitative case study of the Technical University of Kenya was applied. Twenty (20) respondents were selected purposefully from the Lecturers, library, Directorate of ICT, and Directorate of Research and Knowledge Exchange (ReKE) based on expert sampling. Data was collected through interviews and analysed using content analysis. Research data management at the Technical University of Kenya is in its infancy, leaving gaps in its management. Strategies put in place by the Technical University of Kenya to ensure effective research data management include, setting up a Directorate of Research to coordinate data management as well as drafting of research data policy to facilitate the practice's enactment. Challenges such as knowledge and skill gap, financial and administrative support, and staff apathy hamper data management. The nature of Research Data Management is collaborative, calling for a collective effort in managing data amongst the institution's interdisciplinary service provisions, researchers and knowledge managers. The study therefore recommends implementation of legal frameworks as well as staff training and development. This will reduce data redundancy within the access platforms making data use, and reuse visible and thus transforming research through research data communication.*

**Keywords:** Academic libraries, Data processing, Research Data Management, research data services.

## 1 Introduction

Knowledge is the manifestation of research which involves a series of processes with data being accumulated in all the phases of research. This data requires to be managed effectively to enhance its consumption and application. Research data requires service tools and infrastructure to be managed across its life cycle (Wilson and Jeffreys 2013). Equally important are contribution of researchers, information systems and regulatory bodies. These support crucial functions such as policing and legal placement of research in the university and other organisations.

Research data management enables divvying up and re-use of data created through the research process contributing to openness. Furthermore, the practice of Research Data Management (RDM) reduces an institution's reputational risk by determining, beyond doubt, the validity and confirmation of the research data engendered within its premises. However, challenges such as skills gap, fiscal support and inadequate infrastructures hinder the practice. For instance, insufficient workstations, poor cabling, low bandwidth Internet connectivity are bound to decelerate effective RDM.

The Technical University of Kenya (TUK) was chartered in 2013 and began offering postgraduate courses (Masters and PhD programs) in 2015. It was chosen for the study primarily due to its infancy in RDM. The essence of supporting researchers and scholars in the implementation of data management plans has gained the attention of research funders requiring libraries to set up services to support and facilitate RDM. The directorate of Research and Knowledge Exchange (ReKE) office at The TUK coordinates research funding and conferences. The TUK library on its part manages research data by storing and making it accessible whenever needed.

## 2 Statement of the Problem

Numerous studies have shown that research data support services offered by libraries are currently emerging (Patel, 2016; Liu and Ding, 2016; Chigwada, Chiparausha and Kasiroori, 2017). Negligible studies have been done towards this end. Research requires rigour to enhance its reliability and conformability. Data created during the research cycle has to be managed along the way to facilitate data confirmation, scrutiny in the future as well as use, reuse, and sharing among others. Effective strategies to oversee the whole process of research data management, however, have not been put in place. This has led to the partial research data life cycle hampering accessibility of data and its re-use. A lot of research data is generated. However, there are limitations in mechanisms of knowing what exists. In response to this, the research assesses strategies the Technical University of Kenya has put in place to manage its research data.

### 3 Aim and Objectives of the Study

The overall purpose of the study which generated this chapter was to appraise the strategies used in managing research data at the Technical University of Kenya. In addition, the nature of research data, approaches in managing research data, and challenges experienced in managing research data are explored. The specific objectives included to identify the types of research data produced and managed at the Technical University of Kenya; explore the approaches used by the Technical University of Kenya in managing research data; and establish the challenges the university encounters in managing its research data.

### 4 Methodology

A qualitative case study was used. The Technical University of Kenya was chosen for the study based on it as a pioneer Technical University chartered in 2013 in Kenya in line with the provisions of the Universities Act, 2012. The target population comprised of Heads of Department, lecturers, Post graduate students, library management, Head of ICT Directorate and head of Directorate of Research. Twenty (20) respondents were selected purposefully based on expert sampling from, Dean of Faculty of Social Science (1), Director of School of Information Communication Studies (1), Chair of Department (1), lecturers (9), Students undertaking Masters programs (2), University librarian (1) and Heads of library departments (acquisition, cataloguing and circulation) (3), ICT Directorate (1) and Directorate of Research and Knowledge Exchange (ReKE) (1). Interviews were conducted and data analysed using content analysis.

### 5 Research Findings and Discussions

This section presents and discuss the findings of the study under the following headings: the nature of research data produced and managed at the Technical University of Kenya; approaches adopted by the Technical University of Kenya to manage its research data; and the challenges the university encounters in managing research data.

#### 5.1 Research data produced at the Technical University of Kenya

The study probed on the data types, areas, amount, storage (active and long-term) and sharing behaviour of the respondents at the TUK in respect to research data management.

The study confirmed that the respondents were creators of either qualitative or quantitative research data in the form of text narratives and spreadsheets. Their target audience were policy makers and fellow researchers. The data generated ranged from 3 MB to about 5 GB hinged on the scope of the research as well as the nature and number of researches conducted. For instance, staff in social sciences tends to produce more textual data as opposed to the physical sciences, while frequent researchers had more data.

It also emerged that few respondents granted access to their data before public release other than to collaborators for fear of data nicking. They did not create metadata for their data due to deficiency of skills to do this effectively. Active data was stored on hard drives, laptops, smart phones, folders on personal computers, and email. The cloud, hard drives, folders on personal computers and laptops stored long-term data.

The study established that the university lacked a coordinated institution-wide research data management facility for active data leading to scattered or and lost data. The university's institutional repository was utilised mainly for published research. Needless to say, the study confirmed that a few of the respondents did not submit data to the repository even when prompted to do so due to a lack of clear guidelines and lack of enthusiasm in sharing. This sentiment is echoed by Vines *et al.* (2014) who argue that authors are poor stewards of their data and are often unable or unwilling to share.

#### 5.2 Strategies for managing research data

The study further investigated the strategies the Technical University of Kenya applied for efficient management of its research data. Results indicate diminutive research data management strategy in this regard. The strategies are discussed as follows.

##### 5.2.1 Establishment of research data management governance structure

The study confirmed that the university has established the Directorate of Research and Knowledge Exchange to coordinate research activities and policing within the university. However, little had been achieved toward research data management by the unit other than facilitating funding and development of research proposals. Seemingly, the library mainly coordinated long-term research through selection, processing, preservation and diffusion of research. Arguably, there lacked clear guidance on which body was at the top of the structure with results indicating that while the Directorate of Research and Knowledge Exchange dealt with active research data management, the library on the other hand, extended its management to long-term use and re-use. Lack of a clear segregation of the roles on RDM hampered effectiveness, since neither of the two units paid attention to active data. One respondent explained the scenario as below:

*"Lack of broader institutional support, as well as "territorial struggles" between various departments within the institution ultimately leads to a backlog in the research data management"*



### 5.2.2 Draft policy on research data management

The research data policy provides guidelines on the management of data created and used through the university's research according to legal and ethical requirements. It informs best practices and offers leadership to all regarding datasets. The study discovered that the university lacked an approved research data management policy. The library had originated a draft institutional repository policy that would double as a RDM policy but that was pending approval by the university management. If approved, it is envisaged that research data management policy will facilitate proper management of data by giving proper guidelines.

### 5.2.3 Training on research data management

Professional staff skills development on research data management though uncoordinated was in place. For instance, library staff undertook training on emerging areas in information management mainly to manage the institutional repository. Likewise, Research and Knowledge Exchange office occasionally trained staff on research project proposal development, fund soliciting, opportunities for grants and fellowship programmes.

### 5.2.4 ICT infrastructure

The Research Data Management process operates on a linkage of amenities such as computers and cyberspace and infrastructure for its transformation. The university had made some effort towards this. The University Librarian explained:

*"We have bought computers for RDM purposes and have DSpace software installed. We also have Koba, which we use for data description."*

A few work stations exist in major departments. However, the respondents stated that they were inadequate. The majority of the respondents utilised their own computers, tablets and smart phones. Sporadic Internet was noted as a challenge.

## 5.3 Challenges facing Research Data Management (RDM)

As stated earlier, the effectiveness of RDM depends on the supporting infrastructure, alongside collaborations of the various units involved. As such, the challenges that were affecting RDM in the university are as follows:

### 5.3.1 Financial and administrative support

There was minimal financial and administrative support accorded to the staff to conduct research. The study attributed this to staff apathy leading to individual staff conducting research in isolation as opposed to patronage by the university system. The study noted that the Directorate of Research mainly provided non-financial support such as training, and facilitation of conferences. The institution was deficient in financial resources to fund academic research adequately. What was available was in the form of grants routed via the Directorate of Research from external research grant endowments.

The respondents further identified bureaucracy from management as one of the challenges researchers face. They explained that the staff was not supported by the university management while conducting research as quoted below.

*"As much as we keep talking of inclusive governance, the management casts a blind eye on funding, especially academic research funding. This really does not motivate the rest of the staff to conduct research as much as expected"*

Lack of support was identified by the staff as one of the contributors to the lack of interest in research data management.

### 5.3.2 Research Data Management Coordination

The respondents stated that most data were scattered in individual researchers' and practitioners' computers and external drives since they lacked RDM skills and the institution lacked a coordinating organ. This was affirmed by all respondents who had dissimilar ways of storing data ranging from own computers to cloud facilities. This, therefore, made it difficult to aggregate data for curation at the resource centre at opportune time for data consumption. Wilson and Jeffreys (2013) compliment the current study that the predominant challenge faced by many universities is poor coordination.

### 5.3.3 Legal framework for Research Data Management

The study confirmed that there were no Research Data Management policies. The majority of the respondents were not aware of any policy except for the library top management who acknowledged the presence of a draft policy document that was actually pending approval by the top university management.

Without a policy, everyone is left to deal with research data in their own understanding. This contributes to unidentified and untraceable research in the university. This view is confirmed by Liu and Ding (2016) that 50 per cent of researchers in China use their own standards to describe their data making it difficult to integrate such standards when hooked on one platform or shared with other research teams. In addition, the study also confirmed that there was no constituted institutional ethics committee to oversee conformity. Similarly, the institution had not acquired plagiarism detection software though efforts were being made to acquire one. These are important in safeguarding best practices in research.

### 5.3.4 Supporting infrastructure

Research data requires supporting infrastructure. The study revealed gaps in the research infrastructure. There were cases of insufficient workstations, unstable network connection and outdated software. The institutional repository did not have a Virtual Private Network (VPN) subscription due to limited funding. This could facilitate off-campus use if implemented. Consequently, the institution operated with only Local Area Network (LAN) further aggravating scattering of data.

### 5.3.5 Knowledge and skill gap

Apathy of staff towards Research Data Management was also prevalent amongst the respondents. The majority confirmed that RDM was a new practice. Therefore, many people did not have the knowledge of what it entails. The study attested to individualistic understanding of what was needed to be done in managing data for generations by preserving it after the project was completed. This explained why there were multiplicity of ways of managing current data such as use of cloud storage, hard disks and use of e-mails. Other issues raised by respondents included, lack of RDM skills, ability to comprehend their position in RDM and lack of articulation of RDM processes. This contributed to poor creation, storage and use of metadata, as noted by one lecturer:

*“Research Data Management is a new practice that hasn’t been fully embraced by many. We feel outpaced and therefore, lack confidence in our expected roles in RDM.”*

There is need for individual researchers to manage their own data using best practices in generating, managing and sharing data. This will enable RDM coordination at the institutional level where data is stored in a centralised and secure place as opposed to datasets being scattered in individuals’ laptops where it is not well described and is not usable to the wider university research community.

## 6 Conclusion

Research is core to the growth and development of a society. There is need to manage Research data in its life cycle for better utilization of research results. Research Data Management is collaborative, calling for a collective effort in its management from amongst the institution’s interdisciplinary service provisions, researchers and knowledge managers. In addition, it entails setting up effective data management strategies. The Technical University of Kenya is striving to put strategies in place for RDM such as policies, ICT infrastructure, and funding. In addition, stake holder involvement at all levels is needed to effectively manage research data sets. Effective strategies of RDM would enable curbing data redundancy within the access platforms making data use, and re-use visible thus transforming research communication.

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# Open Science Practices among Universities in Kenya: Opportunities and Challenges

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## Abstract

*Science is data-driven however access to scientific data often possess a challenge to scientist. Scientific data is often subject to legal and privacy regulations, restrictive institutional policies, in addition to weak incentives for researchers to share data. There have been concerted efforts to promote openness in research through encouraging open science among researchers. This chapter analyses open science practices, opportunities and challenges among universities in Kenya. The study on which this chapter is based employed a descriptive survey research design using an online questionnaire through Google forms to collect data from researchers in universities in Kenya. Data was collected from 34 universities. A majority of the respondents 55% were familiar with some aspects of open science such as open access, open source software and open data, most of them were not aware of open peer review and open notebook concepts. Over 70% of the respondents are involved in open access publishing while only a few are involved in other forms of open science. The benefits of open science include sharing knowledge, enabling collaboration and wider dissemination of research outputs. Therefore, Open science practices should be encouraged as a panacea to scholarly crisis and publishing channels needs to be encouraged among researchers. Recommendations made in this chapter may be helpful to all stakeholders in the research workflow to develop open science practices among universities in Kenya.*

**Keywords:** *Open Access, Open Data, Open Peer Review, Open science, Open Source.*

## 1 Introduction

Open science is changing the way in which scientific research processes are conducted and the data/knowledge is produced thereof accessed and utilised by researchers. Science is usually a data-driven and expensive activity however on access to scientific data is subject to administrative, legal and privacy regulations, ICT infrastructure requisites, restrictive institutional policies and practices in addition to weak incentives for researchers to share data. Therefore, open science is gaining momentum as a new and alternative way for researchers to conduct, publish and disseminate their research.

Open science as a term is attributed to Paul David who defined the phenomenon in 2003 (David, 2008), and can be taken to refer to efforts made to provide the outputs of a research in digital formats for wider accessibility to the scientific community and the society at large. Information and communication technologies (ICTs) have reshaped the scientific research process by creating opportunities to collect, organise and publish the outputs (OECD, 2015). Open science is about increased rigour, accountability, and reproducibility for research. It is based on the principles of inclusion, fairness, equity, and sharing. Open science ultimately seeks to change the way research is done, who is involved and how it is valued. It aims to make research more open to participation, review/refutation, and improvement and (re)use for the world to benefit. Research in many fields are facing reputation crisis due to what Kohler (2018) calls failure of replication attempts. He adds that the major reason for this lack of reproducibility is questionable research practices that might invalidate the research outputs. Open science has been touted to improve such a situation.

Open science has the potential impact research workflow; how researchers conduct their research; how they share and discuss research findings; how they publish articles; how research findings are disseminated to academics and civil society; and how research findings are evaluated using new metrics to assess their impact. There is however no known scholarly study undertaken to explore how researchers practise open science. Much research has been concentrated on the explanation of the concept (Frieske, Widenmayer, Gassmann & Schildhauer, 2015; Kisjes, 2015) and a few on its impact on researchers' career progression (McKiernan *et al.*, 2016). This chapter analyses open science practices, the opportunities and challenges in universities in Kenya.

## 2 Open Science Practices in the Research Workflow

Open science embodies an approach to research that is collaborative, transparent and accessible. There is a wide range of activities that come under the umbrella of open science that include open access publishing, open data, open peer review and open research. It also includes citizen science, or more broadly, stakeholder engagement, where non-specialists engage directly in research (European Commission, 2017). Open science in itself is not a new initiative but has been practised in various approaches as early as 1990s with open access movement. It started with the development of open access journals (1993), open archives (1999) and open access policies (2003) (Laakso *et al.*, 2011). These initiatives led to an increased availability of open online publications. However, this practice focused more on the publications phase in the research

workflow. Other initiatives of open science started developing in early 2000 but with slow adoption rates (Kisjes, 2015). These initiatives included open data, open educational resources, open peer review, open source, and open methodology.

Researchers all over the world, to some extent, practise open science. More and more researchers do so by publishing in open access journals, sharing research data, or including other researchers into the research process (Friesike *et al.*, 2015). The increased requirement for implementation of Open science practices can be attributed to a push by funders, publishers and institutions requiring researchers to work in an open science manner. There is an increased recognition and adoption of open science practices, including new policies that increase public access to the academic literature (open access) (Björk *et al.*, 2014; Swan *et al.*, 2015) and encourage sharing of data (open data) (Heimstädt, Saunderson & Heath, 2014; Michener, 2015; Stodden *et al.*, 2013), and code (open source; Stodden *et al.*, 2013; Shamir *et al.*, 2013).

### 3 Methodology

The purpose of this chapter is to explore open science practices in universities in Kenya. The objectives of the study which yielded this chapter were to analyse open science practices among universities in Kenya; and examine the opportunities and challenges in open science.

The study adopted a descriptive survey research design. According to Salaria (2012), descriptive survey concerns itself with the present phenomena in terms of conditions, practices beliefs, processes, relationships or trends. Creswell (2014) adds that descriptive research design is devoted to the gathering of information about prevailing conditions or situations for the purpose of description and interpretation. This study describes how the universities in Kenya practise open science and explores the opportunities and challenges they face. Therefore, a descriptive survey research design was found to be appropriate. An online questionnaire was formulated with three (3) sets of questions. The first part of the questions captured background information about the respondents' institution and gender. The second set of questions assessed the respondents' understanding and level of awareness of the concept of open science practices. The third set of questions, meant for respondents who had practiced open science, sought to establish the extent of this practice in terms of length of time, the specific open science practised and the opportunities and challenges experienced. The questions in the third set of questions provided for an open-ended response where the respondents were to give additional information in regard to the issue under study.

The target population was 71 universities accredited by Commission for University Education in Kenya as at July 2018. The study sampled 68 universities ranked by Webometric in July 2018 (Cybermetrics Lab - CSIC, 2018). The methodology for webometrics ranking heavily relies on the quantity and quality of research outputs. This is the basis of the assumption that open science practices contribute a great deal to the rank attained. Virtual snowball sampling technique was used. Respondents-driven sampling where the university librarian in each institution was the first contact and was used to identify eligible participants for inclusion in the study and share the research instrument through virtual social networks.

A questionnaire survey mounted on an online survey tool 'Google form' was used to collect data. The questionnaire was sent to email addresses of the university librarians with a message to share with the researchers in their institutions. The questionnaire remained online for three (3) weeks. The data was analysed manually and presented in form of charts, graphs, and percentages.

To ensure generalisability of the study, 'Proximal Similarity Model' proposed by Donald T. Campbell was used. This model is an appropriate approach to ensure external validity where the context (people, place, setting, and time) of the study are more or less similar (Trochim, 2006). Open science practices and research process are the key variables in this study and they are more proximally similar, and hence generalisation of the results of this study is possible.

### 4 Results and Discussion

A total of 36 responses from 34 universities were received by the end of the survey period. This composed of 24 females, 8 males while 4 did not provide their gender. This represents a 50% response rate.

#### 4.1 Level of understanding of open science concept

Open science being a new concept, it was necessary to establish the level of understanding. 9% (3) of the respondents rated their level of understanding as "very well"; 47% (16) rating their understanding as "well" and 20% (7) as "moderately well", while 15% (5) rated their understanding as "a little" and 9% (3) did not answer this question. A study conducted among European researchers in May 2017 reported otherwise. It reported that the concept of open science was unknown to a majority of researchers (European Commission, 2017). Fuente (2016) highlighted the non-realisation of the concept of open science despite the developments in information and communication technology which propels the practice. In Kenya, deliberate efforts have been made to mainstream open science practices through trainings, workshops and sensitisation forums for different practitioners, ranging from researchers, librarians to policy makers (Sturdy & Wykstra, 2016). Such kind of efforts can be said to have contributed to the high level of understanding of the concept of open science among researchers in Kenya. Figure 1 presents these findings.

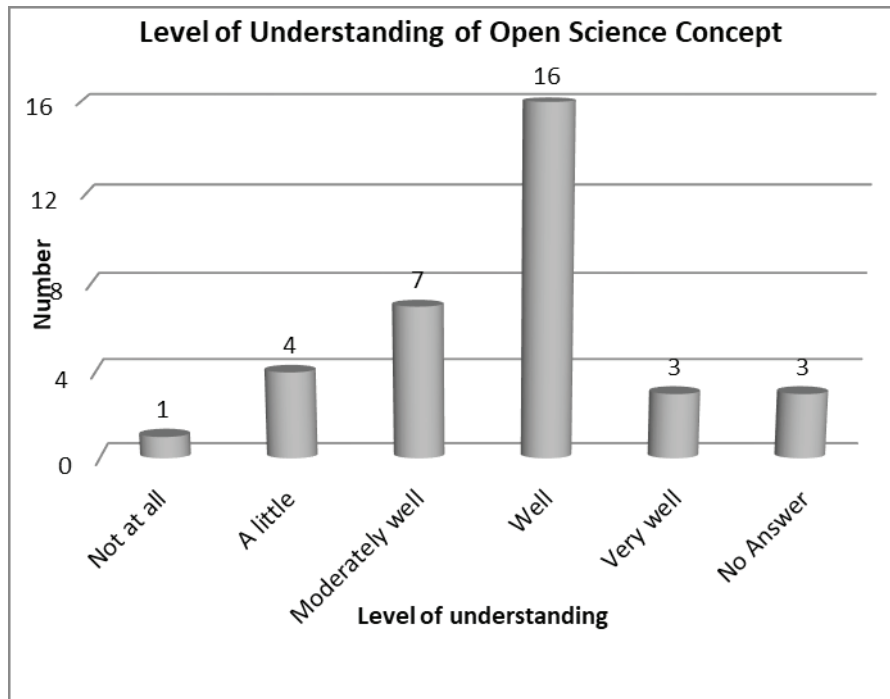


Figure 1: Levels of understanding of open science concept

#### 4.2 Open science practices

There are various practices which are regarded as contributing to open science and are employed in different stages in the research workflow. This study sought to establish the practices researchers in Kenya were aware of and engaged in. The open science practices were extracted from literature to include open access, open software, open data, open notebook, open peer review, and open science evaluation and open lab notes. Figure 2 shows that the majority of the respondents, 91% (31), are aware of open access, 73% (25) open software, 70% (24) open educational resources; while 11% (4) open notebook and open science evaluation and 2% (1) for open lab notes.

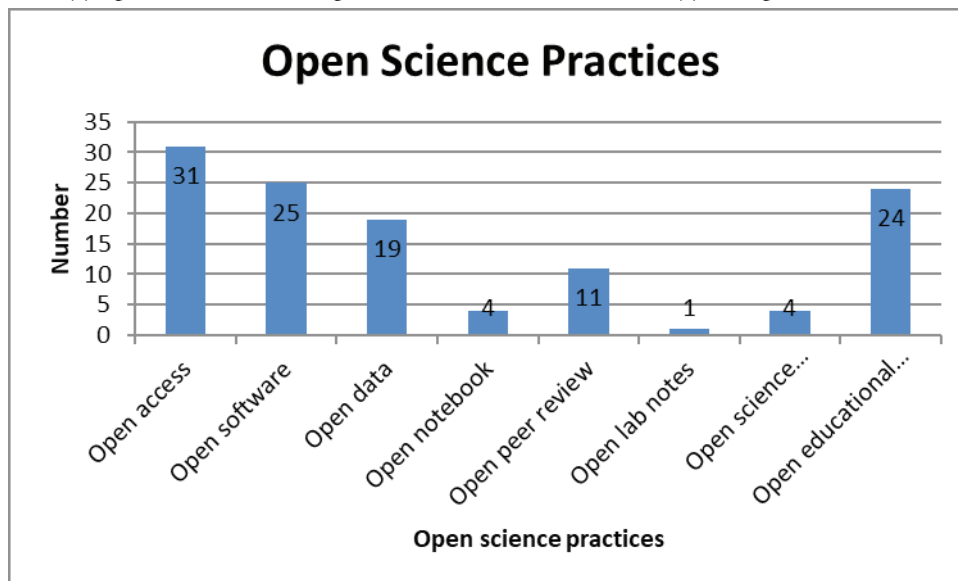


Figure 2: Open science practices

Open access publishing is the most known open science practice and on the contrary, open lab notes, open science evaluation and open notebooks are less known. Similar findings were reported by European Commission (2017) where it was found that open access publishing was known by three out of four researchers while open notebook and open peer review was not known at all. A search for literature on open science in Kenya showed that many international organisations and partners have organised trainings and forums advocating for open access publishing, open source software and open data, with little or no mention of the other forms of open science. Additionally, open access publishing is the oldest form of open science practice having begun in 2000 (Appel *et al.*, 2017), while open notebook

in 2006 (Bradley, 2007) and open peer review in early 2010 (Ross-Hellauer, 2017). The emphasis given to open access publishing and the adoption time may have contributed to these findings.

#### 4.3 Involvement in open science activities

Upon establishing awareness of the open science practices, the author explored how the researchers were involved in open science. The respondents were asked to indicate the open science activities they were involved in. The activities were derived from literature review to include: publishing in open access, communication/sharing research works through social media, using open licenses, sharing research data, sharing software code, sharing notebooks, using open peer review, sharing pre-prints, using shared reference libraries and sharing (grant) proposals. This question also allowed the respondents to add any other activity they undertake and consider it to be open science. Figure 3 presents the results.

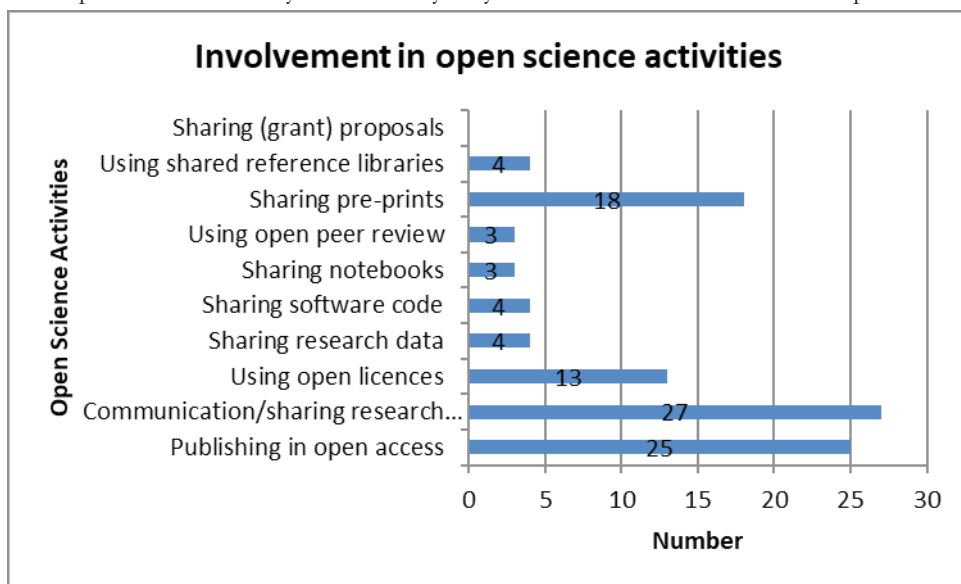


Figure 3: Involvement in open science activities

It was found that the majority 79% (28) and 73% (26) of the respondents were sharing their research work through social media networks and publishing in open access respectively. This corroborates what was reported in Figure 2 where open access publishing was the most known practice. Similar results show that many researchers are publishing their research work in open access journals and self-archiving in their institutional repositories or personal websites (Laakso *et al.*, 2011; Whyte & Pryor, 2011). Opening research work including has been touted to lead to an increase in research impact (McKiernan *et al.*, 2016) and hence the reason why many researchers are involved in open access. There has been a debate on the evaluation metrics for research work and a number of authors have proposed new strategies of communicating research work and especially through social media networks for wider impact (Arza & Fressoli, 2018; McKiernan *et al.*, 2016; Whyte & Pryor, 2011). This explains why 79% of the respondents in this study were involved in sharing their work through social media. Literature search on the other open science activities revealed that no scholarly research has been done, except non-scholarly reports such as blogs and wikis. Therefore, this can explain why not many researchers are aware and involved in such activities.

#### 4.4 Opportunities and challenges offered by open science

One of the objectives of this study was to establish the opportunities and challenges offered by open science to researchers in Kenya. The following were the opportunities identified in order precedence:

1. Enables collaboration in research 27(79%);
2. Sharing of knowledge 27(79%);
3. Wider dissemination of research work 26(76%);
4. Greater access to research outputs 25(73%);
5. Makes research more transparent and trustworthy 24(70%);
6. Allow use and re-use of research 20(58%);
7. Minimise research duplication 2(5%); and
8. Give more visibility, more citation and more accessibility 1(2%).

Arza and Fressoli (2018) identified collaboration among researchers as the engine for production of interconnected knowledge. Research funders, governments and individual institutions have developed policies motivated by ethical,

moral and utilitarian arguments that the public has a right to access literature arising from publicly funded research (Suber, 2012; Willinsky, 2006). Publishing in open access has been evidenced to have the advantage of higher citation (Gargouri *et al.*, 2010; Hitchcock, 2016). Open research gives visibility to the activities undertaken and hence ensuring transparency and reproducibility and dispels replication failures (Kohler, 2018). Fuente (2016) notes that one of the key benefits of open science is efficiency which is achieved through providing greater access to scientific outputs, reducing research duplication, and allowing more research from the same data. The values and benefits of open science are not constrained to researchers but extend to the whole society.

The challenges identified as bedevilling open science among researchers in Kenya are:

1. Lack of standards for sharing research 15(44%);
2. Cultural/institutional constraints 15(44%);
3. Difficulties in guaranteeing data privacy 14(41%);
4. Ineffective policy guidelines 14(41%);
5. Lack of legal clarity 12(35%);
6. Fear of free-riding 10(29%);
7. Need to invest more time and effort 8(23%);
8. Trouble with digital tools for research 7(20%);
9. Financial aspects of openness 7(20%);
10. Reluctance to share code/data 5(14%); and
11. Evaluation criteria impede openness 4(11%).

Fuente (2016) explains that there are still concerns about open science which need to be tackled so as to realise the full potential of openness. Fuente (2016) grouped the challenges as socio-cultural, technological, political, organisational, economical and legal. Socio-cultural concerns range from lack of awareness of the benefits and potential of open science (Whyte & Pryor, 2011); reluctance to change the current research practices (Arza & Fressoli, 2018); diverse approaches to research; to researchers considering open science as a time and effort-consuming activity (Appel *et al.*, 2017). The technological issues identified were the need to improve the e-infrastructure to support transition to open science and the wide variety of technologies available (Fuente, 2016). A true open science landscape should happen from an international level and be supported at national level. The political and organisational issues raised included lack of political commitment to promote and integrate open science in the government agenda (Fuente, 2016); and lack of policy framework to guide open science practices at both national and institutional level (McKiernan *et al.*, 2016). Although open science has been praised to lead to better use of resources, there is need for significant investments in order to develop the technical and organisational ecosystem (Appel *et al.*, 2017). Legal issues identified as the major concerns range from data privacy to lack of clarity of appropriate laws. Fuente (2016) stresses the concern of absence of legislative frameworks at international and national levels while Appel *et al.* (2018) found that lack of set rules for disclosure of data and other inputs of research and protecting the privacy of the contributors was impeding the uptake of open access. To realise the potential of open science, the stakeholders in the research workflow need to be abreast with the challenges raised in this study.

## 5 Conclusion

The findings of this study indicate that researchers in Kenya understand the concept of open science and are aware of the open science practices. The high level of awareness can be attributed to advocacy programmes conducted by various international agencies like Centre for Open Science, Innovations for Poverty Action (IPA) among others. Despite the high level of awareness, it was found that open science practices in which the researchers were involved were limited to open access, open source software and open data. There was minimal involvement in open peer review/evaluation and open notebook/lab. To optimise the benefits offered by open science, the author recommends the following:

1. To foster a change of attitude towards open science, there is need for incentives and rewards for researchers practicing open science by university management.
2. There is also a need for trainings and awareness creation on all open science practices to be given a balanced attention by librarians and international bodies and partners involved in open science advocacy.
3. Create support structures for open science. These structures may include technical, legal, professional and implementation support from institutions. This can be at organisational or national level. For organisational level, the management should be responsible, while national level the government.
4. Develop and implement open science policy. To mainstream open science, a policy is important to ensure compatibility tools and elements of research to open science. Such a policy will provide clarity to all stakeholders in regard to open science. Librarians should guide in the development and implementation of the open science policy.

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# Techniques and Tools of Big Data Analytics at the Technical University of Kenya and Strathmore University

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## Abstract

*Big data is the term used to refer to any group of datasets so huge and composite that it is difficult to process the same using traditional data processing applications. Big data analytics is a set of procedures and technologies that entail new forms of integration to uncover large unknown values from large datasets that are various, complex, and of an immense scale. Analysing big data is a challenging task as it contains huge dispersed file systems which should be fault-tolerant, flexible and scalable. There is an immense need of constructions, platforms, tools, techniques and algorithms to handle big data. Some of the tools used to analyse big data are Hadoop, Map Reduce, Apache Hive, and No SQL, among others. Techniques for big data analytics include descriptive, diagnostic and prescriptive analytics. This chapter compares the techniques and tools used for big data analytics by the Technical University of Kenya with those used by Strathmore University. The study on which this chapter is based was conducted as a mixed method research to enable deep understanding of the concept. Primary data was collected through structured questionnaires and interviews with clientele and information communication technology staff from the two institutions in Nairobi, Kenya. Secondary data was collected through document analysis. Data was analysed and presented using descriptive statistics. The findings revealed that the tools used frequently for big data analytics were SQL and Java. The two academic institutions mostly used descriptive big data analytics techniques. There was variance in the use of some techniques where SU applied predictive and TUK diagnostic techniques, SU used rules and algorithms to detect the patterns. They also employed statistical analysis, data mining and machine learning to get meaning from data. On the other hand, TUK employed diagnostic analytics to examine their big data.*

**Keywords:** Big Data, Big Data Analytics, Big Data Analytics Tools, Big Data Analytics Techniques

## 1 Introduction

The value of big data is realised when an organisation is able to leverage on it to make decisions. Organisations need to turn big data into meaningful insights in order to benefit from it. Labrinidis and Jagadish (2012) assert that in order to extract value from big data, organisations need to conduct data management and analytics. Through data management, organisations are able to attain, store and retrieve data for analytics. After acquiring the data, organisations can analyse it to gain insight from it. Big data analytics is the procedure where the large amount of data is analysed to gain insight from it and show correlations (Sagiroglu & Sinanc, 2013). The use of big data analytics enables organisations to gain insight from the large volumes and varieties of data. Big data analytics depends on the organisation's ability to employ technologies that can assist them to analyse the big data they hold. The technologies include data management tools such as Hadoop, MapReduce, arithmetical analysis and advanced visualisation tools. The advancement of technology especially in the big data analytics has made it possible to retrieve data of every kind notwithstanding its size, variety and retrieval speed required. Big data analytics has created organisational value through increased transparency; created adaptive organisation models; and supported decision making (Wamba, Akter, Edwards, Chopin & Gnanzou, 2015). This helps organisations to enhance their competitive edge through the creation of information based collections pools that assist in decision making.

## 2 Techniques of big data analytics

According to Laney (2012); Banerjee, Bandyopadhyaya and Acharya (2013); Evans and Lindners (2012); Eckerson (2007); Chappelle, Schölkopf and Zien (2006) and Basu (2013), techniques of big data analytics include descriptive, diagnostic, predictive and prescriptive big data analytics.

### Descriptive analytics (what happened?)

Organisations use descriptive analysis to recognise previous and present organisational performance in order to make informed decisions. Through this, organisations are able to classify, describe, combine and categorise data to translate it to valuable information for understanding organisational performance. The analysis assists in summarising the data into meaningful charts and reports.

**Diagnostic analytics (why did it happen?)**

Banerjee *et al.* (2013) perceive diagnostic analytics as an exploratory analysis of existing data to discover the root cause of a problem in an organisation. The analytics is also termed as generic extrapolative analytics which examines data to answer the question “why did it happen?” It uses techniques such as drill-down, data discovery, data mining and correlations. It looks at the causes of events and behaviours based on data.

**Predictive analytics (What might happen?)**

Predictive analytics examines historical data and combines it with rules and algorithms. It can detect patterns or relationship in data. According to Evans and Lindners (2012), predictive analytics extrapolates data relationships. This analysis involves statistical analysis, data mining and machine learning to find meaning from large amounts of data. There are two major types of predictive analytics. These are supervised and unsupervised analytics (Eckerson, 2007).

**(i) Supervised predictive analytics**

Supervised prediction is based on the previously solved cases or historical data that contains the results one is trying to predict. The approaches applied include classification, regression and time series analysis. For example, classification can be used if one wants to know which clients are likely to respond to a new direct mail campaign while regression is used in forecasting. Variance analysis and time series assist in understanding the unique properties of time and calendars (Chapelle, Schölkopf & Zien, 2006).

**(ii) Unsupervised predictive analytics**

According to Eckerson (2007), the unsupervised predictive analytics directly infer the properties of the probability using descriptive statistics to examine the natural pattern and relationships that occur within the data. It can be used to identify products and content that goes well together hence used a lot in market analysis. According to Chapelle *et al.* (2006), the concept of semi-supervised predictive analytics algorithms is applied with some supervision information but not necessarily for all examples.

**Prescriptive analytics (How can we make it happen?)**

Basu (2013) explains that prescriptive analytics enable organisations to not only look at the future but also to look at the opportunities that are potentially out there. It goes beyond describing, explaining and predicting by associating alternatives with the predictions of outcomes. It helps analysts to know what might happen in future and optimise to get the best in achieving the organisational objectives with the limited resources they have. Riabacke, Danielson and Ekenberg (2012) assert that prescriptive analytics assists to forecast what lies ahead and suggests means to take advantage of this predicted future without compromising other significances. Examples of prescriptive analytics are recommendation systems such as those used by Netflix, Google, and Amazon. Figure 1 presents examples of the types of analytics.

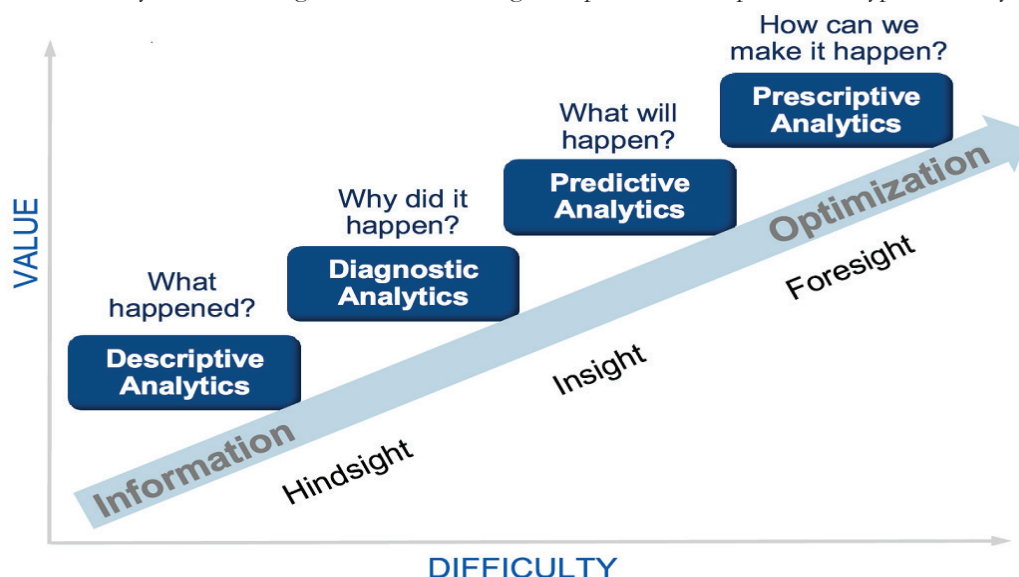


Figure 1: Big data analytics techniques

Source: Laney (2012)

**3 Tools for big data analytics**

To conduct big data analytics, there are tools required to help in analytics and getting insights. According to Ajit-Kumar (2016), the tools used for big data analytics depend on five concepts which are:

1. Processing - This is where the processing is hosted, for example, on distributed servers or cloud such as Amazon EC2;
2. Storage - This is where big data is stored;
3. Programming model - Distributed processing by use of MapReduce;
4. Indexing of big data - Entails the use of high schema databases such as MongoDB; and
5. Processes performed on data - Examples include analytical or semantic processing.

Researchers such as Loshin (2013), Raghupathi and Raghupathi (2014), Shvachko, Kuang, Radia and Chansler (2010), Zikopoulos and Eaton (2011), Fan and Bifet (2013) as well as Cuzzocrea, Song and Davis, (2011) identify some of the tools and platforms for big data analytics as indicated in Table 1.

Table 1: Big data analytics tools

Tools/platform	Role in big data analytics
Hadoop	Storage of big data using Hadoop clusters.
MapReduce	Dividing tasks to be done during data analytics and assembling of outputs. During the execution of tasks, it tracks the processing and shows progress.
Hive	Works on the Hadoop platform. It allows querying on SQL to retrieve big data. Can be used for data mining.
Cassandra	Used to handle big data that is on different servers. Also supports querying of No-SQL type.
MongoDB	Can be an alternative to relational databases. It is used for managing big data that keeps on changing and which is unstructured or semi-structured. It helps to store and analyse big data.
NoSQL	Used for storing unstructured data. Also can be used to store large set of data.
RapidMiner	Offers advanced analytics where the users do not require to write any code. It works as a data mining tool for data dispensation and imagination.
Talend	Big data integration to cloud controlling and also simplifies the processing of big data.
Bokeh	Used to generate data applications, dashboards and plots.
Plotly	A tool for visualisation of big data. It can be used even by organisations with low skills on big data. It also enables the sharing of the visualised data.
Cloudera	Used for creating data repositories.
R	Software used for analytics and graphics. It also assists with data mining and statistical analysis and presentation.

Source: *Research Data*

## 4 Rationale of Study

Academic institutions have not been left behind in the production of big data in terms of student and staff records; research output and innovations; as well as administrative, logistics, financial and procurement records. These records are produced very fast, in vast volumes and diverse formats. This creates enormous challenges in identifying, processing and applying data produced by the academic institutions for decision making and general operations of the organisations. Manyika, Chui, Brown, Bughin, Dobbs, Roxburgh and Byers (2011) assert that the concepts of big data and analytics have developed into hotspots that fascinate academic institutions, industries and most government in the world. These concepts have infiltrated most of today's organisations making it a crucial influence of performance. Similarly, the same academic institutions are operating in increasingly complex and competitive environments which they need to forecast and respond to appropriately. Clarke, Nelson and Stoodley (2013) are of the opinion that academic institutions should realise the need to make decisions based on the synthesis of the vast data that they generate to help them understand the rapidly changing contexts of the academic sector; otherwise, the potential value of big data is not realised. They recommended that academic institutions need to invest on tools and techniques that would unravel insight from the big data they generate. This will in turn enable them to generate meaning from the big data. There is a dearth of literature on how academic institutions in Kenya analyse the big data they generate. This study seeks to bridge the gap by analysing tools and techniques used for big data analytics by academic institutions in Kenya. The specific objectives of the study were to: investigate the techniques used in big data analytics at the Technical University of Kenya and Strathmore University; investigate the tools used in big data analytics at the Technical University of Kenya and Strathmore University; and recommend tools and techniques that academic institutions in Kenya can use to analyse big data.

## 5 Context of Study

The mandate of the Technical University of Kenya is to provide technical education and training so as to contribute towards the progression of society through research and innovation. Therefore, the university has engaged in innovation projects such as the development of the "green tuk tuk" that uses biodiesel instead of fuel, among other innovations (TUK, 2014). The university has also not been left behind by the information explosion emanating from the vast amounts of information being produced from its processes, staff and students. To make sense out of this content, the university

conducts big data analytics to support its decision making process. For example, every end of semester, the university conducts a financial analysis to determine the number of students who have paid school fees and those who have not as a means of establishing those who are eligible to sit examinations. Based on this analytics, the university management sends out memos to academic departments with lists of the students who should be allowed to sit examinations. Similarly, the university from time to time requests academic staff to submit information on various issues including publications and research projects, among others. The TUK represents universities which generate and manage big data without using conventional big data analytics tools and procedures. The university, therefore, offers the researcher a big data context which is in its infancy and ad hoc. Apart from the environment being representative of several other public universities, it also offers the researcher a good context to examine the potential of big data analytics in enhancing organisational performance.

According to the July 2017 and 2018 webometrics ranking of universities, Strathmore University emerged as the best private university in Kenya. It is perceived as the best performing private university in Kenya. On 21<sup>st</sup> July 2015<sup>4</sup> Strathmore University, under @iLabAfrica Research Centre, signed a memorandum of understanding (MOU) with the Dell EMC, which is a United States firm, to offer access to platforms for big data analytics, information on data storage management and the modern research and training resources on cloud infrastructure and data science. Through this, the university was able to get assistance from the firm in line with its vision of providing the latest of global technology tools and un-equalled training in Africa. This followed another engagement in which the university met with the Data Science Centre (DSC) in June 2015<sup>5</sup>. The DSC thereafter collaborated with the university to introduce the use of data analytics at the university to enhance research in the university and enhance its performance. These projects emanated from the understanding that big data research inspires new ways of transforming processes, organisations, industries and society at large. This researcher holds the view that the university provides an appropriate big data analytics environment which has a great potential to contribute to the objectives of this study.

## 6 Methodology of Study

The study from which this chapter is extracted was designed as a mixed method research design. According to Creswell and Plano-Clark (2015) mixed method design enables the understanding of a problem of study by gaining different corresponding data and enhancing validation. This research adopted a convergent parallel design. The data collected and analysed was both qualitative and quantitative. The authors merged the results from both sets of data for comparison and validation. This enhanced the interpretation of similar and dissimilar concepts. Primary data was collected through structured questionnaires and interviews from the Technical University of Kenya (TUK) and Strathmore University (SU). The study targeted 15,020 students and information communication technology staff from TUK and 7,030 from SU as study population. Therefore, the total population of the study was 22,050 respondents. Information-oriented purposive sampling was used to select information rich subjects where class representatives were selected for the study. This gave TUK a sample size of 580; while SU was 114. Thus, total sample was 694 respondents. Questionnaires were distributed to all the selected respondents using drop and pick techniques and face to face interviews with key informants. Data was analysed using SPSS and presented using descriptive statistics. Secondary data on the understanding of the concept was collected through documentary analysis.

## 6 Findings and discussions

A total of 576 (83%) respondents responded to the study while 118 (17%) of them did not provide usable responses. The response rate was considered admissible since Mugenda and Mugenda (2012) recommend that a response rate of at least 50% is adequate for analysis; 60% is generally good; while a response rate of above 70% is excellent. Kothari (2014) concurs with this position and adds that a response rate of above 70% is deemed to be very good. The findings are presented hereunder according to the objectives of the study.

### 6.1 Field of study and titles for staff respondents

The research investigated the areas of study and job titles of the staff respondents at TUK and SU. This was done in order to establish whether the people dealing with big data analytics are trained in the field. None of the respondents indicated that they were big data analysts but from the field of study they indicated that they studied analytics and information technology as shown in Table 2.

4 <http://www.nation.co.ke/business/corporates/Strathmore-deal-with-US-firm-to-boost-research-and-training/-/1954162/2801342/-/bc3hm0/-/index.html>

5 <https://www.strathmore.edu/news/ims-establish-research-data-science-centre-industrial-mathematical-program/>

Table 2: Fields of study and titles of the staff’s respondents

<b>Fields of study</b>	Mobile telecommunication and IT
	Information systems and security
	Mobile innovation and telecommunication
	Telecommunication and innovation
	Analytics and business intelligence
	computer science
	hardware maintenances
	Information technology
	Information and communication technology
	Telecommunications technology
	Business intelligence
	Machine learning and data mining
<b>Job titles</b>	Software developer
	Project coordinator
	Business intelligence analyst
	Senior technologist
	System developer
	Technologist
	Technician
	Business intelligence specialist
	Analytics designer
	Programmer

Source: Research Data

It is evident from Table 2 that none of the staff members indicated they were big data analysts. However, their fields of study and job titles closely resemble the descriptions of big data analysts. Patil (2011) asserts that big data analysts are often trained in mathematics, computer science, business intelligence, statistics, database management, and social science. They can also emerge from any field that focuses on computational and data management. Although none of the respondents indicated that they were big data analysts, their field of study and job titles agree with the description of Patil (2011) and Harris, Murphy and Vaisman (2013) on big data analysts.

## 6.2 Technical skills for big data analytics

The study investigated the technical skills of the respondents relevant to big data analytics. This resulted in multiple responses since the respondents were free to choose more than one entry to the question that sought to establish technical skills, competencies and expertise of staff as shown in Figure 2.

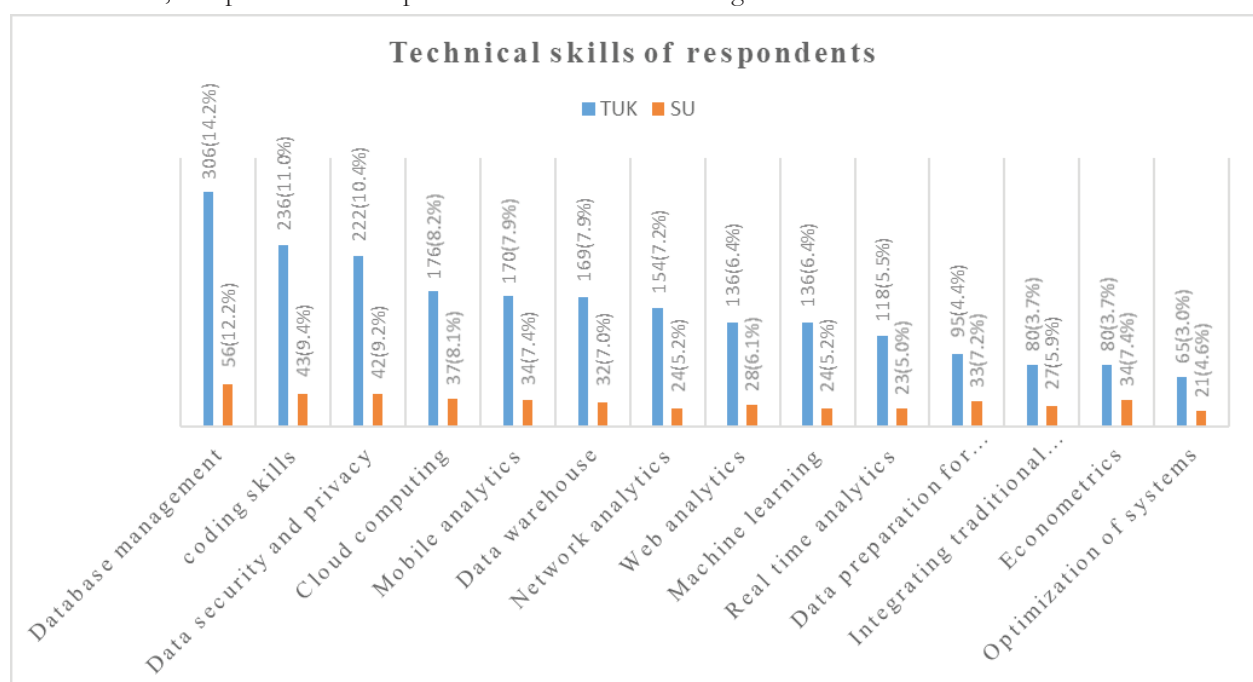


Figure 2: Technical skills of respondents

The most popular technical skill was database management with 306(14.2%) respondents from TUK and 56(12.2%) from SU. The other notable competences included coding skills indicated by 236(11.0%) respondents from TUK and 43(9.4%) from SU; as well as data security and privacy skills which was identified by 222(10.4%) respondents from TUK and 42(9.2%) from SU. The prominence of coding skills is understandable because it is one of the basic competency requirements for big data analysts. Data analysts need to master technical skills such as mathematics and statistics, data architecture design, and databases and data warehouse knowledge (Miller, 2014). Competency in data management seems to be the requirement for big data analysts. Among the study participants, competency in subjects related to data management such as data architecture design, databases, integration of different kind of data and preparing data for analytics was generally at a good level.

### 6.3 Tools for big data analytics

The staff were requested to rank their proficiency in the use of tools for big data analytics using a scale of 1-4 (where 1 was None; 2- Basic; 3- Proficient; and 4- Expert). Figure 3 presents the means of the responses from the two universities.

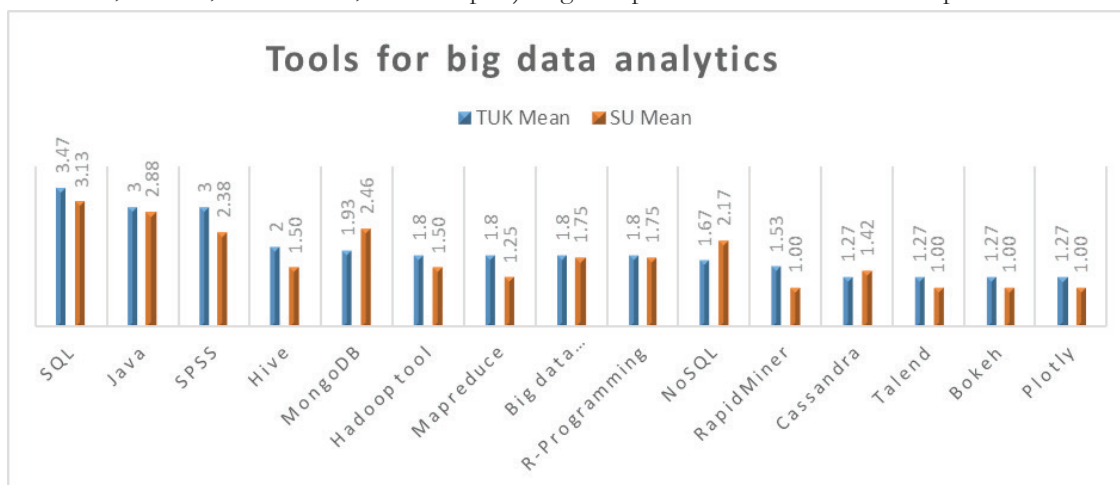


Figure 3: Staff means of tools for big data analytics

SQL tools had the highest mean with TUK having a mean of 3.47, while SU had 3.13 followed by Java as shown in Figure 3. This is an indication that most of the staff from the two universities are proficient in using SQL and Java tools for big data analytics. Based on the staff proficiency, the tools that had the least mean at TUK were Cassandra, Talend, Bokeh and Plotly, which had a mean of 1.27. At SU, the tools were RapidMiner, Cassandra, Talend, Bokeh and Plotly with a mean of 1. This meant that the staff had no proficiency in using the tools.

When the respondents from the two universities were asked to identify tools they have used for the big data analytics, the question yielded multiple responses because a respondent was required to tick as many tools as they are proficient in as shown in Table 3.

Table 3: Student's responses on tools for big data analytics

Technical University of Kenya			Strathmore university		
Tools for big data analytics	Responses	Percentages	Tools for big data analytics	Responses	Percentage's
Java	310	20.70%	Java	56	19.50%
SQL	241	16.10%	R-Programming	50	17.40%
SPSS	180	12.00%	SQL	42	14.60%
R-Programming	162	10.80%	SPSS	36	12.50%
NoSQL	118	7.90%	Hadoop tool	31	10.80%
Hadoop tool	97	6.50%	Mapreduce	21	7.30%
Mapreduce	75	5.00%	NoSQL	13	4.50%
Hive	71	4.70%	MongoDB	12	4.20%
Rapid-Miner	63	4.20%	Hive	8	2.80%
Cassandra	61	4.10%	Rapid-Miner	5	1.70%
MongoDB	50	3.30%	Cassandra	4	1.40%
Cloudera	42	2.80%	Cloudera	4	1.40%
Bokeh	14	0.90%	Plotly	3	1.00%
Plotly	14	0.90%	Bokeh	2	0.70%
<b>Total</b>	<b>1498</b>	<b>100.0%</b>	<b>Total</b>	<b>287</b>	<b>100.0%</b>

Source: Research Data

Table 3 shows that Java was the most popular tool in the two institutions with 310 (20.7%) at TUK and 56 (19.5%) at SU. The least popular tools were Bokeh and Plotly 14 (0.90%) for TUK, and Bokeh 2 (0.7%) at SU. Concerning tools, the basic requirements for data analysts seem to be competence in Java, SQL, and SPSS. Competence in SQL also seems to be needed in many cases.

#### 6.4 Techniques for big data analytics

The research sought to establish whether the concept of big data analytics was employed in the two academic institutions. The respondents were asked to explain why and how they undertake big data analytics. Two of the respondents expressed their views as follows:

*“Getting relevant information from big data requires approaches that help gain the insight from the data. This requires looking at all the data that you have and understanding what it contains to help you to decide what to do with any other data similar to it in future.” [TUK]*

*“To make meaning from big data, there needs to be analytics done to it. This will help organisations to get value from the big data through insights. It can be done by use of statistical analytics, for example, analysing how many students are admitted and from them how many manage to graduate.” [TUK]*

A number 16 (67%) of the respondents from SU reported that they used the theme of descriptive analytics to try and make meaning from data they had to support current decision making. The rest 8(33%) said they used predictive analytics which is the use statistics and algorithms to show patterns of events and relationships. Similarly, 12(80%) respondents from TUK indicated that most of them use descriptive analytics to make meaning from the big data while 3(20%) use diagnostic analytics. Below are some of the verbatim responses:

*“Analytics today is the bedrock of any growing business. This is because analytics can help us in bringing improvements in performance, enhance security, productivity, and efficiency. There are some very good developments happening in machine learning and artificial intelligence which could potentially have huge impact on organization.” [SU]*

*“Today, every discussion about changes in technology, business, and society begins with data. In its exponentially increasing volume, velocity and variety, data is becoming a new natural resource and if not well analysed it will not make sense to the society. Organisations need to explore their existing data and make sense from them to keep operating in business.” [SU]*

### 7 Conclusion

Both institutions used descriptive big data analytics to leverage on their big data. TUK also analysed its big data through diagnostic data analytics technique while SU also preferred predictive big data analytics technique. Arising from the findings from the two institutions the most used tools for big data analytics were Java and SQL. The institutions also used tools such as SPSS, R-Programming and NoSQL to get meaning out of their big data. The mean of proficiency in the various tools for big data analytics showed that the staff of the two universities were proficient in SQL followed by Java tools. However, they had inadequate skills on the use of tools like Cassandra, Talend, Rapidminer and MongoDB.

It also emerged that the two institutions use descriptive analytics. This was the most popular technique in both institutions. There was variance in the use of some techniques where SU applied predictive and TUK diagnostic techniques, SU used rules and algorithms to detect the patterns. They also employed statistical analysis, data mining and machine learning to get meaning from data. On the other hand, TUK employed diagnostic analytics to examine their big data. This is an approach where they just explore the different types of big data they generate and examine causes of events and behaviour based on the big data. The application of the two different big data analytics techniques could be so because SU has invested on big data analytics and has already established a lab that undertakes the project. The limitation of variety of techniques applied may also be indirectly related to low level of information and communication technology skills available in the institutions.

### 8 Recommendations

Based on the findings and conclusions of this study, the authors make the following recommendations:

#### 8.1 Embrace more tools of big data analytics

Both TUK and SU need to embrace more big data analytics tools. They should particularly explore open source tools such as Hadoop and cloud-based analytics systems which bring significant cost advantages on the analysis and storage of large amounts of data.

#### 8.2 Adopt diverse techniques of big data analytic

The two academic institutions should adopt diverse big data analytics techniques. For example, they can adopt techniques like learning analytics and mobile analytics techniques to enable them to get insight from their big data. Similarly, they can adopt advanced analytics techniques such as text analytics, machine learning, data mining, statistics, and natural language

processing. The techniques can be used to analyse previously untapped data sources independently or together with their existing enterprise data to gain new insights resulting in better and faster decisions.

### 8.3 Invest on big data analytics and training on big data analytics

Both academic institutions should invest in enhancing their ICT tools, skills and capabilities. Investing on big data analytics significantly increases value addition on services or operating profits. Also investing on training personnel on big data analytics builds skills for the analytics. Skilled employees across the spectrum of data analytics roles are in short supply. So, aggressive actions to address this problem are critical.

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SECTION 4:  
LEARNING  
MEDIA AND  
TECHNOLOGIES

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# Systematic Literature Review as a Means of Promoting Effective Use of E-Resources in Institutions of Higher Learning in Kenya

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## Abstract

*The digital age has fundamentally changed the world. With the introduction of electronic information resources, commonly referred to as e-resources, significant impact has been felt in the world of information. The Kenya Library and Information Services Consortium (KLISC), observed that despite the increase in the number of institutions that subscribe to e-resources, many academic institutions of higher learning in Kenya still record low use of e-resources. This is attributed to various reasons; for example, lack of marketing and promotion strategies among potential academic users including members of faculty and learners. This chapter proposes the promotion of Systematic Literature Review (SLR) as a way of encouraging the use of e-resources. Systematic Literature Review in social sciences is an orderly manner of searching for academic literature, selecting relevant literature following a set of inclusion/exclusion criteria, qualitatively analysing the selected literature, and reporting the findings in such a way as to generate a set of hypotheses or conclusions. A SLR involves four key steps: literature search, literature selection, literature analysis, and reporting of findings. This chapter describes the four steps involved in carrying out SLR in detail. This study encourages the use of SLR among users so as to assist them choose one or more of the e-resources databases and use keyword(s) search technique to carry out their research. The output of SLR can yield publishable papers, increase the use of e-resources available and justify the amount of financial resources spent on e-resources.*

**Keywords:** *E-resources use, Systematic literature review, Electronic sources, SLR, Institutions of higher learning, Kenya.*

## 1 Introduction

Information and Communication Technology (ICT) has significantly impacted the provision of library information services. As libraries embrace automation, there has been a rise in embedding electronic resources into the library collection and services. This is because of the Internet which has become an undisputed infrastructure of today's library. According to Odero-Musakali and Mutula (2007), Internet connectivity is essential for the provision of electronic information resources (e-resources).

Following the introduction of the Internet in Kenya in 1996 (Mutula, 2001) and the subsequent rise of electronic resources, libraries in Kenya came together in 2002 to discuss concerted efforts to overcome some of the challenges related to access to e-resources and the way forward. In response, the Kenya Libraries and Information Services Consortium (KLISC) was formed in 2003 (Ouma, 2007). The main objective of KLISC was cost sharing for sustainability of e-resources and capacity building. As of today, KLISC has increased its membership beyond academic institutions. According to Ouma (2007), the consortium has made great strides in providing access to e-resources and this has translated into better services offered by member libraries. Efforts to improve connectivity such as the laying of fibre optic cable which started in 2009, the formation of the Kenya Education Network (KENET) whose aim is to enhance Internet access for Kenyan universities and the need to have e-resources as a requirement set by the Commission for University Education (CUE) have impacted positively on the uptake of e-resources.

Electronic resources or e-resources, as they are commonly referred to, are online information resources. According to Akpojotor (2016), e-resources can be defined as an electronic representation of information which can be accessed via an electronic system or computer network. They include bibliographic databases, electronic reference books, and digital collections of journal articles.

In Kenya, there have been a number of e-resources initiatives supported by different organisations. Through funder-support, some have been made free for access and others offered at subsidised costs. Some of the initiatives in Kenya include HINARI, OARE, AGORA, AJOL, AIM, Medline, and PERi among others. However, academic institutions cannot solely rely on them considering that donor-funded projects may come to an end. Consequently, the formation of KLISC was timely (Gathoni *et al.*, 2011).

Currently, the consortium is made up of more than 150 member institutions. The membership includes universities, tertiary colleges, technical institutions, government ministries, parastatals and research institutions. Kenya Libraries and Information Services Consortium negotiate and pay for a collective subscription for electronic resources on behalf of its members. Kenyan libraries and other information centres are now accessing over 20,000 full-text electronic journals for teaching and research. Furthermore, KLISC is involved with supporting the improvement of Internet connectivity,

provision of computers and development of the capacity of library staff as well as researchers in the use of e-resources (Noreh, 2009).

## 2 Problem Statement

The provision of e-resources does come with various challenges. One way of identifying the challenges and possible ways to improve services is through monitoring and evaluation (Rosenberg, 2008). One of the roles of KLISC is to monitor and encourage maximum use of available e-resources. In 2011, the consortium conducted a national survey with the aim of monitoring and evaluating e-resources in academic and research institutions in Kenya. From the findings, it was established that though there was an increase in subscription of e-resources, their use was still very low. One of the recommendations was that there is need to employ more creative and high impact initiatives and activities that will promote the use of e-resources (Gathoni *et al.*, 2011).

Different promotional methods have been used to market and encourage maximum use of e-resources. However, this chapter presents the steps taken in conducting Systematic Literature Review (SLR) as one way of promoting wider use of e-resources and thus solving the problem of the underuse of e-resources among institutions of higher learning in Kenya.

## 3 What is Systematic Literature Review?

Selvam (2017, p.41) defines SLR as “an orderly manner of searching for academic literature, selecting relevant literature following a set of inclusion/exclusion criteria, qualitatively analysing the selected literature, and reporting the findings in such a way as to generate a set of hypotheses”. If an SLR is well conducted, it can help in reducing flaws or errors in a study, resolve confusion emerging from studies with conflicting findings, yield new insights by combining findings from different studies and justify the need for further research in situations where there is not enough evidence (Sambunjak and Franić, 2012). Bettany-Saltikov (2012) describes SLR as a scientific approach to research beginning with a specific review question, finds all relevant studies, evaluates their quality, and summarises their results using a scientific methodology.

Systematic literature reviews are common in medical sciences and psychology. In these fields of human knowledge, the procedure of meta-analysis; as it is also referred to, attempts to statistically analyse quantitative data to identify, appraise and synthesise available evidence, and on that basis, propose some conceptual or hypothetical conclusions. Qualitative systematic literature reviews are also increasingly being employed in social sciences (Selvam, 2015). While quantitative systematic reviews help in evaluating the strength of available evidence in terms of numbers, the qualitative reviews are beneficial in systematically schematising the emerging themes within the selected studies in relation to the research question of the review for some samples of published SLR (Connolly, Boyle, MacArthur, Hailey, and Boyle, 2012; Parris and Peachey, 2013).

Whittemore and Knafl (2005) indicate that SLR attempts to collate all empirical evidence concerning a specific topic and respond to a specific research question. In the process of applying the method, the researcher tries to minimise bias. While carrying out an SLR, conducting a comprehensive search to identify relevant studies is a key factor in minimising bias in the review process. Emphasis is placed (and not limited to) on the transparency of the search process and documentation.

## 4 Development of SLR: From QUOROM Statement to PRISMA

In the years preceding 1996, it was quite evident that there was poor reporting of key information in systematic reviews which according to Liberati *et al.* (2009) diminished their potential usefulness. Just like all other researches, SLR should be fully and transparently reported to allow readers to gauge the strengths and weaknesses of the investigation (Moher, Simera, Schulz, Hoey and Altman, 2008). This realisation led to the need for guiding standards in carrying out SLR. The rationale led to the development of what came to be referred to as the QUOROM (Quality Of Reporting Of Meta-analyses) statement (Moher, Cook, Eastwood, Olkin, Rennie and Stroup, 2000).

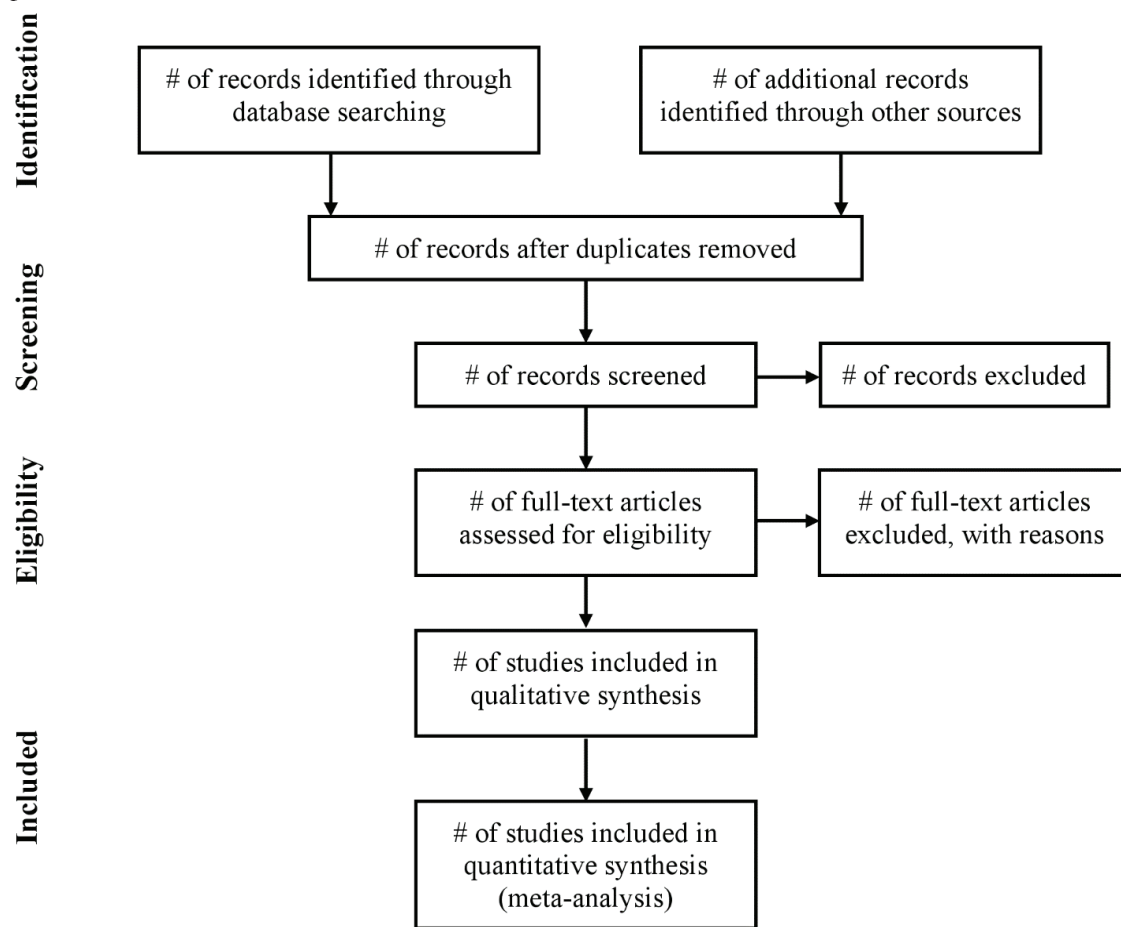
Developed in 1996 and published in 1999, the QUOROM Statement, became the guidance for reporting SLR. Despite the advances, suboptimal reporting continued and systematic reviews remained well short of the ideal (Tao, Li, Zhou, Moher, Ling and Yu, 2011). This prompted the need for an update and expansion of the QUOROM Statement to PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses). As an updated statement, PRISMA addresses both conceptual and methodological issues in SLR. Furthermore, it has a broader applicability than the original QUOROM Statement (Liberati *et al.*, 2009). The PRISMA Statement contains a 27-item checklist which includes items considered necessary for transparent reporting of a systematic review. The checklist's purpose is to guide users on how to develop a systematic review protocol and what to include when writing up a review.

According to the PRISMA checklist (Liberati *et al.*, 2009), one should set down a clear method which should include:

- All the databases to be searched and any additional sources used;

- Keywords to be used in the search strategy;
- Limits applied during the literature search, for instance, language, range of year of publication;
- Screening process, for example, scanning titles and abstracts for relevance according to inclusion and exclusion criteria;
- Data to be extracted from the relevant articles identified during the search; and
- Summary data to be reported in line with the primary aims of the literature review.

The statement also has a modified flow diagram which shows numbers of identified records, excluded articles, and included studies (Liberati *et al.*, 2009). According to PRISMA statement, all systematic reviews should include a flow diagram demonstrating the total number of publications that were identified and screened for eligibility; how many publications were excluded and the reason for their exclusion; and the final number of selected sources. Figure 1 presents the flowchart.



**Figure 1: Flow of information through the different phases of a systematic review**

The PRISMA statement, as captured in Figure 1, is focused on ensuring transparent and complete reporting of systematic reviews and meta-analyses. It is, therefore, an evidence-based minimum set of items for reporting in systematic reviews (Page and Moher, 2017; Stewart *et al.*, 2015; Liberati *et al.*, 2009). Therefore, SLR can be used by anyone who wants to keep up with the overwhelming amount of evidence that can sometimes emerge within their field, including policymakers, researchers, lecturers, and students (Bettany-Saltikov, 2012).

#### 4.1 The 5 Steps in carrying out SLR

In SLR, conducting a thorough search to identify relevant literature or studies is considered as a key factor in minimising bias in the review process (Budgen and Brereton, 2006). Therefore, the search process should be as transparent as possible and documented in a way that enables it to be evaluated and reproduced (Tacconelli, 2010). Selvam (2017) and others describe in some detail the four main steps to be followed while carrying out an SLR:

##### *Step 1: Literature Search*

The process of SLR begins by asking one or two precise research questions that would be answered by the literature review. These questions need to be reduced to certain search terms: that is, what key terms would provide the body of

literature to answer the research questions. The next would be to choose one or two databases of e-resources for search. Note that KLISC institutions subscribe to several databases such as EBSCOHost, Emerald, Taylor and Francis, Sage and among others. The user is expected to choose the databases depending on the subject-matter. The literature search should be carried out using the key term(s). These should be noted down as they need to be reported later. It is necessary to be systematic about the key terms used. Constructing an effective combination of search terms involves breaking down the review question into easily understood and easy to search concepts (Tacconelli, 2010).

In order to be systematic, search strategies or techniques such as Boolean formula and Truncation can be used. Boolean operators aid in forming relationships between concepts or words for the purpose of establishing search parameters (Best, Taylor, Manktelow and McQuilkin, 2014). The most frequently used Boolean operators are:

- AND - used between terms to capture articles containing both terms;
- OR - used to retrieve papers using either term; and
- NOT - too narrow or refine a search (Houser, 2012).

One can also choose to use other search strategies such as truncation. This is a searching technique where a word ending is replaced by a symbol. Some of the frequently used truncation symbols include the asterisk (\*), a question mark (?) or a dollar sign (\$) (Golder, McIntosh, Duffy and Glanville, 2006).

#### *Step 2: Literature filtering and selection*

Depending on the topic under study and the choice of database(s), literature search may yield a large number of potential records. Upon assessment and evaluation, according to the criteria used, only a small proportion may eventually be included in the review (Tacconelli, 2010). The process of selection must, therefore, minimise biases. Biases may occur when the decision to include or exclude certain studies is made. However, Tacconelli (2010, p.23) adds that “even when explicit inclusion criteria are specified, decisions concerning the inclusion of individual studies can remain subjective. Familiarity with the topic area and an understanding of the definitions being used are usually important.”

Different criteria could be used in filtering out the entries. Inclusion criteria could include: peer-reviewed articles, English language. Exclusion criteria might be book-reviews. Filtering out using a time-frame or restricting the number of years could also be used as a criterion (Selvam, 2017). All these choices need to be justified. Most of the databases provided through KLISC have an inbuilt mechanism of filtering made possible by a click. Databases such as EBSCOHost have click-on filters which are easy for a user to apply. If the results are still too many, then the researcher would need to read the abstract of the articles and filter out.

To ensure that the literature-selection is comprehensive, cross-references may be used: that is, sources cited by the already selected sources could be identified and added to the selected list. Google Scholar could be used to get a comprehensive view of the subject matter, even though it is through the subscribed databases that one would have access to full-texts. Some authors have suggested the use of expert-consultation, including requesting suggestions from authors whose works have been already identified as crucial to the topic (Okoli and Schabram, 2010). Books could also be added to the collection of selected resources, in addition to articles, unpublished theses, research reports, and policy documents.

The study selection process must be reported using the PRISMA flow chart. According to Tacconelli (2010), the search process should be reported in sufficient detail so that it could be re-run at a later date, or by someone else to verify for reliability. The easiest way to document the search is to record the process and the results simultaneously. The decisions reached during development and any changes or amendments made should be recorded and explained.

#### *Step 3: Literature Analysis*

Once the resources have been selected, they are to be systematically analysed with the aim of identifying common patterns that would respond to the research questions of the literature review. If the scope of the literature review is to carry out a meta-analysis of quantitative data, then an appropriate quantitative analysis technique is carried out on the data emerging from the selected literature. If the scope of the literature review is qualitative, then we recommend the method of thematic analysis. “Thematic analysis is a method of identifying, analysing and reporting patterns (themes) within data” (Braun and Clarke, 2006, p.79). Often this approach goes beyond identifying and analysing to interpreting various aspects of the research topic. In this way, thematic analysis is very flexible. If the literature is being read from the perspective of a selected theoretical framework, then it would be helpful to use a coding template evolved from the theoretical framework. However, if the researcher uses a grounded theory approach then the themes are said to ‘emerge’ from the data (Charmaz, 2008). For this purpose, the following steps could be used:

Step 1. Initial coding: The selected documents are meticulously read, highlighting sentences that seem to provide answers to the research question. They are then given codes.

Step 2. Axial coding: In the second level of coding the initial codes are merged into more generic codes. No new codes are created at this stage, but existing codes are merged to reduce their number.

Step 3. Thematic identification: At this stage, an attempt is made to merge the second level of codes into themes. These themes are used to generate the report. Standard software for qualitative analysis such as Nvivo or ATLAS-ti could be used to analyse literature.

#### *Step 4: Reporting Findings*

The general outline for the report of the SLR follows the one recommended by *Publication Manual* of the American Psychology Association (APA): Abstract, Introduction, Method, Results, Discussion, Conclusion, and References. In the Introduction, the problem statement is made that generates the research question(s) for the literature review. In the Method section, the process of Literature Search, Literature Selection, and Literature Analysis are transparently described in sections with corresponding titles. In the Results section, the findings are reported. The report of the identified themes could be preceded by a summary of the list of the selected literature and other reports regarding the characteristics of the literature, in terms of year of publication, or location (for a good report see Theron and Theron, 2010). The main results section should be divided up according to the research questions. The themes are reported with ample evidence for the claims providing references to the analysed literature, sometimes even with verbatim quotes. The Discussion section engages the results with broader literature pointing to the implication of the emerging data from the literature analysis. The Conclusion will evaluate and point out limitations of the whole exercise.

## 6 Conclusion

Researchers carrying out SLR are increasingly using electronic bibliographic databases as their initial and dominant resource of information. However, many current research reports fail to demonstrate that electronic information sources have been fully exploited indicating a hit-and-miss approach rather than a systematic search methodology (Han and Kamber, 2001; Petticrew and Roberts, 2006; Jenkins, 2004). In fact, the success of an SLR is based on a good electronic database with related information to the subject under study.

The availability of electronic databases provides an easy reach to information resources that would enhance SLR. By encouraging SLR, users of e-resources will have an opportunity to comb through an avalanche of resources provided by KLISC. Faculty members would, therefore, need training in order to equip them with skills on how to carry out SLR. Thus, countries such as Kenya do not have to mourn the lack of opportunities. It is a question of learning the methodology of using the opportunities to generate knowledge. The use of e-resources is an indispensable method in combing the information available so that the new knowledge is rightly claimed to be new. As argued and described in this article, SLR is one valuable way of handling e-sources in a systematic manner. In this way, the financial resources spent by the institutions of higher learning through the services of KLISC will be proportionately exploited.

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# The use of WhatsApp as a Learning tool for French Language at the Technical University of Kenya

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## Abstract

*This chapter analyses the educational potential of French language WhatsApp groups that are created and used by learners under an administrator at The Technical University of Kenya (TUK), with the participation of the instructor. The objective is to explore learner-administered WhatsApp groups, referred to in this chapter as “third space” that is situated between the institutional space of instructor-managed WhatsApp and non-institutional, personal space of WhatsApp. The chapter examines six student managed WhatsApp groups and provides an analysis of a survey answered by 117 learners from the departments of Information and Knowledge Management; Tourism and Travel Management; Leisure and Events Management; and Hospitality and Restaurant Management at the TUK. The students in the named departments take French as a course unit in their programmes. The author also conducted group interviews with learners from the four departments. Based on the interviews and the survey, the author concludes that WhatsApp application is an important educational platform for students at the Technical University of Kenya to receive assignments, reading material as well as oral and visual audios for continuous practice. On the basis of the analysis of WhatsApp groups, this chapter also concludes that the examined WhatsApp groups can be characterised as a third space where learners harmonise their personal life with academic work.*

**Keywords:** Media, Technology, WhatsApp, Learning, Learners, French.

## 1 Introduction

The Internet has changed lives considerably. As technology grows and changes, people’s daily lives change. According to Hamad (2017), today people do not need a digital camera or even a personal computer to perform certain tasks. They only need a simple smartphone. The education system has developed rapidly universally, technology has invaded our life, and today almost everyone has a smartphone and are using WhatsApp, Facebook, Twitter, Instagram, and Telegram, among others. The generation in today’s classroom is addicted to these applications for social relationship and fun. The digital devices have a range of networking platforms such as WhatsApp, Skype, Facebook, Twitter and YouTube.

*“Today’s youth are experiencing the impact of living and developing under the everyday influence of digital technology. In response, inspired educators go to great strides to develop relevant methods for meaningfully incorporating these technologies into learners’ classroom learning experiences” (Blackwell, 2012).*

In 2013, teaching of foreign languages at the Technical University of Kenya (TUK) was still mostly done using blackboards and the whiteboards. The use of digital technology started gaining ground in the university in the language classroom in 2014. A study conducted by Otieno (2017) concludes that incorporating the latest digital technology into traditional language teaching systems has opened up a wealth of multimedia and interactive applications available to bring teaching methods into the 21<sup>st</sup> Century. Most language instructors in the university are now using computers and the Internet a lot to teach the foreign languages. It was noted that the use of these digital devices has helped to improve the learning and the teaching of foreign languages in the institution in the past four years.

This chapter, therefore, shows how the use of WhatsApp application has helped to further motivate the learning of French language in the institution. The chapter also addresses the methods the instructors can use to improve on the difficulties that are encountered and offers suggestions for practitioners who would like to replicate this experiment.

## 2 Problem Statement

At the Technical University of Kenya learners take 48 hours of class over the period of one semester. In reality, very little time from this total period is given to each learner to exercise the five skills during class hours given the number of learners in today’s language class. A class can have as many as 40 to 60 learners. Arnaud (2008) argues that two-thirds of French language instructors speak between 50% and 70% of the class time. In the language classroom, the vast majority of exchanges always follow a particular method. The instructor asks a question which is answered by a learner before being corrected or confirmed by the instructor. Therefore, the learners are left with only one third of interactions while the instructor is left with the remaining two thirds. A language class does not always focus only on the speaking skill and will often allocate time to the four other skills. If for the sake of this demonstration, we distribute time evenly between the 5 skills, this would give very little time allocated to each learner per skill, especially for oral expressions and oral interactions.

Since most of the students who learn French at the Technical University of Kenya do not come to the university every day, it is difficult to gather them if the instructor needed to reinforce some elements of the lesson. This author, therefore, started to think of a method of enhancement between the learners. She had to choose between Facebook, Twitter, WhatsApp or Text messages. The researcher picked WhatsApp as it is the most common app used by the learners. Furthermore, the students do not need a computer to use it because it is accessible and does not cost much. The researcher, therefore, decided to use WhatsApp to facilitate and create an avenue for learning and communication as well as it is the most common App to the learners. Besides, they always have their mobile phones and smart phones in their hands. It is also cheap to activate the app. After getting the students' approval to use WhatsApp for learning when they are out of the class, the learners created six groups, that is, for the six different classes of French, that the learners gave different names. The instructor then started opening discussions for the groups by uploading videos and audios. Some classes only take French one day in a week. These learners therefore only tend to look at their French materials only on that particular day. The instructor had to look for a way to make these learners engage in the language on a daily basis.

The main objective of the study leading to this chapter was to determine the impact of using WhatsApp application in the teaching of French language. The researcher's main focus was on the exploration of the learners' opinion and also observing their progress after using the application to support their learning of French as a foreign language. This chapter provides answers to these questions: 1) Does the introduction of WhatsApp groups in various classes helped to improve the learners' skills in French? 2) Does WhatsApp help the students to learn from their colleagues? 3) Does WhatsApp help the learners to overcome their fear of the French language? 4) Does WhatsApp help to motivate the learning of French at the Technical University of Kenya?

### 3 Theoretical Framework

The chapter is framed within four theories provided by Ghada (2016). These are the theory of active learning; theory of activity; theory of community sharing; and the theory of learning communities. These theories suggest that collaboration promotes learning. According to Ghada (2016), WhatsApp learning fosters online community teaching and learning among learners who collaborate while participating in course activities.

Citing Bielaczyc and Collins (1999), Ghada (2016) adds that WhatsApp mediation promotes the construction and dissemination of knowledge among the collaborating and interacting learners through collaborative learning activities. She further cites Rovai (2002) that WhatsApp mediation helps the learners to get their queries to be answered quickly while participating in a supportive, interactive, and collaborative community. Activity theory is also suited for the current study since the experimental group participants could construct and analyse interactions among the learners who might utilise the expeditors to impact their participation in online discussion. Furthermore, this theory helped the author to identify the key factors that determine students' needs to involve in online discussion. The author uses the activity theory to investigate learner–phone interactions. The author examines the structure, progress and context of the recommended activities facilitated by WhatsApp such as the communication of text messages, visuals, videos and word files.

Community sharing as developed by Engestrom (1987) forms another theoretical framework of this study. Engestrom reveals that the activity theory incorporates guidelines that facilitate the division of labour between the learning community and the subject. The community sharing theory seeks out to analyse the social and mechanical aspects of social action (Bertelsen and Bødker, 2000). Ghada (2016) explains that community or externalisation is reflected as a social environment of the system and a community level of activity theory. All experimental group learners are engaged in the activity system whereby their engagement in learning is based on social communication targeting the construction and sharing of knowledge in an exemplary learning community.

### 4 Methodology

The study was conducted at the Technical University of Kenya in two schools in the Faculty of Social Sciences and Technology. The two schools were the School of Information and Communication Studies (SICS) and the School of Hospitality and Tourism Management (SHTM). Four different departments, namely Department of Information Knowledge Management, Department of Hospitality and Restaurant Management, Department of Tourism and Travel Management and the Department of Leisure and Events Management participated in the study. The population of the study were students from first to fourth year who are studying writing, reading, listening and speaking skills in French. The study was conducted during the first semester of the 2017/2018 academic year.

The author used an analytical descriptive method to conduct this study. A survey was used to collect data from the students. Additional data was collected through non-obtrusive observation. The results were coded manually and analysed using SPSS, a statistical analytic tool. The survey had 12 questions where the learners had to select Agree, No Idea or Disagree.

### 5 Findings and Discussion

The findings from this research reveal that using multimedia in the WhatsApp messages made the exchanges richer as well as more relevant to the learning of French language. Almost all respondents supported the use of WhatsApp to enhance students' learning and enthusiasm. Using WhatsApp helped the students to develop French language skills and enriched their vocabulary as they learnt from their classmates.

The use of WhatsApp application for academic work finds itself between academic work and personal life. Consequently, the learner has three spaces in his or her life as shown in Figure 1 below. When a student buys a smartphone, he or she buys it for his or her personal life and not for the academic work. The student then downloads the Apps he or she would like to use, WhatsApp being one of them. WhatsApp is a social media and most of the students in the university spend most of their time on this platform given that there is a free Wi-Fi provided within the university. Most of the learners interviewed said they spent almost a total of three hours combined in a day on the WhatsApp platform.

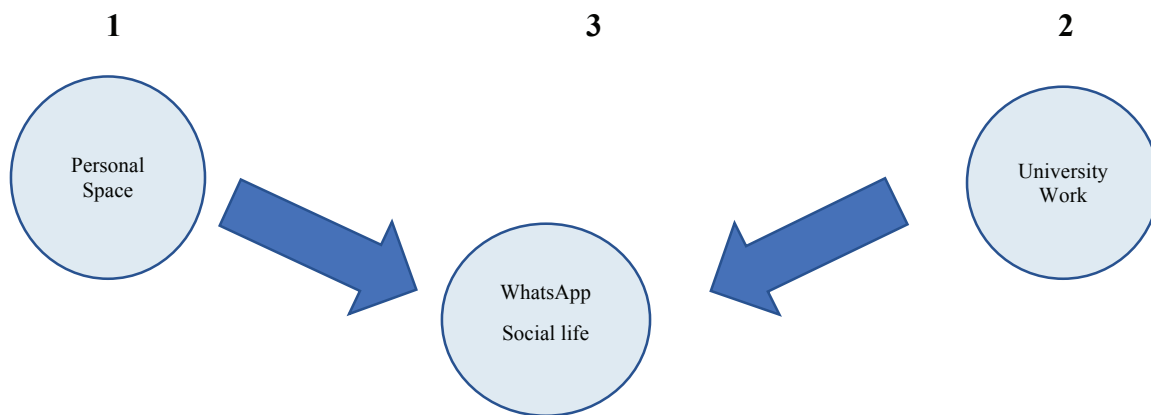


Figure 1: Media and technologies between personal life and university work.

A total of 117 learners participated in this survey. They were given a questionnaire with a total of 12 questions to answer. The questions were basically on the learners' experience on the use of WhatsApp platform as a tool to learn French. The findings from the survey are presented hereunder.

Please, note that where the response is indicated as "N/A" implies that the respondent did not provide a usable answer to the respective question.

#### 5.1 Ease of downloading WhatsApp

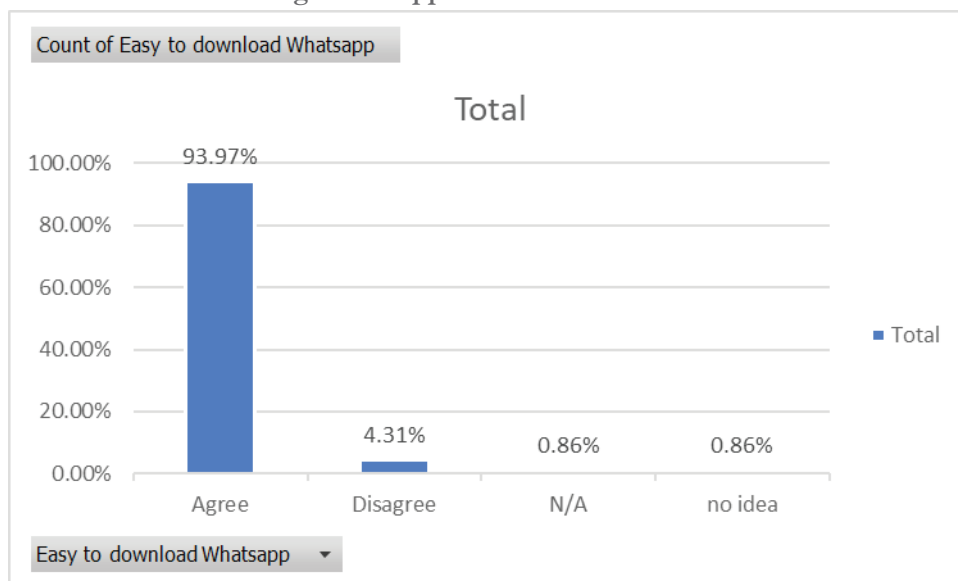


Figure 2: Ease of downloading WhatsApp

As shown in Figure 2 above, 93.97% of the learners agreed that it is easy to download WhatsApp on their cell-phones.

### 5.2 Writing skills developed by WhatsApp

The respondents were asked whether the introduction of WhatsApp groups in various classes helped to improve the learners’ skills in French. This question has been answered as shown in Figure 3.

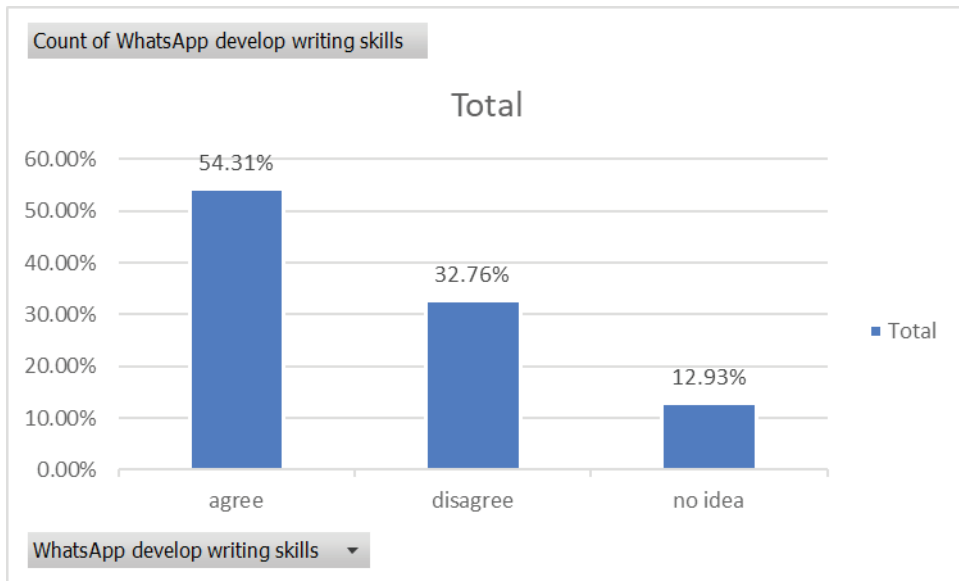


Figure 3: WhatsApp and improvement of learners’ skills in French

The majority of the learners, 54.31% agreed that WhatsApp platform helped them to develop their French writing skills. However, 32.76% disagreed while 12.93% had “no idea”. The latter two responses could be attributed to the fact that these learners may have not participated actively in writing messages. As the learners practise to express themselves on the platform, the instructor corrected them in certain cases and avoided correcting mistakes most of the times as this would discourage the learners from participating.

### 5.3 Listening skills developed by WhatsApp

As indicated in Figure 4 below, 43.97% agreed that WhatsApp helped them to develop their listening skills while 41.38% disagreed; 12.93% had no idea. The learners who disagreed are likely to be those who do the listening once and then give up claiming that they have not understood anything.

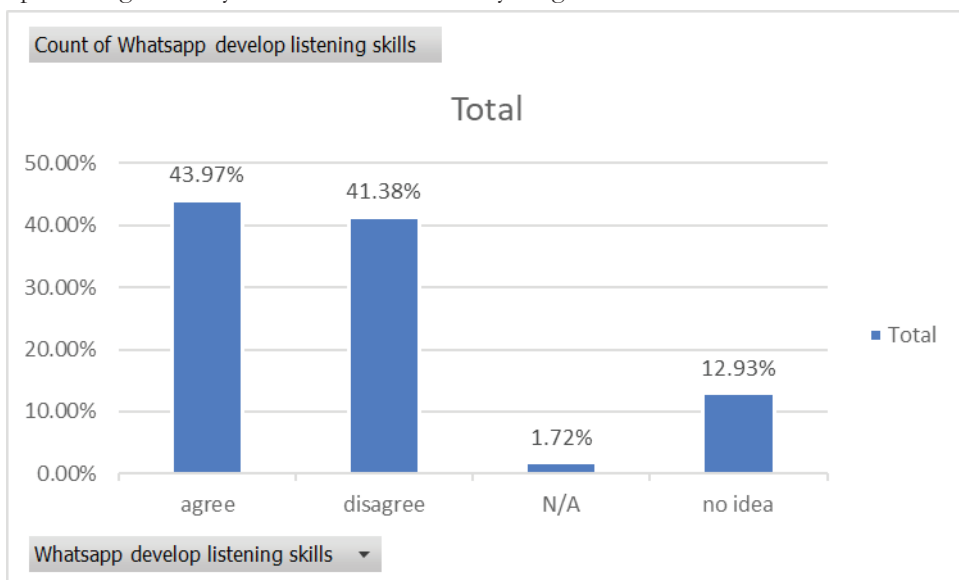


Figure 4: WhatsApp and listening skills

### 5.4 Reading skills developed by WhatsApp

The majority (77.62%) of the learners agreed that WhatsApp has helped them to develop their reading skills as they have to read their classmates’ comments and responses. The other responses were as shown in Figure 5.

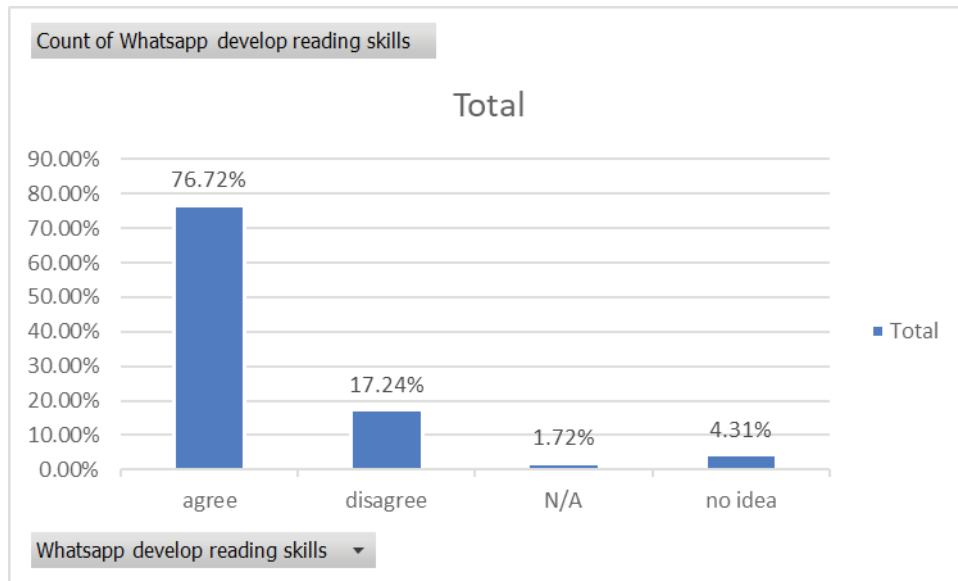


Figure 5: Influence of WhatsApp on reading skills

### 5.5 Speaking skills developed by WhatsApp

The findings as shown in Figure 6 indicate that this application has not helped develop the learners speaking skills. This could be attributed to the fact that no recorded speech was done in any of the groups.

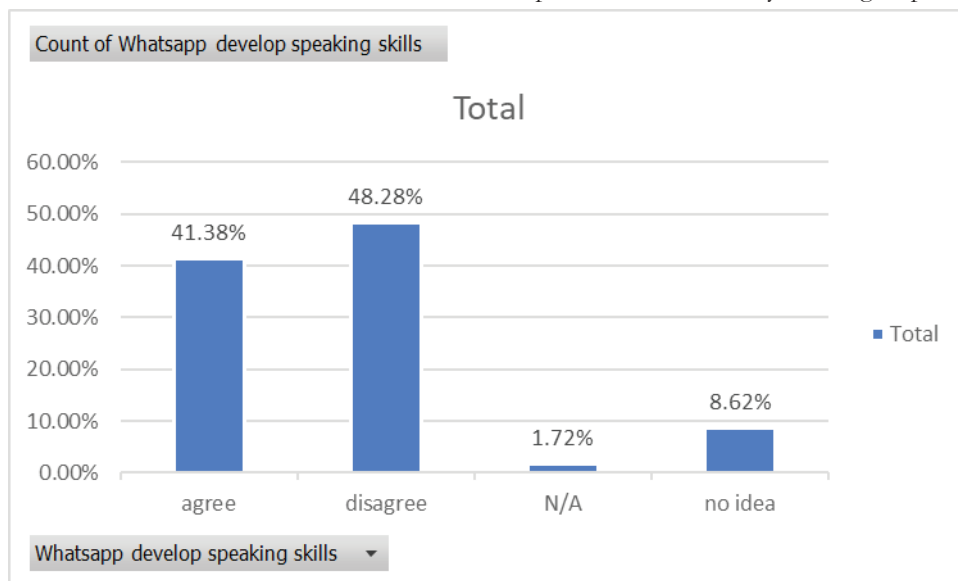


Figure 6: Influence on WhatsApp on speaking skills

### 5.6 WhatsApp influence on direct thinking in French

As shown in Figure 7, most learners still think in other languages before expressing themselves in French language.

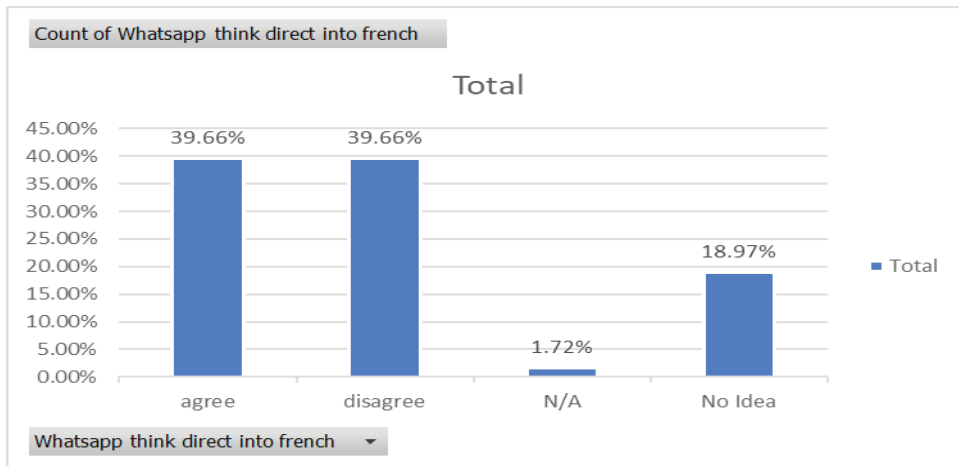


Figure 7: Thinking directly in French

5.7 WhatsApp helped in learning from colleagues

The majority, 89.66% of the students agreed that using WhatsApp has helped them to learn from their colleagues. Other learners posted very helpful material that they benefited from or when the instructor corrected their colleagues' mistakes; they also learnt from the correction.

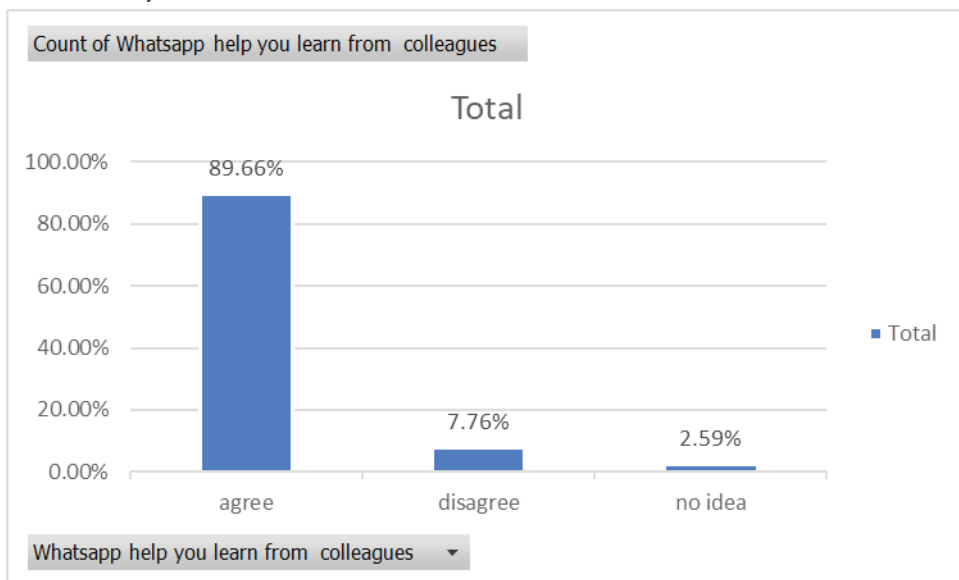


Figure 8: Learning from colleagues through WhatsApp

5.8 WhatsApp helps in enriching vocabulary

As shown in Figure 9, the majority of the learners, 71.55% acquired a lot of vocabulary from the WhatsApp platform. Most of the learners agreed that WhatsApp helped them to enrich their vocabulary by reading their classmates' comments and responses. They also found an opportunity to use the vocabulary they acquired to communicate their messages in turn.

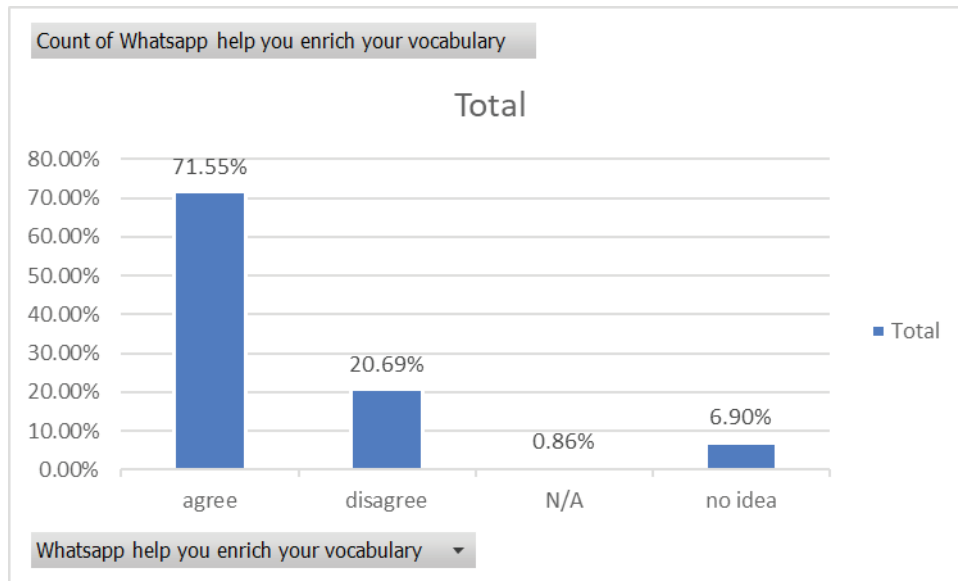


Figure 9: Influence of WhatsApp in enriching vocabulary

### 5.9 WhatsApp influence in overcoming fear to use French language

The majority of the learners at 56.90% agreed that the WhatsApp platform helped them to overcome the fear to learn French language owing to the fact that they were not in direct contact with their classmates and even the instructor.

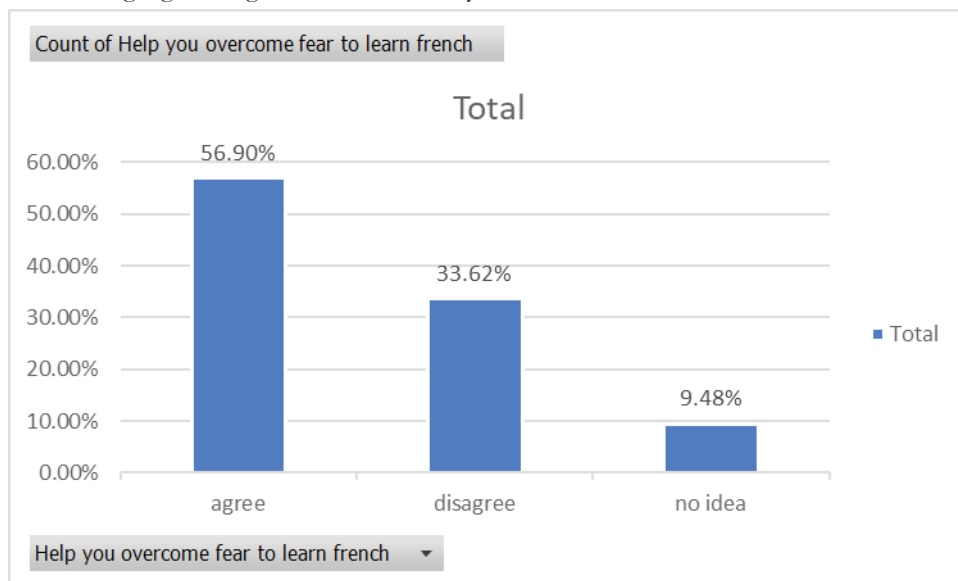


Figure 10: Overcoming fear of French

### 5.10 WhatsApp on accessing class assignments compared to photocopies

Most of the learners (86.21%) agreed that accessing assignments on WhatsApp is faster than making photocopies. They would rather take photos of the assignments and send the same to the WhatsApp platform and use the free Wi-Fi in the university to access it.

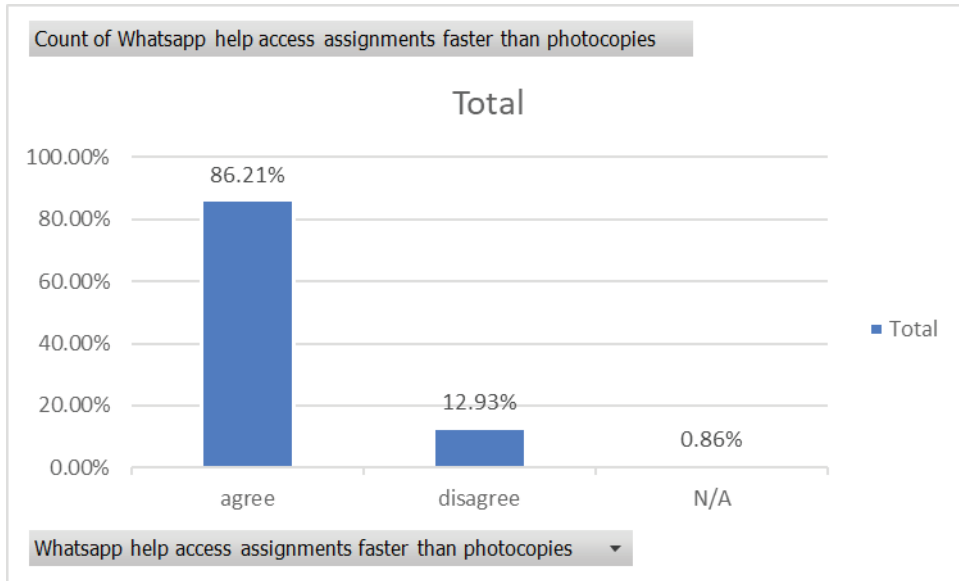


Figure 11: Ease of access of assignments on WhatsApp

5.11 WhatsApp as a motivator to learning French language

The majority (75.86%) of the learners agreed that WhatsApp has helped to motivate their learning of the French language as compared to 17.24% of the learners who disagreed.

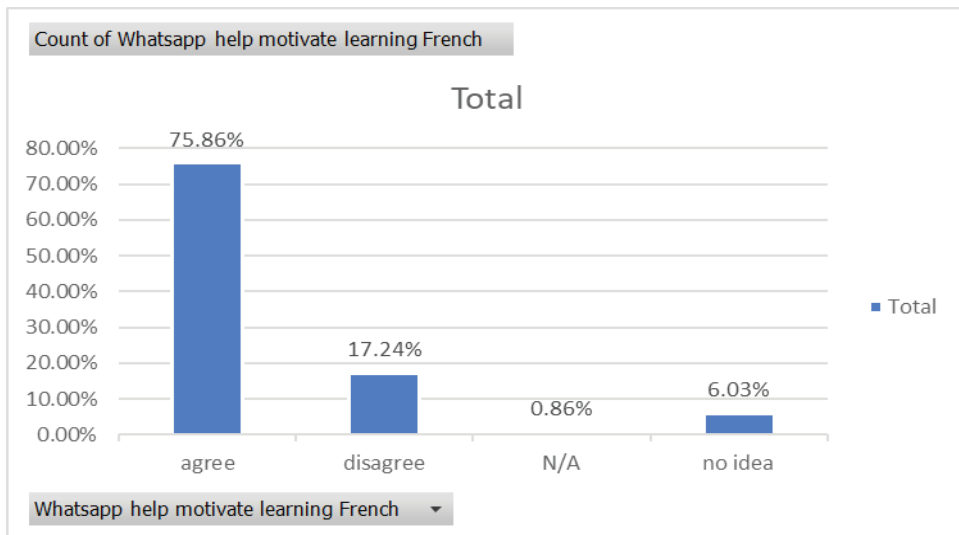


Figure 12: WhatsApp as a motivator to learning French

5.12 Ease of contacting instructor through WhatsApp compared to other applications

As shown in Figure 13, the majority (74.14%) of the learners agreed that it is easier to contact the instructor through WhatsApp than through telephone. This is because WhatsApp is free whereas using the phone implies some cost.



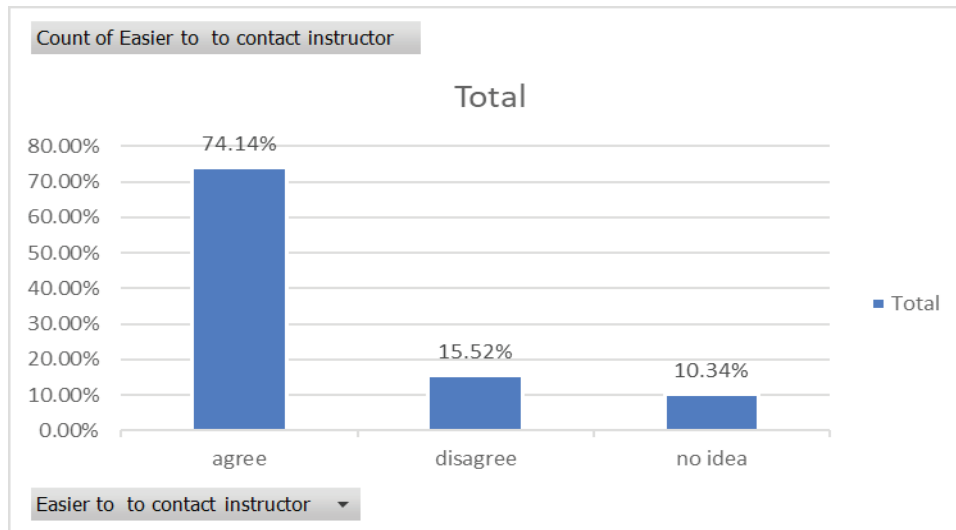


Figure 13: Ease of contacting instructor using WhatsApp

### Discussion of Results

Three issues emerged from the findings which are of concern to the author: (1) WhatsApp did help a small percentage of learners to develop their listening skills. Learners should learn from the audios and the videos that are sent in the group but only 43.97% agreed, 41.38% disagreed while 12.93% had no idea. (2) WhatsApp did not help the learners to develop their speaking skills. 48.28% disagreed that WhatsApp helped them to develop their speaking skills whereas 41.38% agreed while the remaining 8.62% had no idea. (3) WhatsApp did not really help a big percentage of the learners to think directly in French. The percentage of those who agreed and those who disagreed is the same at 39.66%, whereas 18.97% had no idea.

The results obtained in this study show that WhatsApp has helped the learners to overcome most of the obstacles in the learning and teaching of French as a foreign language at the Technical University of Kenya. The results have shown how the instructor can take advantage of the technology that the learners have on their phones even if there is no Internet available in the classroom. Most of the activities can be set up by the instructor and extended beyond the classroom when learners later connect to Wi-Fi. The study also reveals that learners can share their phones at different stages of class activities in the classroom or outside the classroom.

### 7 Challenges Encountered Using WhatsApp

According to the author, the study was a great success apart from having some cases of indiscipline. Some learners posted messages either in English or Kiswahili in some of the groups. The administrator would give them warnings that if they continued, they would be removed from the group.

The biggest challenge of this study was either the occasional instability or the absence of Wi-Fi connection within the university and students had to use their mobile data for the sessions. In most cases, the data speed was low leading to delayed downloads as well as uploads of the learning material. The other inconvenience was that the learners' mobile phones ran out of power before the session ended.

### 8 Conclusion and Recommendations

This study has accentuated the significance of using the WhatsApp application as tool which can improve the teaching and learning of French as a foreign language at the Technical University of Kenya. The study has pointed out that the WhatsApp can ameliorate students' learning and increase their motivation for the learning of foreign languages. Abraham Gert van der Vyver and Marais (2015) also pointed out that social media platforms like Facebook and Twitter makes it possible to generate a running commentary of feedback which can be used to effect managerial adjustments if and when needed, and this also applies to the use of WhatsApp as a learning tool. Using WhatsApp application in enhancing the language skills is significant through exchanging of files between the learners and the instructor. The use of this application also helped to create an atmosphere that increased the learners' sense of belonging. This in turn helped to improve their performance in the language.

As pointed out by Church and de Oliveira (2013), the easy access to WhatsApp application tool along with the low cost and the affordability of the tool made the tool more useful and efficient in the teaching and learning of the language. The instructor can communicate with their learners through these mobile applications. This application may also be

utilised further as a means for giving assignments or any material that the instructor or the class members would wish to share.

The author makes two major recommendations for further research on the use of WhatsApp application in the institution:

1. another study should be carried out on the speaking skills alone as the result on the speaking skill was low;
2. an investigation should be conducted on the effectiveness of the WhatsApp tool in exchanging ideas, suggestions and experience among the language instructors in the institution so that instructors could broaden their perspectives of how to improve pedagogical practices and achieve objectives in teaching foreign languages such as French and German in the case of the Technical University of Kenya.

This constant availability of learning anytime anywhere has made WhatsApp an efficient and convenient tool for teaching learning activity in the institution.

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# Behaviour Modelling in a Learning Management System

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## Abstract

*Learning Management Systems lack automated components that analyse data and generate information on learner behaviour. Manual methods involving administering questionnaire related to a specific learning style and cognitive psychometric tests have been used to identify such behaviour. The problem with such methods is that a learner can give inaccurate information, it is time consuming and prone to errors. Although literature reports complex models for predicting learning style and cognitive traits, most studies reviewed are based on single behaviour and tested on specific learning platforms. The primary objective of this study was to design, develop and evaluate a model complementing Learning Style with psychology-based ones such as Cognitive Trait. An automatic model based on Felder-Silverman Learning Style Model, and Cognitive Trait Model was designed. From this, a prototype estimating learning behaviour based on the two theories was developed and evaluated with students in a classroom environment. Results indicated precision and recall above 0.5 demonstrating the model can be relied on to identify the two learner behaviours. This chapter brings forth a generic modelling architecture that developers can integrate with existing learning management system platforms to improve learner characterisation. Furthermore, a lecturer can use information generated by the model to provide learning materials matching identified characteristics for each student and also apply appropriate teaching methods.*

**Keywords:** *Learning Style, Cognitive Trait, Learning Management System, Learner Modelling, Learner Behaviour.*

## 1 Introduction

Learning Management System (LMS) is a web based platform that manages the delivery of online courses (Ondřej, Hála, and Přeč 2010). Such systems create class attendance roster, register users, upload, manage and deliver content, and create online tests. Examples include Blackboard Learn, Desire 2 Learn, Moodle, Activate Mind Solutions and Claroline (Don 2014). Most LMS have Sharable Content Object Reference Model (SCORM) specifications. SCORM is an eXtensible Markup Language (XML) framework for defining and accessing learning contents to allow navigation, sharing and compatibility among different LMS. The systems generate huge volumes of data during student access that can be analysed to create knowledge useful for online tutors and lecturers. These include access statistics, login details, learning progress and server logs. Instructors in most cases rely on a quick view of such basic learning data to monitor progress.

It has been reported that individuals have different learning preferences and cognitive behaviour regarding leaning materials they use. Learning style is defined as the most preferred mode of instruction or study (Pashler et al. 2008). Cognitive trait is defined as the ability to perceive, learn, remember, think, reason, and understand (Doshier, Zhong-Lin, and Barbara 2007). The literature reports several theories on learning style and cognitive traits. Some examples of learning style theories include Felder Silver Model (Felder 1988), Myers Briggs Type indicator (Myers 1995), Kolb learning model (Kolb, A. 2015) and Visual, Aural/Auditory, Read/Write, and Kinaesthetic learning styles (Fleming 2014). Some examples of cognitive theories are Information Processing Model (IPM) and Cognitive Traits Model (CTM).

The problem with LMS is lack of features that automatically analyse records of students' access to generate knowledge on individual behaviour such as learning styles and cognitive traits but instead treat learners equally.

Instructors have previously administered manual instruments such as Index of Learning Style (ILS) questionnaire (Felder, 1988) and psychometric tests like operation task span (Turner & Engle, 1989) to gather information on learning styles and cognitive traits respectively. A recent study conducted by (Lamia and Yamina 2018) developed a model generating course content matching data gathered using manual learning style questionnaire. The method was experimentally validated with promising results. The weakness with the approach is that a learner can give inaccurate information. Administering questionnaire and cognitive tests like operation task span is also time consuming, prone to errors and tedious thus can compromise results.

As a result of the above challenges, studies have been conducted to create automated computer applications that analyse log data gathered during students' interactions with LMS without additional effort to use psychometric tools or questionnaire. One recent study reported with significant evaluation results is a system taking users' answers as an input to the system and inferencing using fuzzy logic to predict the learning style (Ozdemir et al. 2018). Another related study using intelligent agents to customise and adjust the learning time according to the learner's concentration time during LMS access (Kamsa, Elouahbi, and El Khoukhi 2018). Evaluation done by simulation experiment reported dependence

between concentration time and success of the learners. (Ghadirian, Fauzi Mohd Ayub, and Salehi 2018) analysed the learning activity log and discussion records to investigate how perceptions of online discussions influenced the participation and e-moderation behaviours reporting significant results. Santoso (2018) proposed a learning monitoring tool capable of visualising and collecting data in a form that facilitates lecturer observation, analysis and targeting of specific concepts. Interview conducted among potential users confirmed the model fulfilled their needs comment. The approach, however, was only tested and validated with Moodle LMS.

Some researchers have attempted to map records of LMS access to identify learning styles and cognitive behaviour based on specific theories. (Pham and Florea 2013) created a system automatically estimating learning styles with reference to Felder-Silverman Learning Style Model (FSLSM) based on their behaviours in an online course. Evaluation of 44 students reports an average precision of above 65%. Although literature has reports on use of complex models to predict learning style and cognitive traits, most studies reviewed were based on single behaviour and tested on specific learning platforms. Only a few investigate a combination of cognition-based theories such as working memory capacity and psychology based ones such as learning styles. Knowledge discovered on a single learning theory identifies certain traits while leaving out others leading to incomplete or partial student modelling process thus unreliable information.

Thus, the study on which this chapter is based sought to answer the research question: is it possible to establish a methodology for automatic estimation of learning styles and cognitive trait from LMS records? The study used Felder-Silverman Learning Style Model (FSLSM) and Cognitive Trait Model (CTM) as theoretical frameworks.

FSLSM profiles a learner as active or reflective, sensing or intuitive, sequential or global and visual or global (Felder 1988). The model uses a 44 - questions Index of Learning Styles Questionnaire (ILS) with 11 for each dimension as a manual measurement tool. A student selects choice a or b. Questionnaire score sheet classifies a respondent as 1-3 mild, 5-7 moderate, 9-11 strong preference for either dimension. A study conducted by (Litzinger et al. 2007) indicated the tool generated consistent, reliable and valid results.

CTM profiles learners based on their mental ability in terms of working memory capacity, inductive reasoning ability, associative learning and information processing speed (T. Lin, Kinshuk, and Graf 2007). Most studies have administered psychometric tests such as operation task span (Turner and Engle 1989) to measure cognitive traits. (T.-Y. Lin, 2007) used psychometric tools to gather data about the three cognitive traits of students - working memory capacity, inductive reasoning ability and associative learning. The data were used to validate results generated by cognitive adaptive system and reported positive results.

The primary objective of this study was to design a model complementing LS with psychology based ones such as CT. The second objective was to develop a prototype implementing the model. The third objective was to evaluate the developed model using a case study and analyse the results. This paper presents a model for extracting records from LMS SCORM content records to estimate LS and CT based on FSLSM and CTM dimensions. A prototype was developed using the methodology proposed to estimate LS and CT for each student. The results evaluated using precision and recall demonstrated the proposed accurately predicted LS and CT.

The chapter is organised as follows. Section 2 describes the proposed model design, development and evaluation. Section 3 discusses results. Section 4 presents conclusions and suggests future work.

## 2 Proposed model

The first objective of this study was to design a learner behaviour model complementing learning styles with psychology based ones such as cognitive traits. In this section, we present a model based on used Felder-Silverman Learning Style Model (FSLSM) and Cognitive Trait Model (CTM) that analyses student access records generated by LMS to estimate LS and CT. The two theories are well researched and validated with promising evaluation results in many similar studies such as (Bernard et al. 2017); (T.-Y. Lin 2007). Figure 1 illustrates the working mechanism of the model. First, the model extracts records of students' access from SCORM modules hosted in LMS. Second, it maps access patterns to relevant LS and CT dimensions described in FSLSM and CTM respectively. Third, it estimates and displays LS and CT for each student from patterns.

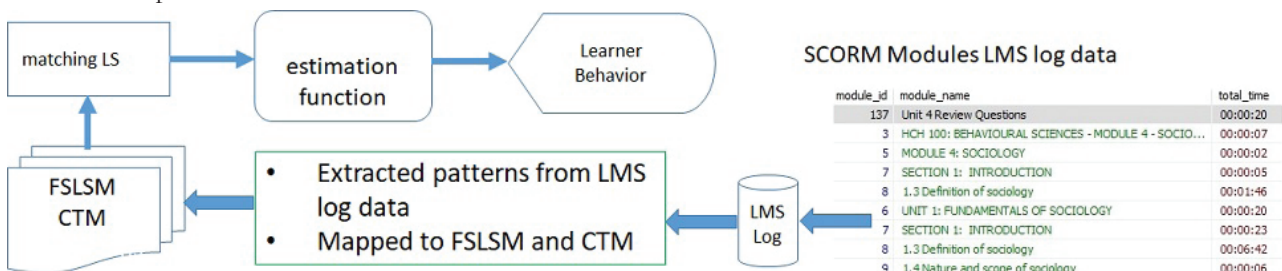


Figure 1: LS and CT detection process

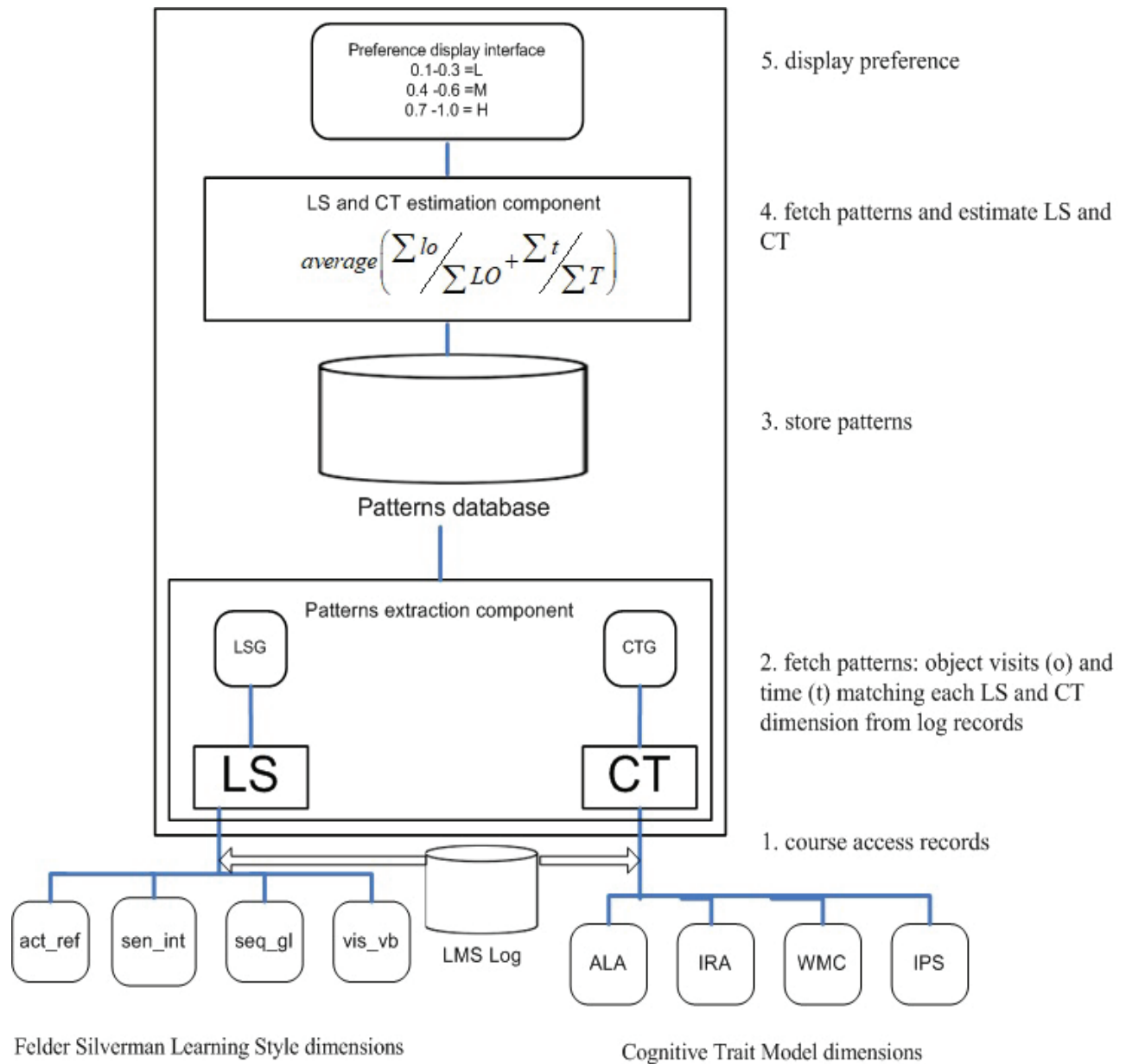


Figure 2: Model architecture

Figure 2 shows the components of the model. Learning Style (LS) and Cognitive Trait (CT) pattern extraction engines fetch relevant LS and CT from LMS log database. Learning Style Generator (LSG) and Cognitive Trait Generator (CTG) engine receive data from pattern extraction component, calculate then map results to 3 item scale: 0.1-0.3 low, 0.4-0.6 moderate and 0.7-1.0 high and 0.0-no preference. Behaviour for both LS and CT are combined and displayed for each student.

### 3 Implementation

The second objective was to develop a prototype implementing the above model. This section describes development steps.

#### 3.1 Extracting data patterns from log

Patterns matching descriptions of FSLSM and CTM dimensions were extracted from relevant learning objects of SCORM content pages such as examples, summaries, revisions, result, conclusion, exercises. Table 1 and Table 2 show how each of the patterns was mapped to LS and CT dimensions.

Table 1: Learning style, objects and investigated patterns

FSLSM	Description	Relevant Learning Object ( e-book page)	Pattern extracted
active	Likes trying things out	activities, tests, exercise	Visits and time
reflective	Think about learned materials	Examples, summaries, revisions, result pages, conclusion pages	Visits and time
sensing	dislike challenges, patient with details	Practical, user manuals, explanations, lectures, units, topics	Visits and time
intuitive	likes challenges, impatient with details	Definitions, procedures, meanings, process	Visits and time
verbal	written text, audio, discussing	Text	Visits and time
visual	Graphic, illustrations	Images, illustrations	Visits and time
global	Jumping; whole picture of the content	Area before content, content, area after content	Navigation order, visits and time
Sequential	step by step navigation	Area before content, content, area after content	Navigation order, visits and time

Table 1 shows each dimension of FSLSM, description, leaning object investigated and pattern extracted. According to FSLSM, active learner likes trying out things while reflective think about learning materials. A learner who spends more time or prefers to engage in; activities, test, and exercises show hints for active learning style. On the other hand, a learner who prefers to view examples, summaries, revisions, result pages and conclusion pages shows preference of reflective learning style. Sensing learners dislike challenges but are patient with details while intuitive learners like challenges but are impatient with details. Visits and time on practical, user manuals, explanations, lectures, units, topics with contents indicate preference for sensing learner. Visits and time spent on content which has definitions, procedures, and meaning indicate preference of an intuitive learner. Verbal learners like text-based contents, discussions and audio. Visual learners prefer graphical contents. Time spent and number of visits indicated preference for each dimension. Global learners like getting a full picture of the course contents and sometimes read by skipping pages. A sequential learner navigates content pages' step by step. Time and visits on overview pages (area before content) followed by conclusions and summaries (area after content) indicate preference for a global learner. Time and visits to overview pages (area before content) followed by content pages (lectures, units, topics) then conclusions and summaries (area after content) indicate preference for a sequential learner.

Table 2: cognitive traits, objects and investigated patterns

CTM dimension	Description	Relevant Learning Object	Pattern extracted
Associative learning	link new to existing knowledge	Revisited pages, pages visited once	Visits and time
Working memory capacity	ability to keep limited amount of information for a brief period of time	Forward navigation, backward navigation	Visits and time
Inductive reasoning ability	ability to construct concepts from examples	Examples, revision and exercises	Visits, time
Information processing speed	how fast the learner acquire information correctly	Exercises	Attempts, time, score

Table 2 shows each dimension of CTM, description, leaning object investigated and pattern extracted. According to CTM, associative learners like linking new to existing knowledge therefore revisiting already read pages is a sign of associative learning. Working memory capacity tests the ability to keep limited amount of information for a brief period of time. Constant forward navigation of pages is a sign of high working memory capacity. Inductive reasoning is the ability to construct concepts from examples. Visits to exercises, examples and revisions are signs of inductive reasoning. Information processing speed checks how fast the learner acquires information correctly. Exercises attempts, score and time spent are indications of information processing speed.

### 3.2 Behavior estimating from patterns

Using automatic behaviour estimation method proposed by (Dung Pham and Florea 2013) patterns above were used to estimate LS and CT by computing average ratio of total learning objects accessed and time spent by each student. The following steps describe estimation procedure.

#### 3.2.1 Estimating LS

For matching pair of learning styles such as active-reflective, sensing-intuitive, sequential-global and visual-verbal, consider:

- Time on learning objects relevant to a LS dimension ( $t$ ) (e.g. active or reflective) out of total time spent in all objects  
(I)  $\frac{\sum t}{\sum T}$  (e.g. active + reflective)
- Number of visits on a learning object relevant to a LS ( $lo$ ) (e.g. active or reflective) dimension out of total objects accessed (LO)  $\frac{\sum lo}{\sum LO}$  (e.g. active + reflective)

- iii. Compute average ratio from step 2  $average\left(\frac{\sum lo}{\sum LO} + \frac{\sum t}{\sum T}\right)$
- iv. Map to 3 item scale: 0.1-0.3(low), 0.4-0.6 (moderate) and 0.7-1.0 (high) to get appropriate preference

Table 3: Estimation procedure for each CT dimension.

FSLSM	Relevant Learning Object	Pattern extracted	Estimation function
<b>Active (a)</b>	Activities, tests, exercise	object visits (o) and time (t)	$average\left(\frac{ta}{ta+tr}, \frac{oa}{oa+or}\right)$
<b>Reflective(r)</b>	Examples, summaries, revisions, result pages, conclusion pages	object visits (o) and time (t)	$average\left(\frac{ta}{ta+tr}, \frac{oa}{oa+or}\right)$  $average\left(\frac{tr}{ta+tr}, \frac{or}{oa+or}\right)$ $average\left(\frac{tr}{ta+tr}, \frac{or}{oa+or}\right)$
<b>Sensing (s)</b>	Practical, user manuals, explanations, lectures, units, topics	object visits (o) and time (t)	$average\left(\frac{ts}{ts+ti}, \frac{os}{os+oi}\right)$
<b>Intuitive(i)</b>	Definitions, procedures, meanings, process	object visits (o) and time (t)	$average\left(\frac{ts}{ts+ti}, \frac{os}{os+oi}\right)$  $average\left(\frac{ti}{ts+ti}, \frac{oi}{os+oi}\right)$ $average\left(\frac{ti}{ts+ti}, \frac{oi}{os+oi}\right)$
<b>Verbal(v)</b>	Textual content	object visits (o) and time (t)	$average\left(\frac{tv}{tv+tvi}, \frac{ov}{ov+ovi}\right)$
<b>Visual(vi)</b>	Images, illustrations	object visits (o) and time (t)	$average\left(\frac{tv}{tv+tvi}, \frac{ov}{ov+ovi}\right)$  $average\left(\frac{tvi}{tv+tvi}, \frac{ovi}{ov+ovi}\right)$
<b>Global(g)</b>	ABC->AAC ABC- area before content AAC – area after content C- content	object visits (o) and time (t)	$average\left(\frac{tg}{tg+tsq}, \frac{og}{og+osq}\right)$
<b>Sequential(sq)</b>	ABC->C->AAC	object visits (o) and time (t)	$average\left(\frac{tsq}{tg+tsq}, \frac{osq}{og+osq}\right)$

### 3.2.2 Estimating CT

For matching pair of CT patterns such as pages revisited vs visited once for *associative learning* or forward vs backward navigation for *working memory* consider:

- i. Time on learning objects relevant to a CT dimension (t) (e.g. revisited vs visited once for associative learning or

forward vs backward navigation) out of total time spent in all objects (T)  $\frac{\sum t}{\sum T}$  (e.g. revisited + visited once for associative learning or forward + backward navigation)

- ii. Number of visits on a learning object relevant to a LS (lo) (e.g. revisited vs visited once for associative learning or

forward vs backward navigation)dimension out of total objects accessed (LO)  $\frac{\sum lo}{\sum LO}$  e.g. revisited + visited once for associative learning or forward + backward navigation)

- iii. Compute average ratio from step 2  $average\left(\frac{\sum lo}{\sum LO} + \frac{\sum t}{\sum T}\right)$
- iv. Map to 3 item scale: 0.1 -0.3 -low, 0.4-0.6 moderate and 0.7 – 1.0 high to get appropriate preference

For inductive reasoning ability, summation  $average\left(\frac{ti}{T} + \frac{o}{O} average\left(\frac{ti}{T} + \frac{o}{O}\right)\right)$  time spent on relevant objects and total objects accessed out of total were considered. For information processing speed,

summation  $average \left( \frac{t}{T}, \frac{a}{A}, \frac{s}{S} \right)$   $average \left( \frac{t}{T}, \frac{a}{A}, \frac{s}{S} \right)$  time spent, attempts and score out of total for relevant objects were considered. Table 4 shows the estimation procedure for each CT dimension.

Table 4: CT estimation functions

CTM dimension	Relevant Learning Object	Pattern extracted	Estimation function
Associative learning	Revisited pages, pages visited once	Visits and time	$average \left( \frac{trp}{trp+ts}, \frac{orp}{orp+os} \right)$ $average \left( \frac{trp}{trp+ts}, \frac{orp}{orp+os} \right)$
Working memory capacity	Forward navigation, reverse navigation	Visits and time	$average \left( \frac{tr}{tr+tf}, \frac{or}{or+of} \right)$ $average \left( \frac{tr}{tr+tf}, \frac{or}{or+of} \right)$
Inductive reasoning ability	Examples, revision and exercises	Visits, time	$average \left( \frac{ti}{T}, \frac{o}{O} \right)$ $average \left( \frac{ti}{T}, \frac{o}{O} \right)$
Information processing speed	Exercises	Attempts, time, score	$average \left( \frac{t}{T}, \frac{a}{A}, \frac{s}{S} \right)$ $average \left( \frac{t}{T}, \frac{a}{A}, \frac{s}{S} \right)$

### 3.3 Prototype development

A web-based system system was developed based on the above estimation formular. The prototype was developed using MYSQL database and PHP scripting language. The model initiates connection to MYSQL database, fetches data and compute LS and CT then display preference as shown in Figure 3.

#### Know Your Learning Behavior

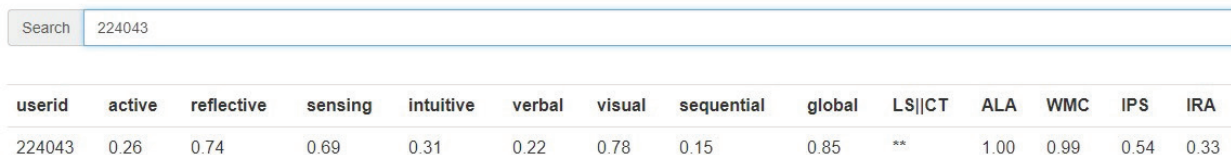


Figure 3 : Model interface functionality

Figure 3 shows model inteface functionality. A user can initiate search by entering identification or registration number. In the Figure 3, the learning style of a student with user id 224043, for instance, is strongly reflective (0.74), less active 0.26, strongly sensing (0.69) amd less intuitive (0.31), more visual (0.78) than verbal (0.15) and more sequential (0.85) than global 0.15.

The student also shows the following cognitive traits; strong associative learning (1.00), strong working memory capacity (0.99), moderate information processing speed (0.54) and weak inductive reasoning (0.33).

A lecturer can use such information to provide appropriate learning materials, apply appropriate tutoring method and provide individualized attention matching learner behavior. A student on the other hand uses the above information for self awareness so as to apply appropriate study method and choose appropriate learning materials.

### 3.4 Evaluation

The third objective was to evaluate the developed model using a case study and analyse the results. In this section, we discuss the methodology used to rate the accuracy of the model in estimating learning style and cognitive trait based on two theories. Evaluation was done by administering manual tools to students then comparing the results gathered against those estimated by the model. Performance of the prototype was evaluated using experiments done with students in a classroom environment. Self-instructional electronic books were converted to SCORM format and hosted in a LMS. Data used as input in the model was collected for the period of a 15-week semester for students who read the content during course work. Approximately 200,000 log file entries were recorded. The log records for these students were used as data input for the model to classify each in respective LS and CT dimension. A total of 200 medicals, dental and pharmacy students from University of Nairobi participated. The group actively accessed learning materials and did online tests during course work. The students were also available and readily accessible through the course lecturer.

The first experiment was done to evaluate learning style results generated by the prototype. Index of Learning Styles



Questionnaires (ILS (a standard measurement tool for FSLSM) were administered to students which they filled and returned. Learning styles for each student were calculated and analysed. The second experiment was done to evaluate cognitive traits generated by the system. Online Cognitive Multiple Choice Questions based on a method adapted from Cambridge Brain Sciences were created and hosted in the university LMS. Four categories of tests were administered. Paired associate tests, spatial span test, abstract reasoning test and mental speed tests were created on university learning management system to evaluate associative learning ability, working memory capacity, inductive reasoning ability and information processing speed respectively. Cognitive traits were determined in terms of marks scored in the test classified as low, moderate and high. These were compared to CTM results predicted for same students by the model

#### 4 Results and Discussions

Precision, recall and F-1 score formula were used to compare results predicted by the model against those gathered by ILS and psychometric tests:

$$\begin{aligned}
 \text{Precision} & \quad \text{Recall} & \quad \text{F1} & = 2 * \frac{R * P}{R + P} \\
 P = \frac{Tp}{Tp + Fp} & \quad R = \frac{Tp}{Tp + Fn} & & 
 \end{aligned}$$

T<sub>p</sub>: True Positive, F<sub>p</sub>: false positive

T<sub>N</sub>: true negative, F<sub>N</sub>: false negative

Precision is an evaluation method used to measure the ratio of correctly predicted positive observations to the total predicted positive observations. Recall measures the ratio of correctly predicted positive observations to the all observations in actual class. F1-score is the weighted average of Precision and Recall.

Table 5: LS precision results

LS	N	positive	negative	TP	FN	TN	FP	precision	recall	f-score
act_ref	60	40	20	19	7	13	21	0.475	0.730769	0.575758
sen_int	30	22	7	13	6	1	9	0.590909	0.684211	0.634146
vis_verb	9	8	1	9	0	8	1	0.9	1.0	0.947368
seq_glo	74	47	27	30	20	7	17	0.638298	0.6	0.618557
CT										
ALA	17	17	0	10	7	0	1	0.909091	0.588235	0.714286
WMC	38	35	3	31	3	0	4	0.885714	0.911765	0.898551
IRA	25	17	7	17	4	2	2	0.894737	0.809524	0.85
IPS	27	15	12	15	0	0	12	0.555556	1.0	0.714286

Precision ratio above 0.5 apart from active reflective were recorded for sensing-intuitive, visual – verbal LS, and all CT. Recall ratio above 0.5 were recorded for all LS and CT. Results also indicate F1-score ratio above 0.5 for all. The above results show that the proposed method accurately estimates LS and CT in a LMS. More validation is however needed on active reflective LS.

#### 5 Conclusion

In this chapter, we presented a model for automatic identification of learner behaviour. The model takes advantage of data collected from LMS log, education theories and literature based method to automatically estimate learning styles and cognitive traits. The precision and recall compared with the ILS questionnaire and psychometric tests are above 0.5 demonstrating accuracy in identifying learning behaviour.

Future work involves automatically mapping e-Learning course content to respective learning styles and cognitive traits. Additional tests may also be carried out on active reflective LS to properly validate the model.

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# Sustainable Implementation of Information Communication Technologies in Secondary Schools in Nairobi County, Kenya

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## Abstract

*The aim of the study leading to this chapter was to investigate the level of diffusion of ICTs for sustainable implementation in secondary schools in Nairobi County, Kenya. Mixed method research design was adopted for the study. The study was conducted in 126 secondary schools in Nairobi County that included 55 public schools and 71 private schools. The study population was 5,939 consisting of school principals, teachers, computer teachers, students, and non-teaching staff including secretaries and bursars. School librarians were also included. Multiple sampling methods were used to select a sample size of 1,380 respondents. A self-administered questionnaire was used to collect data from the subject teachers, non-teaching staff, and students. Further information was obtained through a structured interview with the principals and computer teachers who were the main informants of the study. The study revealed that teachers were not adequately trained to integrate ICTs into teaching. When asked about their qualification in ICT, only 33.7% of teachers confirmed that they had training in ICTs. Out of the 181 teacher respondents, 120 teachers (66.3%) had no training in ICT and did not use ICT for teaching. E-learning was found to be limited to computer-based training for high school final examinations. The challenges that the schools faced included few computers, limited access time to available computers, rapidly changing technology, power failure, and overworked teachers. Lack of qualified teachers and need for training were also noted as major challenges facing the schools.*

**Keywords:** ICTs, IT assimilation, Secondary schools, Diffusion of innovations, Nairobi County, Kenya.

## 1 Introduction and Background to the Study

Education is a core component of any kind of development in a country (Waibochi, 2002). The incorporation of Information and Communication Technologies (ICTs) into the educational curriculum is considered a key step in bridging the digital divide. Due to advancement in ICTs, the world is undergoing a fundamental transformation as the industrial society of the 20<sup>th</sup> Century gives way to the information society of the 21<sup>st</sup> Century. It is recognised globally that social economic growth of any country is a result of the transformation of knowledge, science and technology into goods and services (Republic of Kenya, MoE, 2012). Development of scientific and technological infrastructure as well as technical and entrepreneurial skills is essential to the transformation of Kenya into a knowledge-based society. To be successful, economies must harness ICTs to create new knowledge (Dutton, 1996).

The Government of Kenya recognises that information, education and knowledge are the core of human progress, endeavour and well-being, and that ICTs are creating immense impact on the way services are delivered (Kenya Government ICT Policy, 2004). It also recognises that a combination of ICTs, knowledge and communication comprises the essential resources for social and economic development, and that an ICT-literate workforce is the foundation on which Kenya can acquire the status of a knowledge economy (Republic of Kenya, MoE & MoHEST, 2012). However, like most Sub-Saharan countries, the Republic of Kenya is still grappling with challenges of ICTs such as wide-scale access, formulation of policies, Information Communications Technology ethics and use of the technologies to enhance the quality of life and reduce poverty (Kenya Government, 2004; KENET, 2014). The National Information and Communications Technology Policy (2004) recognise young people as the workforce and leading creators as well as the earliest adopters of ICTs. They must, therefore, be empowered as learners, developers, contributors, future entrepreneurs and decision-makers through the education systems.

Education is seen as the primary means of social mobility, national cohesion and social economic development (Republic of Kenya, MoHEST, 2012). The Constitution of Kenya (2010) has the Bill of Rights at its core. In addition, the Vision 2030 acknowledges the need for reform to offer direction in modernising and re-branding the country's education and training system, (Republic of Kenya, MoEST, 2005; MoEST 2006; and MoE, 2012). Information Communication Technologies are proposed as the teaching-learning tools that will be used to address the quality, service delivery, curriculum, relevance, teacher development, and education management at all levels of education.

## 2 Statement of the Problem

The Constitution of Kenya (2010) clearly outlines that the youth in Kenya should have access to quality and relevant education and training. This is covered under the Article 40 (a) of the Constitution of Kenya 2010. The Ministry of Education, (MoE) has also developed the National ICT Strategy for Education and Training through a collaborative effort with all the stakeholders. The strategies have been exemplified by the government's declared interest in removing the barriers to ICT integration and the development of ICTs in all secondary schools in the country (Kenya Government, 2004; KENET, 2014). This has been extended to education management and administration as outlined in the Republic of Kenya, MoEST and Kenya Education Sector Support Programme, (MoEST/KESSP, 2005; MoE/NICT, 2006; & MoEST/Task Force 2012).

There are two dimensions to ICTs in education. First, teachers and students learn about ICT, and second, teachers and learners learn with ICT (Republic of Kenya, MoE Taskforce, 2012). Learning about ICT allows learners to contribute to its development and also become ICT literate. Learning with ICT is aimed at enabling learners to acquire practical knowledge and skills that they can use effectively. The main structure for implementing ICT policy and strategy is proposed for an education sector that will provide the skills required to steer secondary school students to meet Kenya's economic goals of Vision 2030 (Republic of Kenya, Moe and MoHEST Taskforce, 2010). The MoE policy is to integrate ICT in education and training in order to prepare learners for the 21<sup>st</sup> Century education and knowledge economy.

It has however been established that there has not been uniformity in ICT adoption approach addressing the various needs and disparities in the secondary schools in Kenya (MoHEST /NCST, 2010). The MoEST attributes this to lack of well spelt out programmes to address the implementation of ICTs in the secondary school sector. Kenya Vision 2030 stresses the need to mainstream information technology and a computer supply programme in the secondary school sector as a means of equipping students with modern ICT skills (Kenya Vision 2030; Republic of Kenya, MoE 2007). The ICT implementation policy framework (Republic of Kenya, MoEST, 2006) has given a benchmark of the inputs such as equipment, training and possible costing. However, the extent to which the implementation is achieved has not been assessed or documented. Similarly, the extent to which ICT has been deployed in secondary school managerial systems needs to be assessed. There has not been uniformity of ICT implementation in teaching and deployment in school managerial systems as outlined in Government of Kenya documentation. The MoEST and KESSP (MoE/KESSP 2005-2010), and the Constitution of Kenya (2010) emphasise that the youth should have access to quality and relevant education and training. There is need therefore to explore how ICTs would be sustainably implemented in secondary schools in Nairobi County.

The purpose of this study was to investigate the level of ICTs implementation in secondary schools in Nairobi County with a view to proposing a model of sustainable ICT implementation that could be adapted in secondary schools in Kenya. The objectives of the study were to: Determine the training and ICT skills needed for ICT implementation in the secondary schools; Analyse the challenges experienced in the implementation of ICTs in secondary schools in Nairobi County and map possible solutions; and Recommend measures for improvement and develop a model for sustainable implementation of ICTs in secondary schools Nairobi County.

## 3 Research Methodology

Mixed method research design was adopted for this study. This approach has been identified as a multi strategy research (Bryman, 2004) and multiple methods of data collection (Denzin, 2009; Stake, 2000; Yin, 2003). It was found necessary to elicit information needed from different categories of informants. Mixed methods focus on collecting, analysing and mixing both quantitative and qualitative data in a single study or series of studies. Its central premises are that the use of quantitative and qualitative approaches in a combination provides a better understanding of the research problem (Creswell and Plano Clark, 2011). Different but contemporary data on the implementation of ICT programmes in the secondary school sector in Nairobi County was collected from different categories of respondents who were selected based on the objectives of the study.

The study was conducted in secondary schools in Nairobi County. There are 126 secondary schools, (55 private and 71 public), distributed in three administrative districts of Nairobi East, Nairobi North and Nairobi West, which are further grouped into eight divisions - Embakasi, Makadara, Langata, Dagoretti, Westlands, Starehe, Kamukunji and Kasarani, (Kenya Secondary School Heads Association, 2008; Republic of Kenya, MoE, 2007). Public and private schools participated in the research. The sample size of 44 schools was purposively selected to include boys' schools, girls' schools and mixed schools in Table 1.

Table 1: Sample size, n = 44

Area		No. of Schools		
District/Zone	Division	Public	Private	Total
Nairobi East	Embakasi	3	3	6
	Makadara	3	3	6
Nairobi West	Dagoretti	3	3	6
	Westlands	3	3	6
	Langata	3	2	5
Nairobi North	Starehe	3	3	6
	Kasarani	3	3	6
	Kamukunji	3	0	3
<b>Total</b>		<b>24</b>	<b>20</b>	<b>44</b>

Source: Kenya Secondary Schools Heads Association Newsletter (2008)

Survey research method was adopted for 4,559 student respondents using Krejcie and Morgan (1970) sample size table to get a sample of 880 students. Purposive sampling was used for selecting other respondents who comprised school principals, teachers, students and non-teaching staff. Therefore, a sample size of 1,380 respondents was selected from the population, using the mentioned sampling methods as shown in Table 2.

Table 2: Population and sample size, n=1380

Respondents	Population	Sample size (n)
Principals	44	44
Computer teachers	44	44
Subject teachers	352	352
Students	4,559	880
Non-teaching Staff	60	60
<b>Total</b>	<b>5,939</b>	<b>1,380</b>

Source: Field data

Data collection methods that yielded qualitative data included structured interviews with the school principals and computer teachers, direct observation of classrooms and computer labs, and participant observation in the staff rooms. In addition, quantitative methods mainly used semi-structured questionnaires to collect data from teachers, students and non-teaching staff. "Drop-off and pick-up later" method was used to administer the questionnaires. The researcher visited the schools and interviewed the teachers in the staffroom during the 10 o'clock tea break based on the interview schedule. Interviews with computer teachers and principals were also done at their convenient time because of their busy schedule. Form Two and Three students were purposively selected to represent the student population. Probabilistic sampling involved randomly choosing individuals based on a systematic procedure of selecting the student participants from the class registers (Creswell and Plano Clark, 2007).

## 4 Findings and Discussions

The general response rate was good at 64.2 per cent. Mugenda and Mugenda (2008) argue that a response rate of 50 per cent and above is sufficient for analysis. The study findings provide insight into how a sustainable implementation of ICTs can be enhanced in Nairobi County secondary schools and in Kenya as a whole.

### 4.1 Training and ICT skills needed for sustainable ICTs

The academic qualifications of principals were assessed since this is an indicator of e-readiness. Most of the principals had university level education with 59.4 per cent having undergraduate degrees (B.Ed.) while 16.2 per cent had post-graduate degrees (Masters of Arts and Master of Education qualification). Only 41.8 per cent computer teachers had Bachelors' degree in Computer Science but they did not have teaching qualifications. In private schools, they had either a diploma or certificate in computer science. This can reflect on the quality of ICT teaching in the schools. They had a lot of responsibility and were overworked. They were not well paid and kept looking for better paying jobs away from the teaching profession. Turnover was high and they left schools without continuity, forcing the schools to employ teachers with low ICT qualifications. The subject teachers did not have ICT skills and did not use ICTs in their subject teaching.

The teachers were asked the purpose for which they used computers in relation to teaching. Out of the 188 teachers, only 99 (50%) responded. The teachers who used computers for lesson preparation were only 61 (65.6%) and were from public schools. The private school teachers who used computer for lesson preparation were only 34.4 per cent. Only 27 teachers (71.1%) used computers for classroom teaching from the public schools sampled compared to 11 (28.9%) from private schools. This shows that very few teachers used computers for classroom teaching and lesson preparation. Most of the teachers used traditional methods of teaching and writing notes and lesson plans. They did not use a computer for teaching purposes.

Table 3: Qualifications of Teachers in ICT Teaching (n =181)

Qualifications ICT Teaching	School type				Total	
	Public	%	Private	%	No.	%
Yes	37	20.44	24	13.25	61	33.7
No	79	43.64	41	22.65	120	66.3
<b>Total</b>	<b>116</b>	<b>64.08</b>	<b>65</b>	<b>35.9</b>	<b>181</b>	<b>100</b>

Author: Field data

Non-teaching staff, comprising the secretaries and the bursars, had basic skills to perform their work. However, it was observed that the school bursars and accountants were not trained in computer basic skills. Only 14.6 per cent of the non-teaching staff who worked as support staff indicated that they were proficient in use of ICTs. Some private schools used computers to generate income after normal school hours and during the school vacations. They offered computer training courses, desktop publishing services and business training to the public. Instead of locking the computer rooms especially during school holidays, the public secondary schools could use the computer labs to train the community around the school and students from rural areas at a fee. The benefits accrued would enable the schools to achieve higher degree of resource utilisation and earn from the investment. This would enable them to raise extra finances to support ICT initiatives and to meet the high costs of ICT implementation. The students who trained in ICT were preparing for KCSE exams and were using the set out books for their studies and exercises. However, the teachers need training on how to use ICTs and be encouraged to apply ICTs in lessons delivery. They should also be made aware of the benefits of ICTs in teaching.

#### 4.2 Factors hampering implementation of ICTs in secondary schools in Nairobi County

The study revealed that the respondents encountered various challenges regarding ICT implementation. The school principals, who were interviewed, reported that they had challenges in ICT implementation as indicated below:

*"We have few computers. Our wish is to buy more computers and encourage the students to use them but the problem is the high cost of acquiring the computers."*

The major challenge faced by the principals was financing of the computer projects and their sustenance. Computer projects were expensive and the Ministry of Education did not have policies on such financing. They, therefore, have to depend on donor projects. However, these were only available for a period of time before they were discontinued. The schools were required to raise finances for computer projects from parents or other sources such as holding fundraisers. They also mentioned other challenges such as data security, replacing "out-dated computers and equipment and their disposal, computer repairs as there were no qualified technicians employed by the Ministry of Education among other challenges. It was established that acquisition of computers was through rigorous procurement procedures.

The major challenge faced by the computer teachers was lack of standardised software updates and antivirus programs. The rapidly changing technology was also cited by the teachers. The challenges faced by the computer teachers range from lack of enough computers, space, power supply, software's, computer vandalism and theft by mischievous students, and computer breakdown. Other challenge included limited number of computers and lack of training.

The factors that hampered ICT implementation could be solved by availing more funds to purchase new computers, improving Internet access, and maintaining the equipment and staff training was cited as an area that needed attention and guiding policy.

### 5 Conclusion

The study concluded that the school principals who are supposed to be leaders in ICT implementation had not undergone any training of how the change in school management. They were supposed to look for finances to fund ICT projects. This was not a job to be delegated to the other members of staff and they needed to take the centre stage. They delegated a lot of the work to the computer teachers, the school bursar and the secretary. As heads of schools, a lot was expected from them. They needed to take the centre stage and make the implementation of ICTs effective. The computer teachers needed to go back to college learn teaching methodologies and skills and acquire certificates. Most schools lacked a technician and this needed to be addressed. The subject teachers were not trained to use ICT in the classroom. They needed training in new software and new techniques in ICT. Therefore, for ICTs implementation to succeed there is need for continuous training for all cadres of staff. The study revealed that majority of subject teachers did not use ICTs for teaching and learning.

The schools did not have a sustainable ICTs infrastructure at the time of this study. Financing of computer equipment was not adequate as majority of the schools did not have any budget allocated to ICT projects. A few schools were allocated less than 5 per cent of the school budget. All the respondents stated that there was need for more computers. Only 10.3 per cent of the schools had around 20 computers which are shared in the ratio of one computer to three

students during the computer lessons. Most of the computers were old and slow. They could not support the new software. Students used them for keyboarding purposes only.

Secondary schools did not have policies to guide ICT implementation. The Ministry of Education's policies were not properly coordinated to achieve positive results in all the schools. There is need for the strengthening of ICT policies and evaluation procedures that would reward the schools that performed well in ICT implementation. As a result of financial constraints and lack of training, the schools faced various challenges in ICT implementation. The challenges needed to be addressed if a sustainable implementation of ICTs in Nairobi secondary schools is to be achieved. The study, therefore, concluded that integration of ICTs into teaching and learning is important to improve school administration and learning instruction but is still lacking in both public and private schools.

## **6 Recommendations**

Based on the research findings, the study recommends the following:

1. There is need for continuous training through organised symposia, workshops, in-service training and forming peer study groups to keep them informed and updated in new ICT developments.
2. The Ministry of Education needs to give out training directives to both the training institutions and the schools. This would ensure that there is trained manpower for ICT implementation so that the piecemeal approach where every school follows its separate direction does not happen.
3. The Ministry of Education should come up with policy guidelines that are appropriate so that they are enforced and schools that follow up the set guidelines and requirements are rewarded and follow-ups on policy implementation be done.
4. The institutions of higher learning need to train teachers who will be in a position to integrate ICT in their subject content and embrace change in the ICT curriculum. There should be in-service courses for practicing teachers. Teacher training institutions should also include an ICT component to all their students to assist them to be confident in ICT when they start their teaching career. This is in line with Kenya Vision 2030 which states that the government will accelerate the pace of training for school heads and other teachers to improve their ICT skills. The Ministry of Education should introduce compulsory in-service courses for teachers to update their skills in use of ICTs. This will save the teachers embarrassment in class when they try to use computers, as their students are way ahead of them.
5. The study recommends the adoption of the sustainable model for ICT implementation in secondary schools in Kenya. The model can be adopted for policy making at the Ministry of Education level as well as at teacher training institutions. The sustainable model for ICT implementation recommended for initiation by the Ministry of Education is given below.

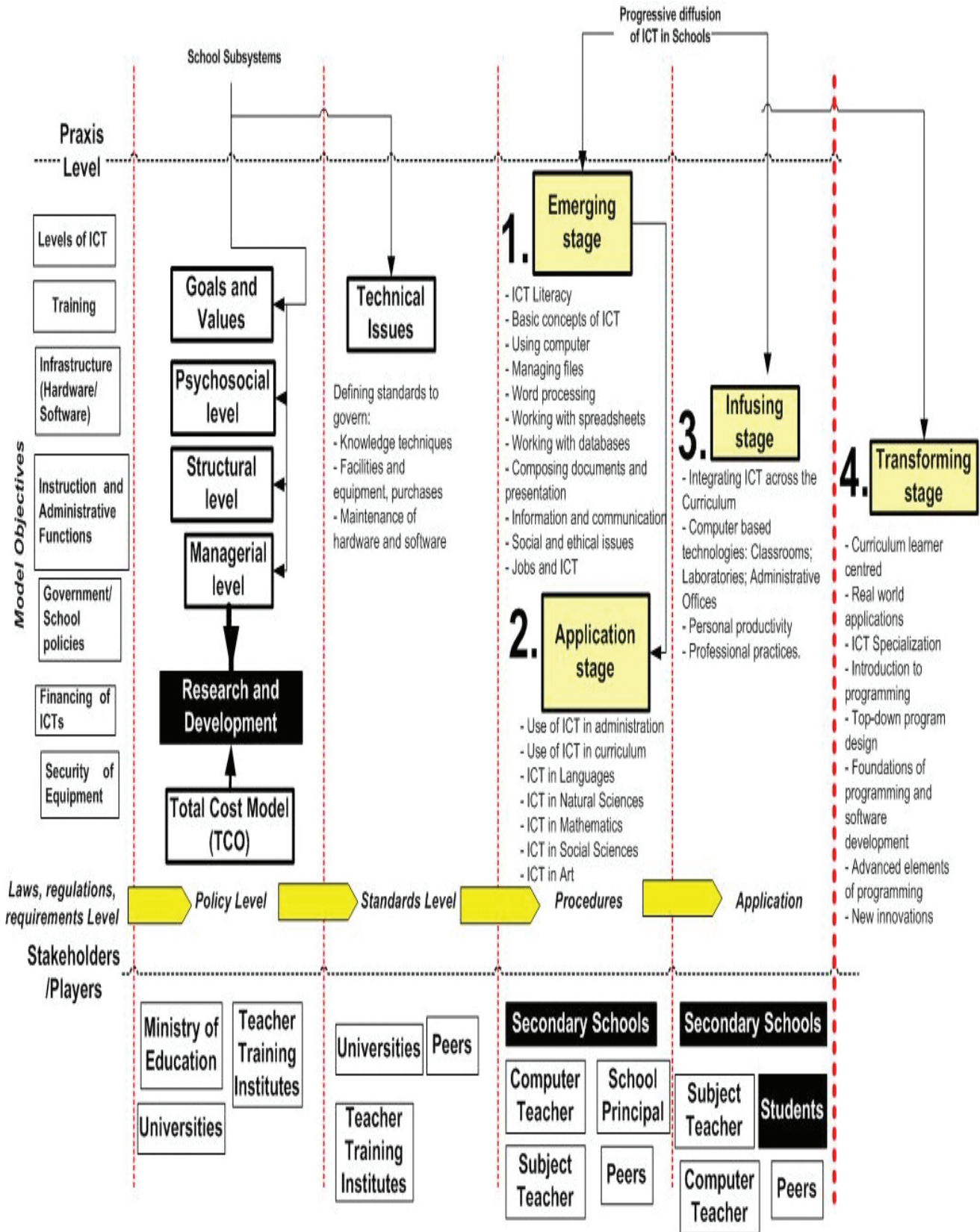


Figure 1: Proposed model of sustainable ICTs implementation in secondary schools in Nairobi County



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# Information Commons: A Service Model for Academic Libraries in Kenya

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## Abstract

*The changing information landscape in today's library environment has compelled libraries to shift from the conventional library service models to new service models. One of the new service models is Information Commons which is being embraced to satisfy the changing needs and demands by the current generation for technology-oriented services and products. This chapter explores the concept of Information Commons, describes its features and assesses the extent to which academic libraries in Kenya have transformed their physical spaces to Information Commons. This study on which this chapter is based was exploratory and adopted a mixed-methods research design. Data was collected from 30 librarians in six universities using face-to-face interviews and observation. 73% of librarians are familiar with the concept of Information Commons; no university has established an Information Commons; and various aspects of the Information Commons model exist but in fragmented form. Information Commons model is a promising and tenable solution to the challenge of academic libraries offering relevant services and facilities. This study offers insights in the design and composition of an Information Commons in academic libraries. Information Commons is still a novel idea to libraries in Kenya and therefore the results of this study adds to the general knowledge on this model and contextualises its implementation to academic libraries in Kenya.*

**Keywords:** *Information Commons, Library Service Models, Academic Libraries, Kenya, Library Transformations*

## 1 Introduction

The increased use of technology as a way of accessing information and the change towards collaborative learning and group study have brought changes in the way the current generation of students use libraries and the resources therein. The majority of today's patrons in academic libraries are the Millennial or X generation (those born from 1982-1995) and Generation Z or 'I' Generation (those born from mid-1990s to late 2000s). The attributes of these generations have directly influenced the many changes that academic libraries are going through. MacWhinnie (2013) notes that libraries are transforming their services and physical spaces to satisfy the changing needs and demands by the current generation for technology-oriented services and products. These changes have led to emergence of Information Commons (ICs) model, which MacWhinnie defines as "a new type of physical facility specifically designed to organise workspace and service delivery around an integrated digital environment" (p. 244). In addition, academic libraries have redefined their services to provide self-service and checkout counters, single points to access information stations, cafes, and other physical makeovers to improve the library's significance (Thachill, 2014). Nagy (2011) indicated that many academic libraries in the developed countries have expanded their roles in their communities and bought in the "learning café model by providing discussion areas and non-structured work spaces with cosy seating and group study areas with appropriate technological support" (p. 10), which he refers to as Information Commons. Information Commons can therefore be defined as a space in a library that has been redesigned bringing together pervasive technology, content and services designed around social construction of knowledge and equipped with up-to-date technologies.

Another factor influencing academic library's physical makeover is the change toward group learning brought about by an emphasis on collaboration and group study modes of learning. This is causing demand for facilities that allow group study and incorporate technology for accessing both the physical collection and electronic resources in addition to offering the necessary software that allows students to collaborate to complete shared assignments (Jamali, Abbaszadeh, Ebrahimi & Maleki, 2011). Despite the Information Commons model being in existence for over two decades and promising to be a tenable solution to the challenge of academic libraries offering relevant services and facilities, little attention in research has been given to offer insights on how this model can be implemented in academic libraries in Kenya.

The aim of the study leading to this chapter was to explore the Information Commons model as it has been implemented in academic libraries in Kenya. The specific objectives of the study were to describe the features of Information Commons model in libraries; determine the extent to which academic libraries in Kenya have transformed their physical spaces to Information Commons; and identify gaps in the implementation of Information Commons model so as to offer recommendations to optimise the new service model. The findings of the study may assist librarians when configuring

the Information Commons to leverage the value of the available content, technology and the physical setting so as to engage and support the academics and students' learning lifestyle.

## **2 Information Commons Service Model**

The concept of the Information Commons also known as the Information Arcade, the Information Hub, Media Union, or Learning Commons) was developed in the 1990s (Heitsch & Holley, 2011). The conception of the Information Commons model was based on the framework of Learning Centers in United Kingdom, which were physical and virtual spaces dedicated to learning and studying (Beagle, 1999). The Physical Commons consists of the computer hardware, furnishings, designated spaces, and traditional collections of the library, while the Virtual Commons contains of the digital library collections, online tools, electronic learning tools, and Web presence of the library (Heitsch & Holley, 2011). Even though there is no single definition of an Information Commons, it can be seen as a convergence of library programmes, services and facilities enabled by technology for teaching, learning and research.

Information Commons model reinforces the social aspects of learning, offers abundant technology and digital content, and provides students with a physical setting that is often available 24–7 (Lippincott, 2012). The Information Commons model provides service desks staffed by individuals from both the library and Information Technology units (Lippincott, 2012). They provide redefined library spaces with fixtures such as table lamps as well as lounge furniture including comfortable couches and chairs (Aiani, 2015). The model provides a library environment that promotes both silent and social communal study (Heitsch & Holley, 2011). Programmes such as writing assistance, peer and professional tutoring, basic technology assistance, special assistance on more complicated technology projects, are provided at convenient times to Commons' users (Sheikh, 2015). The definition of Information Commons includes being responsive to new technologies. Therefore, such spaces have to be technologically rich so as to provide the requisite technologies for teaching, learning and research (Santos, Ali & Hill, 2016).

The primary focus of an Information Commons is technology: tools to complete class assignments, conduct research, acquire information, and synthesise and create knowledge. Computers, scanners, printers, digital and video cameras, teleconferencing equipment, e-book readers, and much more are all at the centre of the Information Commons philosophy (MacWhinnie, 2013). A secondary but equally important emphasis is space for collaborative work: group study rooms, large tables, classrooms, and groupings of comfortable seating. Today's generation of students more often than not want to work in pairs or groups, whether as part of a class assignment, studying for an exam, or just doing homework. This tendency is facilitated by the collaborative spaces typical of the Information Commons (Seal, 2012).

The Information Commons model has become a convincing solution to new challenges experienced in libraries (Pacios, 2015). They have increasingly become the premiere strategy for libraries to meet the multifaceted needs of the new generation of users, and continue to evolve to meet the changing demands in technology and learning theory (Accardi, Cordova & Leeder, 2010). The new spaces established or transformed to be Information Commons in university libraries are wildly popular with students and if a library does not have one, chances are that it is planning for one (Spencer, 2006). Information Commons offer a range of benefits which include seamless and ready access to information resources, software, and hardware needed to create knowledge; flexible spaces both formal and informal which adapt to students' differing learning styles; and the opportunity to interact with both fellow classmates, professors, and librarians, all of whom contribute significantly to their education.

## **3 Rationale and Context of the Study**

The changing information landscape in today's library environment has compelled libraries to shift from the conventional library service models to rethink new service models. The emergence of digital information resources, new educational pedagogies, technological advancements and evolving student research needs have obliged academic libraries to transform their physical spaces by adopting a new service delivery model referred to as Information Commons.

Since the conceptualisation of Information Commons in 1990s, it has continued to evolve. Developed countries have employed it and advanced it in the form of 'learning commons' (Heitsch & Holley, 2011). Sharma (2011) noted that academic libraries in Kenya have not embraced Information Commons and hoped that they would embark on this service model as it was the trend internationally for future libraries. However, seven or so years later it is still a novel idea with no known research on the area. A literature search on Information Commons in libraries in Kenya produces no results. This shows that despite the model being in existence for over two decades, university libraries in Kenya are lagging behind in implementing the model. Although the term 'Information Commons' was not found to be used in existing literature on university libraries in Kenya, the salient features describing the Information Commons have been explored by several researchers (Kwanya, Stilwell, & Underwood, 2012; Makori, 2009; Musangi, 2014). Findings from these studies show that discussion rooms, digital collections, technology-enriched services and spaces are provided in university libraries in Kenya.

Despite the central role played by Information Commons in today's libraries, less research has been done on the extent of implementation of this service model in university libraries in Kenya. Therefore, this study was conducted to fill in this gap. The study was done among fully-fledged universities in Kenya, with an aim to explore how the libraries have implemented the Information Commons model.

#### 4 Methodology

This study used a mixed-method research design because it sought to explore the Information Commons in the context of university libraries in Kenya against the established standards of an Information Commons model.

Data was collected through observation and face-to-face interviews with 30 librarians and 25 focus groups of students. Since Information Commons model is physical in nature, observation was also used to identify the specific features of the model as it exists in the universities. An observation checklist on Information Commons features developed based on existing literature on defining Information Commons (Aiani, 2015) and on redefining the future of academic libraries (Seal, 2012) was used to assess the extent of implementation of this model. The interviews were guided by an interview schedule about the Information Commons, specifically on the level of understanding of Information Commons, presence of Information Commons and key service elements present in the libraries.

The target population included the libraries of the chartered universities in Kenya and ranked by webometrics in July 2015. In this respect, the website for webometric ranking was consulted and details of all such universities were gathered which were 37 in number. The study purposively sampled six universities (the three top-ranked public and three private). This was done with the assumption that the characteristics of an Information Commons model, which are technologically-rich environment and networked information resources contributed to the rank attained by the sampled universities.

#### 5 Results of Study

The findings of the study are presented in this section based on the objectives of the study.

##### 5.1 Level of understanding of Information Commons concept

Many experts and scholars have different interpretations of Information Commons. This study therefore sought to assess the understanding of the Information Commons concept among librarians. A five-point scale was used and the respondents were asked to rate their familiarity level accordingly. Figure 1 presents the findings.

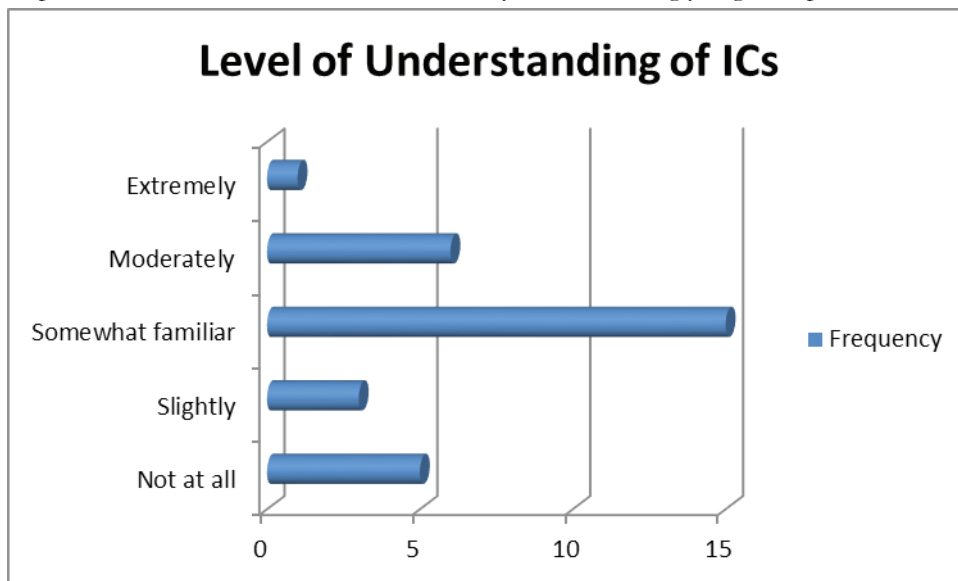


Figure 1: Understanding of the concept of Information Commons by librarians

Source: Research Data

The majority 73% (22) of the librarians were familiar with the concept of Information Commons, with 50% (15) of them rating their level of understanding as "somewhat familiar". However, further probe on the concept showed that some librarians used the term interchangeably with 'graduate commons' and 'research commons' as this is what was observed to exist in the libraries.

## 5.2 Presence of Information Commons

To establish whether university libraries had set up Information Commons, the study found that no university had a facility or transformed the existing facility to an Information Commons. Two private university libraries have set up a graduate or research commons, as they called them. However, it was found that the libraries have implemented varied features of Information Commons model. Two private and one public university libraries had discussion rooms. The discussion rooms were in various sizes to accommodate smaller (see Figure 2) and large groups of users (see Figure 3).



**Figure 2: Discussion room for small groups**

*Photo Credit: Penninah Musangi*



**Figure 3: Discussion room for large groups**

*Photo credit: Penninah Musangi*

Noteworthy to mention was that the furniture in these rooms, which was different from the general reading area, provided an opportunity to the occupants to deliberate and share. It was observed that the location of these rooms was either at the top-most or basement floors of the library building. The librarians said that this enabled the users to conduct discussions without interrupting the quiet study areas. Interviews with the students revealed that Information Commons spaces were one of the most liked facilities in the library.

Another facility was instruction rooms where the librarians conducted information literacy (IL) trainings. The rooms were equipped with necessary infrastructure like networked desktop computers, white boards, projectors, WiFi and, in one library, there was a smart-board (see Figure 4). One of the respondents pointed out that the instruction rooms are important when conducting IL sessions as they do not need to look for venues far from the library. This enables them to train the library users at the place of need.



**Figure 4: Smart-board**

*Photo credit: Penninah Musangi*

In four universities, the furniture, especially the seating, had been transformed, fitted with cosy seats (see Figure 5) along glass-walled spaces. A probe on this revealed that the users use this area for relaxation especially when reading newspapers and they are placed along the wall to attract potential users in the library.



**Figure 5: Cosy seating**

*Photo credit: Penninah Musangi*

The reading tables in one university had provision of power and Internet connection ports (see Figure 6).



**Figure 6: Reading table fitted with Internet and power ports**

*Photo credit: Penninah Musangi*

### 5.3 Key Information Commons model service elements

Information Commons service model integrates the physical and the virtual environment. To establish the presence of key service elements which define an Information Commons, an assessment was carried out using a checklist, the results are as shown in Table 1. All the university libraries were found to be offering technology service, user training and access service. None of them had a teaching centre, media service or collaboration between library and Information Technology Service (ITS). Two libraries had setup writing centres to train and assist in academic writing, two were offering research data service for analysis and archiving. Four libraries had workstations for collaboration to cater for both small and large groups, and also four libraries had transformed their information service desk strategically located as a centre for first link to users and offering reference and consulting service.

Table 1: Presence of key service elements in the six universities

Key ICs Service Element	Universities					
	1	2	3	4	5	6
Collaboration between library & IT units	No	No	No	No	No	No
Media service	No	No	No	No	No	No
User training	Yes	Yes	Yes	Yes	Yes	Yes
Writing centre	No	No	Yes	Yes	No	No
Research data	No	No	Yes	No	No	Yes
Workstations for collaboration (small and large groups)	No	Yes	Yes	Yes	Yes	No
Technology service	Yes	Yes	Yes	Yes	Yes	Yes
Teaching centre	No	No	No	No	No	No
Access service	Yes	Yes	Yes	Yes	Yes	Yes
Information service desk	Yes	Yes	No	Yes	Yes	No

Source: Research Data

## 6 Discussions and Conclusions

University libraries are redefining Information Commons as a ‘place’ or ‘space’ within the library building (Sheikh, 2015). Librarians’ understanding of this concept shows that Information Commons is a novel idea to many although their familiarity negates what they labelled to be Information Commons. The respondents interviewed agree with Sheikh (2015) that Information Commons is a reengineered library space driven by the current generation of users who prefer a socially-connected environment, changes in learning, teaching and research philosophies as well as the emerging trends in technological developments. Despite the familiarity with the concept, all the libraries studied had not implemented the Information Commons model in its complete form.

Learning and teaching pedagogies are changing in higher education requiring libraries to transform, especially their spaces, to accommodate these emerging changes (Freeman, 2005) and support the new pedagogies which involve collaborative and interactive learning methods (Blumenthal, 2017). University libraries in Kenya have not been left behind. They have embraced these changes by creating discussion rooms where users can collaborate in their studies. Three participating university libraries had discussion rooms furnished with furniture (round reading tables and without partitions) for group work and sharing. This confirms the observation of Choy and Goh (2016) that there is a gradual shift in the focus of libraries from accommodation of collection to user spaces. They also advise that users require appropriately organised and well-designed study spaces in the library to suit the variety learning behaviours and activities they engage in. Although users reported that this was one of their most preferred and heavily used facilities within the library setup, only three libraries had such spaces in place.

Zhang (2009) provides what defines and characterises the Information Commons model. Since no library was found to have an Information Commons, this study compared the features which existed in these libraries to what is expected to be an Information Commons model. The following features were found to be present: quiet study areas, chatting space, electronic resources, printing, photocopying and scanning services, ICT support, soft seating areas, PCs with Internet and appropriate software, group study rooms, study carrels (without PCs), reference and research services, space for meetings. However, the following were lacking: video conferencing room, presentation and preparation room, academic writing support, research publishing support, space for seminars and cultural events.

A library space framework developed by Choy and Goh (2016) recommend that in providing for collaborative spaces, libraries should provide spaces for large and small groups. The seating configuration should cater for different group activities such as brainstorming, project work, presentation practice among others, and the spaces should be technologically enabled with the provision of large computer monitors, smart-boards, projection screens and recorders. Such facilities were lacking in the libraries studied.

The changes witnessed in libraries are part of a paradigm shift in libraries where the focus is on the user (user-centred paradigm) (Lippincott, 2012). The Information Commons model expands this paradigm shift to learning-centred paradigm which includes three levels; physical, virtual and cultural commons. The Physical Commons consists of the computer hardware, furnishings, designated discussion and quiet spaces, and traditional collections of the library. The Virtual Commons contains the digital library collections, online service tools, electronic learning tools, and Web presence of the library. The third element, the Cultural Commons, is made up of the workshops, tutoring programs, research collaborations (Heitsch & Holley, 2011). Although university libraries in Kenya have not set up Information Commons *per se*, they have established spaces, services, resources and facilities which can aggregate to key service elements characterising Information Commons. The prevailing service elements fall under physical and virtual commons level. Very little exists in the cultural commons, making the Information Commons model incomplete and hence the reason there was no designated place or space labelled Information Commons, but distinct aspects of the model existed.

The study concludes that university libraries in Kenya have not optimally implemented the Information Commons model in its absolute form despite the existence of drivers and opportunities for this change. The study recommends that:

1. Libraries should benchmark on what constitutes an Information Commons and implement it as it is a need of the hour.
2. Librarians need to get feedback on this model so as to gauge its benefits, better align to users' needs and plan for improvements.
3. The librarians need to congregate or assemble the existing salient features to form an Information Commons and label it accordingly.
4. Establish collaboration between the Information Technology unit and library to set up a technology service within the library to assist in complex technology issues, while the the library offers assistance in information access, all these offered in a central place.
5. To put up an Information Commons in its absolute form requires finances which libraries have been baffling with as a challenge. Libraries should consider implementing this service model in phases.

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## Using ICT Infrastructure to Support Knowledge Transfer at the United Nations Human Settlements Programme (UN-Habitat)

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### Abstract

*The aim of the study from which this chapter is extracted was to investigate the adequacy of ICT infrastructure available to support knowledge transfer processes at UN-Habitat. The objectives of the study were to identify the different ICTs that support knowledge transfer among employees, and how effective they were in facilitating the transfer of knowledge among employees. The study employed a mixed methods research approach. Out of 360 staff members, the target population selected was 49 participants who consisted of 8 knowledge management employees, 13 research and capacity development employees, and 28 policy makers. Due to the small target population, census technique was used to conduct the survey. Structured interviews were used as the data collection technique. The qualitative data collected was analysed and presented thematically while the quantitative data collected was analysed descriptively and presented in the form of figures. The study established that the ICT infrastructure available to support knowledge transfer was adequate but motivation to share and organisational culture negatively affected it. The results of the study may be used in creating a culture of openness, trust, and willingness among staff members to share knowledge. This chapter creates a clear understanding of the intrinsic factors involved when employing ICT infrastructure to enhance knowledge transfer.*

**Keywords:** Knowledge Management, Knowledge Transfer, ICT Infrastructure, Motivation to Share, Organisational Culture.

### 1 Introduction and Background

The shift of the global economy from the industrial age towards the information age has seen knowledge management being recognised as an organisation's most valuable asset. Organisations agree that to grow, remain competitive, and continue to exist, they have to continuously adapt their strategies to meet new business demands. Knowledge management (KM) is argued to be helpful in meeting such demands. Knowledge transfer is one of the distinct but interdependent processes of KM. According to Jasimuddin, Connell and Klein (2005), knowledge transfer is a theme of KM which involves the utilisation and generation of value from organisational knowledge. Knowledge transfer successfully takes place when the process results in the receiving unit applying and creating knowledge in the organisation. Knowledge transfer has been identified as a major focus area for knowledge management. It is widely considered as a strategic issue within knowledge management. However, it is widely acknowledged by researchers to remain a major challenge (Argote & Ingram, 2000). This has led the authors of this chapter to focus on issues relating to successful knowledge transfer.

Knowledge can be classified as being either tacit or explicit. Ganesh, Mohapatra and Nagarajan (2016) define tacit knowledge as experience-based knowledge that resides within an individual, whereas explicit knowledge is precise, formally articulated and documented. Tacit knowledge involves skilfulness, good practices, special expertise, and experience. The transfer of tacit knowledge is enabled through human interaction, for example, apprenticeship, mentorship, or job training. However, it is difficult to capture, codify or transfer because it resides in personal experience, specific work context, and individual insights, hence becomes difficult to articulate. Tacit knowledge ensures effectiveness in the organisation, by making sure that the organisation does the right thing to meet its objectives. It also offers an innovative edge for the organisation to deal with tough problems or making decisions (Agarwal & Islam, 2015; Shetata, 2015; Ogola, 2012).

Explicit knowledge can be articulated and codified in formal language and easily transferred among individuals. It is information that is written or recorded in documents, manuals, books, reports, and files. Explicit knowledge can be stored and transferred through information technology (IT) systems such as email, software applications, databases or digital repositories. Explicit knowledge enables the organisation to be efficient and creates a sense of control in its operations (Shetata, 2015; Liyange *et al.*, 2009; Ogola, 2012).

To assess an organisation's readiness and capacity to integrate KM, four basic areas need to be in place. These are people, culture, processes, and technology. People include factors such as awareness of KM; motivation and individual intention to be involved in KM processes; as well as top management support in providing resources, rewards, and incentives. Culture includes a climate of openness and trust in the organisation; a work environment that drives innovation and learning; and support for collaboration in the work environment. Processes include the strategies in place to facilitate

KM practices. Finally, technology includes the Information Communication Technologies (ICTs) available for linking the staff members and all stakeholders to one another, and enhancing the KM processes (Agarwal & Marouf, 2014).

Information Communication Technology (ICT) is a factor that is frequently mentioned as the solution to knowledge transfer. International organisations that want to encourage a learning environment invest heavily in technology. This enables employees that are located in various regions around the world to share their knowledge with each other. However, some organisations lack adequate ICT platforms to support knowledge transfer. Those that have invested in ICT also report that knowledge sharing often fails. This is blamed on employees' attitude and motivation towards knowledge transfer rather than constraints of technology. Managers with political motives may be reluctant to share best practices because they view it as a source of power. Moreover, there are no rewards and incentives in place to encourage knowledge transfer.

## **2 Statement of the Problem**

UN-Habitat has made efforts to lay the foundation for optimal implementation of KM systems, knowledge transfers and knowledge services. The growth and advancement in the ICT sector has enabled and supported the successful transfer of knowledge amongst staff, partners and stakeholders. This has driven organisations to develop technology that will facilitate their knowledge transfer strategies. UN-Habitat has developed ICT tools such as the UN-Habitat public website that features knowledge on countries, various programmes and digital databases; extranets for the Committee of Permanent Representatives (CPR) and project partners to assist sharing of project and policy information; merged partners' database to ensure aimed promotion of the UN-Habitat publications, events; and Internet tools such as online surveys, Facebook, Twitter, e-learning programmes to encourage interactive debates. However, their efforts are constrained due to their total reliance on the United Nations Office in Nairobi (UNON) for ICT infrastructure because it cannot launch their strategies without the support of UNON. The current ICT infrastructure seems to be inadequate for supporting favourable knowledge transfer between members of staff at the headquarters and in the field.

The aim of the study from which this chapter has been extracted was to investigate the use of the ICT infrastructure available to support knowledge transfer at UN-Habitat. The objectives of the study were to identify the different ICTs that support knowledge transfer at UN-Habitat; and establish the effectiveness of the available ICTs in supporting knowledge transfer at UN-Habitat.

## **3 Research Design**

Since the nature of the study involved getting both in-depth and statistical information on the use of the ICT infrastructure available to support knowledge transfer at UN-Habitat, it employed the concurrent triangulation design which is a strategy of mixed methods research approach. Mixed methods approach involves combining qualitative and quantitative research and data in a research study. Concurrent triangulation design was the most suitable approach for this study based on the fact that it was used to confirm, cross-validate or corroborate findings. It was used to overcome a weakness in one method with the strengths of another, and in expanding quantitative data through collection of open-ended qualitative data (Creswell, 2014).

The quantitative approach is justified because it enabled the researcher to measure the variables in this study. Further, it enabled the researcher to numerically demonstrate the different trends, attitudes, and opinions of the participants relating to the research questions. It employed structured questions in the interviews and presented the analysed data in numeric form through the use of figures.

The qualitative approach utilised semi-structured questions to collect in-depth information in the interviews and presented the analysed data in the form of statements and phrases. Due to the emphasis on real-life experience, qualitative data is well suited for explaining the meaning participants place on the processes under study. The rich data that is provided through the qualitative approach enabled this study to present vivid descriptions nested in real-life context. Further, qualitative data is useful when one needs to supplement or validate quantitative data from the same setting.

This study triangulated both the qualitative and quantitative data in order to provide a comprehensive and rich analysis of the data. Triangulation enables confirmation and corroboration of both types of data, elaborate or develop analysis providing richer details, and initiate new lines of thinking (Amaratunga *et al.*, 2002). The interpretation of the overall results was used to draw conclusions and inferences on whether or not the research objectives were supported.

The target population of the study consisted of information professionals and knowledge management staff who work on the knowledge transfer practices; research and capacity development staff who create and transfer knowledge; and policy makers who formulate, implement and evaluate the policies of the organisation. Due to their work activities and relevance to the study, purposive sampling was employed. Out of 360 staff members, the total target population of the study was 49. The target population comprised of 8 knowledge management staff, 13 research and capacity development employees, and 28 policy makers.

According to Kothari (2004), all items in any field of inquiry constitute a universe or population. A complete enumeration of all items in the population is known as a census inquiry. The use of the census technique in this study is justified due to the small universe or population of this study. The census inquiry consisted of 8 knowledge management employees, 13 research and capacity development employees and 28 policy makers.

Information that went into the writing of this study was gathered through primary data collection methods. The primary research was conducted through the use of face to face interviews. This study used semi-structured interviews. The list of questions covered was derived from the objectives. Semi-structured interviews were well suited for this study due to the following advantages of using them as data collection instruments. In cases of misunderstandings, the researchers can clarify or explain the questions by repeating or rephrasing them. It can be used as a guide or starting point to allow the respondent to express their opinions on a wide range of issues as they respond to questions unlike other data collection methods. The quantitative data was collected by asking a few closed ended questions followed by open ended questions in the semi-structured interview.

To ensure the reliability of the interviews, the interview tools were reviewed by lecturers in the Department of Information Science at Kenya Methodist University. Their observations and suggestions were used to review the draft questionnaire before final adoption. A pilot testing method was conducted to enhance reliability of the research instruments. Interviewing knowledge managers who are in charge of the knowledge transfer process may influence them to give a biased response. To alleviate subject bias, a clear explanation of the purpose of the interview and ensuring anonymity of the respondents allowed them to freely answer the questions.

To enhance the validity of the interview, it was administered to six respondents out of the envisioned sample size of the study. The interviews and the literature review were analysed to facilitate triangulation. This supports the idea that validity is constructed through the usage of multiple sources. The results of the study were provided to the participants for confirmation, which may support and confirm the validity of the data collected.

This being both quantitative and qualitative study provided a descriptive analysis of the collected data through the use of tables, charts, and figures while the qualitative data was analysed thematically. The researchers analysed the qualitative data from the interviews conducted by recording key events, concepts and statements mentioned by respondents and identifying emerging data categories. The study triangulated both types of data to develop a complete understanding of the data. The interpretation of the overall results was used to draw conclusions for the research objectives.

The researchers ensured that the participants' anonymity was guaranteed. Information that was able to identify the participants was restricted from anyone who was not directly involved in the study. Findings were treated with the utmost confidentiality and were only used for the purposes of this research. The researchers did not use words or language that discriminates against persons based on their racial or ethnic group, gender, age, disability or sexual orientation.

All the respondents were made aware of the research intentions through an introduction letter followed by an email. The participants were fully informed of the procedures, risks or benefits involved in this research and were only interviewed after they gave their consent to participate. The researchers were authorised to carry out the study by the National Commission for Science, Technology, and Innovation (NACOSTI).

#### 4 Results

Results indicated that 52.6% of the respondents were of the opinion that the ICT infrastructure available to support knowledge transfer was adequate, while 47.4% are of the view that the ICT infrastructure available was not adequate. The participants informed the researchers that through knowledge platforms such as the Intranet, staff members are able to access and share information. UN-Habitat's website and urban gateway enable staff and external partners to access targeted information, while the Project Accrual Accountability System (PAAS) supports project and resource management and provides information for better management decisions. Traditional ICTs such as emails and telephone are commonly used by staff members to share knowledge and information individually.

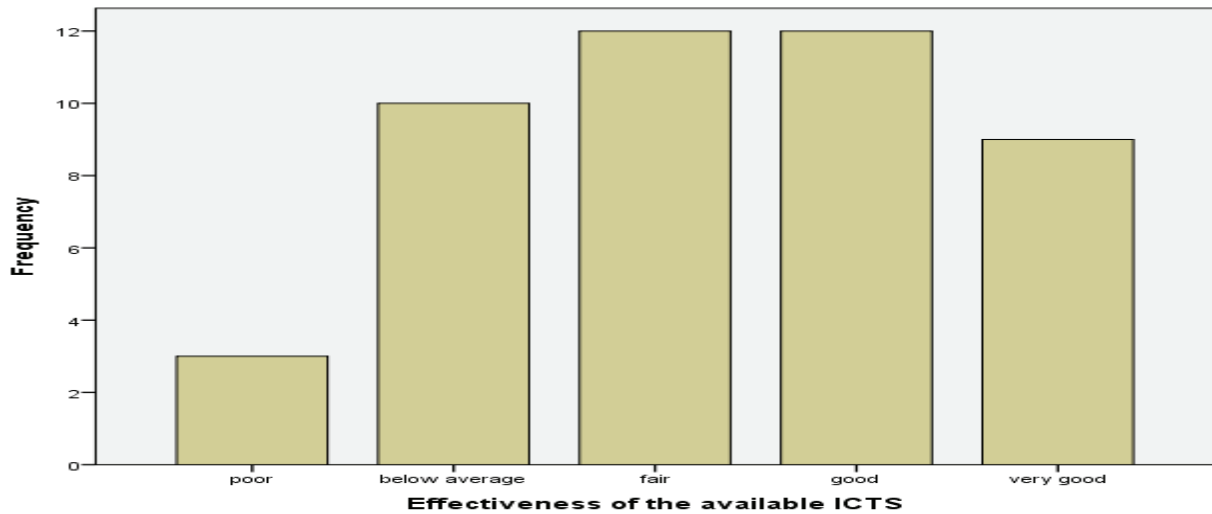
When asked to describe the different ICTs available to support knowledge transfer, a respondent said the following:

*"The Intranet enables us to share knowledge with staff; the UN-Habitat website, PAAS, and urban gateway enable us to share knowledge with our external partners. The ICTs available are rarely updated with knowledge due to the lack of motivation and organisational silo culture thus limiting their support to knowledge transfer."*

UN-Habitat has developed various ICT tools to support knowledge transfer. However, they are segregated. This has led to the formation of multiple information sources.

The findings also revealed that the shared drive which is used to store UN-Habitat's digital records and documents is inadequate due to its limited accessibility and disorganised naming convention making it difficult for staff members to access and retrieve knowledge. A hundred per cent of the participants still utilise some of the available ICTs despite their differing views on their adequacy or inadequacy to share knowledge with their colleagues.

Figure 1 illustrates the effectiveness of the available ICTs in sharing knowledge among staff members. 12 of the participants were of the view that the available ICTs are good and fair in knowledge sharing respectively, 10 participants were of the opinion that the available ICTs were below average in sharing knowledge, 9 participants felt that the available ICTs were very good, and 3 participants believed that the available ICTs were poor in supporting knowledge sharing.



**Figure 1 Effectiveness of the Available ICTs**

*Source: Research Data.*

## 5 Discussion

ICT platforms such as the Intranet supports knowledge transfer among internal staff members. UN-Habitat website, urban gateway, PAAS and emails enable staff members and external partners to share and access knowledge. Similarly, every staff member is provided with a computer, telephone and Internet connection to support the sharing of knowledge. UN-Habitat has developed multiple ICT tools to support knowledge transfer. However, many tools are segregated. This has caused the generation of multiple information sources and makes knowledge transfer process cumbersome. UN-Habitat has adequate ICT infrastructure available to support the knowledge transfer process. However, due to factors such as the segregated ICT platforms, organisational silo culture and lack of motivation, staff members rarely updated the ICTs with knowledge.

## 6 Conclusion

In today's fast changing world, organisations are looking for ways to maintain and grow their competitive advantage. This has seen KM being recognised as an organisation's most valuable asset and is increasingly becoming the focus of most organisations. Knowledge transfer is one of the main themes in KM discipline that remains a major challenge to organisations. This has prompted the researchers to investigate the adequacy of the ICT infrastructure available to support knowledge transfer at UN-Habitat. The ICT infrastructure available to support knowledge transfer is adequate. However, it is limited by the multiple segregated ICT tools, organisation's silo culture and lack of motivation to share knowledge among staff.

## 7 Recommendations

The various ICT tools need to be integrated to enhance implementation and accessibility. Rewards and incentives need to be developed, formally set up and promoted to encourage and foster a culture of knowledge transfer at the organisation. This will also enhance the motivation of staff members to share knowledge amongst each other. Staff members need to be involved when creating solutions for knowledge sharing so that they can share their ideas and opinions. This will enhance the culture of openness, trust and willingness among staff members to share knowledge. Consistent support, strategic advice and leadership from the executive director are needed to motivate the staff members, promote a culture of openness, trust and breakdown of the silo culture.

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# The Effect of ELearning on Students' Learning Process at the University of Nairobi

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## Abstract

*This chapter examines the effect of eLearning on Students' Learning Process (SLP) at the University of Nairobi. The study leading to the chapter employed a mixed research approach constituting both qualitative and quantitative research. Data was collected between the months of May and September 2016 at the College of Health Sciences, University of Nairobi. The population of the study was 530 respondents. A sample size of 100 respondents was selected in line with Yamane's (1967) formula. Questionnaires and interviews were used as the data collection instruments. The research findings revealed that the independent variables eLearning benefits, eLearning challenges, eLearning incentives and eLearning integration contribute to Students' Learning Process. Each of these factors influences the Students' Learning Process either positively or negatively. The research further revealed that the introduction of favourable and supportive eLearning environment enhances eLearning benefits which positively influence Students' Learning Process while unfavourable eLearning environment increases eLearning challenges thus negatively influencing Students' Learning Process. The findings may be useful to the University of Nairobi and other institutions of higher learning within and beyond the region in setting up eLearning technology as well as favourable conditions that support the utilisation of eLearning.*

**Keywords:** *ELearning, Innovation, Students' Learning Process (SLP), Institutions of Higher Learning (IHL), Learning Management Systems (LMS)*

## 1 Introduction

eLearning is the use of Information Communication Technologies (ICTs) in the delivery of content in the education sector. Higher educational systems around the world are forced to integrate and use this innovative technology in teaching and learning for them to remain competitive. This exposes the students to new world of information (Kalembere & Majawa, 2015). These technologies are important to use while studying as it builds a workforce that embraces technology in order to meet society's need for lifelong learning.

The technology can be packaged into Learning Management Systems (LMS) such as Moodle, Blackboard, and WebCT and exists in a number of forms. Hrastinski (2008) identified asynchronous eLearning as one where the instructors use the Internet to deliver lectures, tests, and assignments in a platform which is accessible at any time and is anchored on utilities such as e-mail and discussion boards. Romiszowski (2004) describes synchronous eLearning to include technology such as video conferencing and electronic white boards that require students who are scattered in different geographical locations to be present and actively participate during their learning process.

By integrating ICTs in learning, students can retrieve information they need within a short time. They can access and disseminate electronic information such as e-books, e-journals and can advance their learning by using innovative ICTs in the form of wireless networks, Internet search engines, databases, websites and Web 2.0 technologies (Khan, 2011). Omwenga (2003) as well as Mbambo-Thata (2009), however, noted that eLearning will not replace the classroom setting but rather provide tools to enhance and support it by taking the advantage of new informational content. Innovative technologies used to deliver learning ICTs in education, on their own, are not determinants of how teaching should be conducted. This is in agreement with Adedokun-Shittu and Shittu (2011). who explain that teachers believe that ICTs can only be useful when jointly used with other instructional materials.

However, Tarus (2011) as well as Tarus, Gichoya and Muumbo (2015) explain that the use of ICTs in education face challenges such as inadequate ICT and eLearning infrastructure, inadequate finances, lack of affordable and adequate Internet bandwidth and connectivity, unsupportive policies and laws, inadequate eLearning technical skills especially on e-content development, and lack of commitment among the teaching staff among others.

Different Kenyan public universities have embarked on eLearning initiatives in line with the government's policy that requires universities to introduce eLearning as an alternative delivery system. The University of Nairobi implemented eLearning in 2004 with the intention of having the technology support Students Learning Process (SLP). This process, as described by Hughes *et al.* (1992), includes activities aimed at identifying ways of supporting learners and learning in educational and work environments.

## 2 Statement of the Problem

Kenyan public and private universities are required by the government to introduce eLearning as an alternative delivery system (GoK, 2007). The incentives for this move include technological advancements; needs and demands of the individual learners; as well as the need for cost-effective and efficient access to education among others. Fransen, Kirschner, & Erkens, (2011) noted that African universities are heavily funding eLearning projects. This is in tandem with Ruiz, Mintzer and Leipzig (2006) who explain that adopting eLearning and its technology requires large investments in terms of institutional resources. All these have led public and private institutions in Kenya to allocate and spend huge sums of money on technology as an indication of development and improvement in education. Despite all these, few studies have been conducted in an effort to assess the effect of eLearning on students' learning process in institutions of higher learning (IHL). These include a study by Ruiz et al. (2006) on the impact of eLearning in medical education and another by Adedokun-Shittu, & Shittu, (2013) on the impact of ICTs on students and lecturers. While the use of ICTs in education is perceived to bring a lot of benefits, there is also concern of a widespread of unawareness of the specific effect of ICTs on educational goals and objectives (Wagner et al., (2005). Similarly, the assessment of ICT's impact on teaching and learning (T&L) in Less-Developed Countries (LDC) is a great limitation as most researchers have avoided this aspect (Adedokun-Shittu & Shittu, 2011); (Wagner et al., 2005); (Trucano, 2012). It is because of this that the authors conducted a study to examine the effect of eLearning on the students' learning process at the University of Nairobi (UoN).

## 3 Research Objectives

The main objective of this research was to examine the influence of eLearning on Students' Learning Process at the University of Nairobi. The specific objectives of this study were to:

- i. Determine eLearning benefits, its relationship and the influence it has on Students' Learning Process in UoN;
- ii. Investigate eLearning challenges, its relationship and the influence it has on Students' Learning Process in UoN;
- iii. Establish eLearning incentives, its relationship and the influence it has on Students' Learning Process in UoN;
- iv. Find out eLearning integration, its relationship and the influence it has on Students' Learning Process in UoN;
- v. Determine the eLearning environment and the influence it has on the relationship between eLearning benefits, eLearning challenges and Students' Learning Process (SLP) in UoN.

The study was conducted at the College of Health Sciences, University of Nairobi. The research focused on first year students pursuing Bachelor of Dental Surgery, Bachelor of Pharmacy and Bachelor of Medicine and Surgery and the ICT staff. This study focussed on a technical subject and the respondents were not experts in the field of eLearning and technology. The researcher overcame this by the use of simplified terms and well-structured research instrument.

## 4 Literature Review

This section reviews existing literature relevant to the themes of the study. It is structured according to the objectives of the study.

### 4.1 eLearning benefits

eLearning provides a platform which enables students to access diverse and up to date educational materials, network amongst themselves, and share knowledge resources (Adedokun-Shittu & Shittu 2013. This has led to cost-effectiveness and cost-efficiency to education stakeholders (Ruiz, Mintzer & Leipzig, 2006). Other benefits associated with eLearning include increase in learners' levels of satisfaction; perceived ease of use and access of materials; convenient teaching and learning; enhanced interaction between staff and students; and networking with the outside world through exchange of academic work (Hussain, 2009; Adedokun-Shittu, & Shittu, 2013).

### 4.2 eLearning challenges

Balanskat, Blamire, & Kefala, (2006), Andersson & Grönlund (2009) and Bingimlas (2009) noted that eLearning challenges associated with educators include inadequate ICT skills and insufficient training on how to integrate ICT into the subject they teach; negative attitudes; inadequate expertise; lack of knowledge and skills to evaluate the use of ICT in teaching; as well as lack of motivation and confidence in using ICT. The challenges associated with institutions include inadequate ICT infrastructure; institutions' limited capability in handling projects; high capital expenditure; low Internet bandwidth; as well as poorly designed eLearning systems (Namisiko, Munialo & Nyongesa, 2014; Alemneh & Hastings, 2006; Andersson, & Grönlund, 2009; Chitanana, Makaza & Madzima, 2008). Furthermore, eLearning system-level challenges include unsupportive education systems; inappropriate models for designing eLearning instructional materials; misappropriation of education technology funds; as well as inadequate budgets teacher development (Namisiko, Munialo & Nyongesa, 2014; Adedokun-Shittu & Shittu, 2013).



### 4.3 ELearning Incentives

Omwenga, Waema and Wagacha (2004), Gaebel *et al.*, (2014) and Adedokun-Shittu, & Shittu (2013) highlighted the factors motivating the use of eLearning to include flexibility in time and completion; the need for enhanced and efficient use of classroom time; need to facilitate teaching and instructing larger numbers of students; need to collaborate with each other; availability of Internet services; need for cost reduction; as well as an attempt to meet the needs of young learners who have embraced the Internet and smart phones (Bichsel, 2013).

### 4.4 eLearning integration in IHL

According to Docebo (2014), the global aggregate growth rate for eLearning is 7.6%. However, several world regions have significantly higher growth rate. Asia is at 17.3%. Eastern Europe, Africa, and Latin America are at 16.9%, 15.2%, and 14.6%, respectively. However, Kashorda & Waema (2014) noted that the physical learning environment accounts for 78% in developing nations. The specific areas of integration include integration of ICTs in assessment. University of Ilorin for example used e-assessments for courses having 500 and above students. Similarly, University of Central Florida adopted the use of WebCT/Blackboard as an e-assessment tool. It was estimated that savings of between \$135,000 and \$163,000 in the cost of paper were made (Hartman, Dziuban, & Moskal, 2007).

### 4.5 eLearning environment

Könings, Brand-Gruwel & Merriënboer (2005) postulated that the characteristics of the learning environment have a significant effect on students' learning process. Ginns and Ellis (2007) identified concepts that affect learning process in higher education to entail students' prior experience, knowledge, conceptions and reasons for studying; and students' perception of teaching-learning environment, among others. Similarly, Alhomod & Shafi, (2013) noted that programme content, web page accessibility, learners' participation and involvement, website security and support, interactivity of environment, instructor competency, presentation and design affect students' learning. With the advent of the Internet, learning environments can be virtual, online or even remote. It encompasses the support systems (structures, tools, support services and communities) that provide a platform where students learn best by providing unique learning needs. Non-usable eLearning application obstructs students from learning as this makes learners to spend more time learning how to use the software rather than learning the contents.

### 4.6 Students' learning process

Hughes *et al.* (1992) describe learning processes as those activities aimed at identifying ways of supporting learners and learning in educational and work environments. Learning process entails being introduced to something, getting to know more about it, trying it out, getting feedback, reflecting and adjusting, and finally using the learnt skills/knowledge as shown in Figure 1.

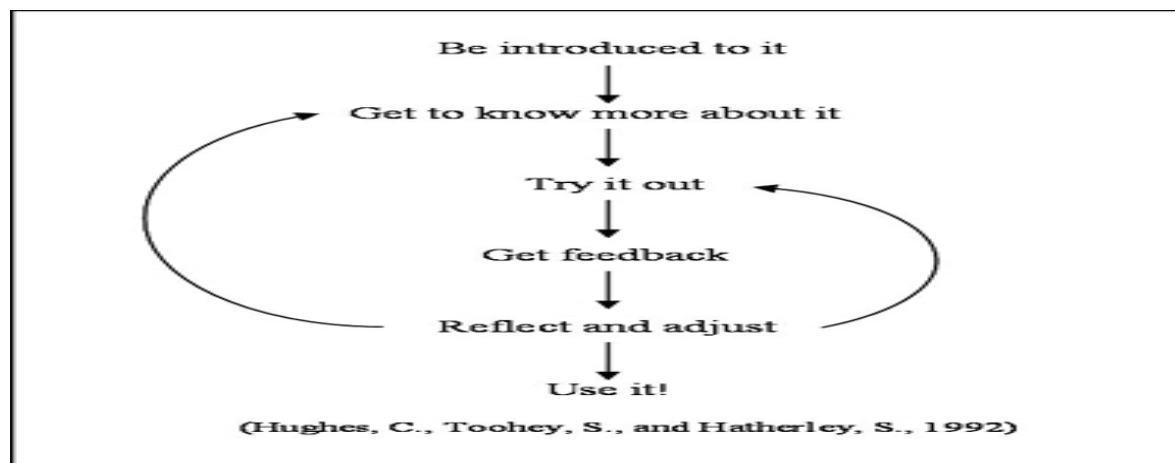


Figure 1: Students' Learning Process (SLP)

Source: Hughes *et al.* (1992)

## 5 Theoretical frameworks

CIPP Evaluation Model, Kirkpatrick Model of Evaluation and The ICT Impact Assessment Models were considered.

### 5.1 ICT Impact Assessment Model

This theory was postulated by Adedokun-Shittu and Shittu, (2013). It extends the elements of Kirkpatrick (reaction, learning, behaviour and results) and Stufflebeams' CIPP (Context, Input, Process and Product) models by adding

the “challenge” element The model is made up of four themes. These are positive effects, challenges, incentives and integration. The model is applicable for both formative and summative assessment of ICT integration in teaching and learning. Positive effects include benefits of ICT, students’ response to ICTs and ICT compatibility/comfort in teaching and learning derived from deploying ICT facilities into teaching and learning. Incentives include the form of trainings, mentoring and adequate facilities that come with the ICT usage is teaching and learning. Integration involves integration of ICT in the curriculum, assessment and pedagogy. Challenges include; problems, constraints and technical issues. The variables in this model were adopted to guide this study due to its fitness as it considers the element of ‘challenge’ as ICT is an evolving subject area. Furthermore, positive effects, incentives and integration variables were deemed applicable for establishing the effect of eLearning of SLP. Hence the model was picked tom guide this research.

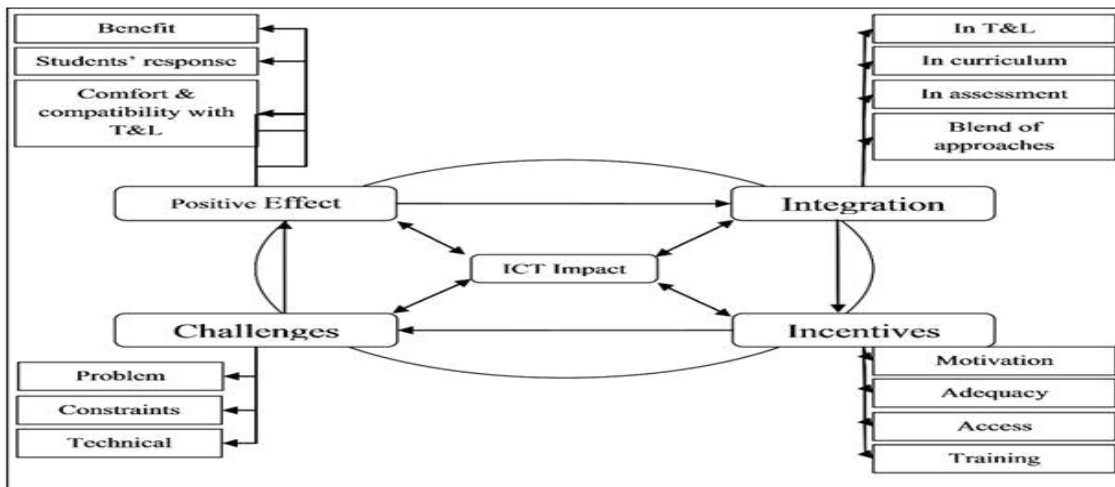


Figure 2: ICT impact assessment model

Source: Adedokun-Shittu and Shittu (2013).

5.2 Conceptual framework

The variables from ICT impact assessment model informed the independent variables adopted to guide this study. They include eLearning benefits, eLearning challenges, eLearning incentives and eLearning integration. The eLearning environment became the moderating variable.

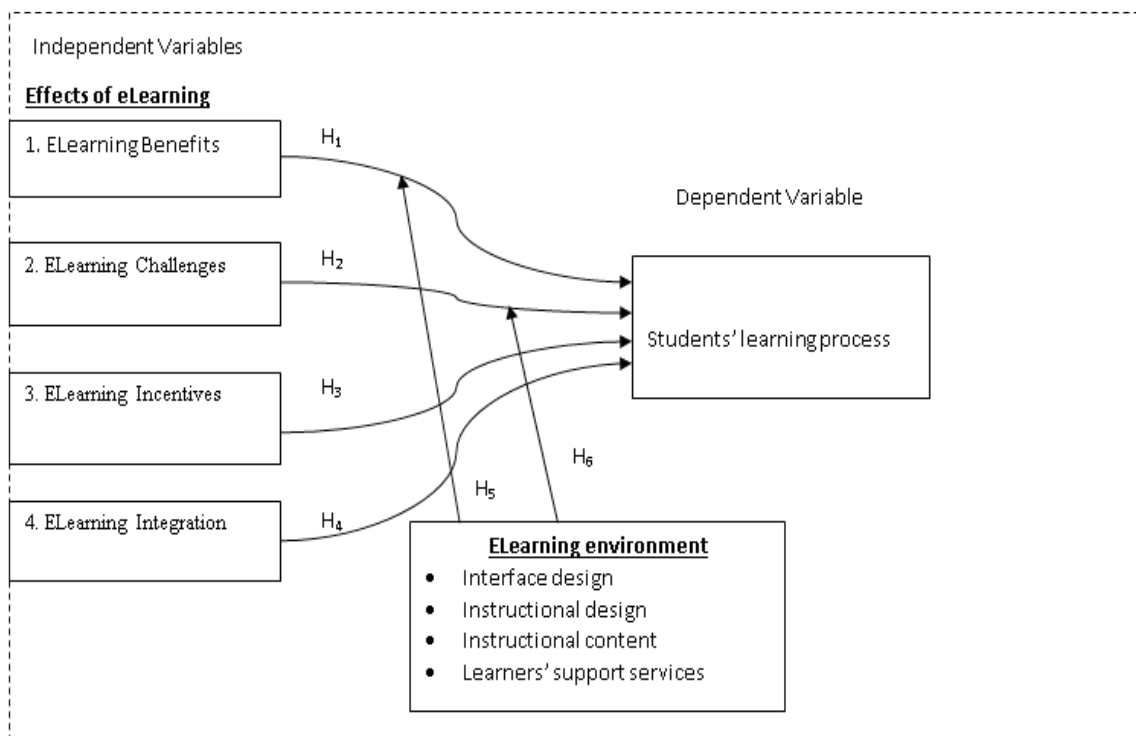


Figure 3: Conceptual framework

Source: Research Data

## 6 Research Methodology

A mixed method research design was used for this study. Both qualitative and quantitative research data were collected. The target population was 530 respondents. These were 520 first year students from the College of Health Sciences and 10 members from the University of Nairobi, Department of eLearning. Based on Yamane (1967) formula with confidence level of 90%, a total of 100 respondents participated in the study. The respondents were grouped into four different strata then proportionate sampling and purposive sampling were used to get respective sample sizes as shown in Table 1 below.

Table 1: Distribution of population and sample size

S/N	School	Course enrolled	Population	Sample size
1	Dental School	Bachelor of Dental Surgery	55	10
2	School of Pharmacy	Bachelor of Pharmacy	115	22
3	School of Medicine	Bachelor of Medicine and Surgery	350	66
4	eLearning Department	Elearning staff members	10	2
			<b>530</b>	<b>100</b>

Source: Research Data

Primary data was collected using semi-structured closed ended and five-point likert scale questionnaires and interviews.

## 7 Research Findings and Discussions

A total of 100 questionnaires were administered. 80 questionnaires (representing 80%) were filled and returned. Out of these, 58 of the questionnaires (72.5 %) were administered to students pursuing Bachelor of Medicine and Surgery, 15 questionnaires (18.8 %) administered to students pursuing Bachelor of Pharmacy and the remaining 7 (8.8 %) were administered and filled by students pursuing Bachelor of Dental Surgery.

### 7.1 Descriptive data analysis

The researchers used SPSS version 21 to code, enter and compute descriptive statistics, correlation analysis and regression analysis. The results are discussed in the sections below. The research findings revealed that eLearning benefits include access to education anywhere and anytime; access of up-to date relevant learning materials; capability of online interaction amongst students and between lecturers and students; online sharing of academic work and linking with academic databases of other institutions; ability to support students to study at their own pace; saving on learning cost; as well as improvement of students' proficiency in ICT skills. These findings corroborate the findings of authors such as Ruiz, Mintzer and Leipzig (2006), Adedokun-Shittu *et al.* (2013; Gunga and Ricketts (2007), and Bingimlas (2009). eLearning challenges identified included inadequate interaction between students and lecturers; inadequate computers with Internet connectivity; insufficient technical support; slow Internet connectivity; computer hardware failure; inadequate lecturers' knowledge on the use of eLearning; poor design of eLearning system interface; and out-datedness of computer hardware. Gunga and Ricketts (2007), Bingimlas (2009), Twinomugisha, Magochi and Aluoch (2004), and Alam and Farid (2011) also noted similar challenges. The research further revealed that eLearning incentives include enhanced accessibility to education; improved adequacy of learning materials; wide availability of training; enhanced flexibility in learning; and enhanced efficiency of class time. These findings are similar to the research findings of Omwenga, Waema and Wagacha (2004) and Gaebel *et al.* (2014). eLearning has been integrated in the delivery of learning content; utilised in administering examinations; as well as ICT integration in curriculum (Adedokun-Shittu *et al.*, 2013; Crisp, 2007).

### 7.2 Correlation Analysis

Correlation analysis was carried out in order to establish the relationship between independent and dependent variables. The Karl Pearson's coefficient of correlation analysis quantifies the strength and direction of the relationship between the variables in the study. The analysis of this research data showed that eLearning benefits, eLearning incentives, eLearning integration and eLearning environment had correlation coefficient of ( $r=.787^{**}$ ,  $r=.216$ ,  $r=.193$  and  $r=.289$ ) respectively. The significance level is also .000, 0.055, 0.087 and 0.009 respectively. On the other hand, there exists a negative correlation between eLearning challenges and SLP ( $r=-.225$ ) and the negative relationship is significant at .045. These findings showed that SLP is positively enhanced by more eLearning benefits. The independent variables incentives and integration have correlation coefficients of .216 and .193 respectively. This means that there existed a positive relationship, though weak, between the two independent variables and the dependent variable. This means that as one variable increases or decreases, the dependent variable would also have low but similar changes. The eLearning challenges have a negative correlation of  $-.225^{*}$ . This means that the effectiveness and efficiency of SLP is inverse to the either increase or decrease of eLearning challenges.

Table 2: Correlations table

Variable	Correlation results	Interpretation
Relationship between eLearning benefits and SLP	$r = 0.787^{**}$ , sig = .000	Highly positive strongly significant relationship
Relationship between eLearning challenges and SLP	$R = -.225^*$ , sig = .045	Weak and negative significant relationship
Relationship between eLearning incentives and SLP	$R = .216$ , sig = 0.055	Positive but insignificant relationship
Relationship between eLearning integration and SLP	$R = .193$ , sig = .087	Positive but insignificant relationship
Relationship between eLearning environment and SLP	$R = .289^{**}$ , sig .009	Positive and strongly significant relationship

Source: Research Data

### 7.3 Regression Analysis

The third part of the objectives was to establish the influence of independent variables on dependent variable.  $R^2$  is a statistical term which indicates how good one term is at predicting another. The rule of thumb is that usually an R square of more than 50% is considered as better. Combining the four independent variables, the R-square is 0.680 representing (68.0%) at significance level of 0.000 implying that these are important factors that influence Students' Learning Process. However, the research findings indicate the existence of other factors (32%) contributing to Students' Learning Process (SLP).

Table 3: Model summary for all independent variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.825 <sup>a</sup>	.680	.663	.28914	.680	39.877	4	75	.000

a. Predictors: (Constant), eLearning integration, eLearning benefits, eLearning challenges, eLearning incentives

Source: Research Data

A specific analysis of both eLearning benefits and eLearning challenges indicated a contribution of 63.5% to SLP as shown on the R Square section in Table 4. The contribution of these two independent variables was also significant at 0.000.

Table 4: Model summary for eLearning benefits and eLearning challenges

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.797 <sup>a</sup>	.635	.626	.30474	.635	67.057	2	77	.000

a. Predictors: (Constant), eLearning challenges, eLearning benefits

Source: Research Data

### 7.4 Focus on the effect of eLearning environment on the relationship between eLearning benefits and SLP

eLearning benefits contributed 62.0% of SLP and with the introduction of favourable eLearning environment, SLP is enhanced by 0.4% as shown in Table 5.

Table 5: Model summary for eLearning benefits with eLearning environment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.787 <sup>a</sup>	.620	.615	.30907	.620	127.239	1	78	.000
2	.790 <sup>b</sup>	.624	.614	.30948	.004	.794	1	77	.376

a. Predictors: (Constant), eLearning benefits

b. Predictors: (Constant), eLearning benefits, eLearning environment

Source: Research Data

### 7.5 Focus on the effect of eLearning environment on the relationship between eLearning challenges and SLP

eLearning challenges contributed 5.1% of SLP and with unfavourable eLearning environment, the contribution changed to 13.4% at highly significant level of 0.008. This contribution is an inverse contribution as indicated in the correlation table.

Table 6: Model summary for eLearning challenges with eLearning environment

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.225 <sup>a</sup>	.051	.039	.48848	.051	4.164	1	78	.045
2	.367 <sup>b</sup>	.134	.112	.46947	.084	7.445	1	77	.008

a. Predictors: (Constant), eLearning challenges

b. Predictors: (Constant), eLearning challenges, eLearning environment

Source: Research Data

The coefficients in table 7 show that eLearning benefits make a strongest unique contribution of 0.828 and the variable is statistically significant to the equation at 0.000. eLearning challenges contribute 0.119 to SLP and the contribution is statistically insignificant at 0.078. eLearning incentives contribute uniquely at 0.147 and the contribution is statistically significant to the equation at 0.049. Finally, eLearning integration is making a unique contribution of 0.174 which is statistically significant to the equation at 0.010. Table 7 shows standardised coefficients – Beta column as well as Sig. column shows the contribution of each independent variable.

Table 7: Coefficients for all independent variables

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.004	.433		2.316	.023
	eLearning benefits	.800	.071	.828	11.250	.000
	eLearning challenges	-.100	.056	-.119	-1.789	.078
	eLearning incentives	-.137	.068	.147	-2.005	.049
	eLearning integration	.181	.068	.174	2.649	.010

a. Dependent Variable: Students' learning process

Source: Research Data

From the data in Table 7 above, the study established regression equation was  $Y = 1.004 + 0.828X_1 - 0.119X_2 - 0.147X_3 + 0.174X_4 + \epsilon$ . Therefore, Students' Learning Process (SLP) at UoN =  $1.004 + (0.828 \times \text{eLearning Benefits}) - (0.119 \times \text{eLearning challenges}) - (0.147 \times \text{eLearning incentives}) + (0.174 \times \text{eLearning integration})$ . Similarly, the regression equation that is used to establish the contribution of eLearning benefits and eLearning challenges to students' learning process was  $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \epsilon$ . Therefore,  $SLP = 1.411 + (0.746 \times \text{eLearning benefits}) - (0.105 \times \text{eLearning challenges}) + \epsilon$ . With the introduction of eLearning environment (moderating variable), SLP is represented by the equation  $y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_mM + \epsilon$ . Therefore,  $SLP = 1.523 + .772X_1 + -.102X_2 + -.057M + \epsilon$ .

The findings revealed that eLearning benefits, eLearning challenges, eLearning incentives and eLearning integration to a constant zero, SLP at UoN would be at 1.004. One per cent (1%) change in eLearning benefits leads to an increase in SLP by variations of 0.828. 1% change in eLearning challenges leads to a decrease in SLP by variations of .119. 1% change in eLearning incentives leads an increase in SLP by variations of .147. Furthermore, 1% change in eLearning integration would lead to .174 variations in SLP at UoN. Further, the study established that eLearning benefits, eLearning incentives, eLearning integration and eLearning environment were all significant as their significant value was less than ( $P < 0.05$ ).

## 8 Conclusions and Recommendations

eLearning benefits, eLearning incentives and eLearning integration have positive effect on SLP. eLearning challenges have negative effect on SLP. The researcher found out that the introduction of favourable and supportive eLearning environment enhances eLearning benefits which positively influence Students' Learning Process (SLP) while the introduction of unfavorable eLearning environment increases eLearning challenges on SLP.

The introduction of technology in education has effects that contribute significantly to SLP. There is need to strengthen eLearning benefits, incentives and further the integration while reducing on eLearning challenges. It is therefore important for the universities within and beyond the continent to not only implement the technology but also provide and enhance supportive and favourable eLearning environment.

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SECTION 5:  

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INTERNET OF  
THINGS AND  
EMERGING  
TECHNOLOGIES  

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# Security and Privacy Challenges in Implementation of the Internet of Things in Homes

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## Abstract

*The Internet of Things has catalysed the emergence and growth of the home automation market. Companies are investing in creating smart home systems to provide home owners with interconnected home environments allowing them to access and link home appliances in private wireless networks and create customised environments. Smart homes have many benefits to their users. These benefits include greater accessibility and convenience of remote access especially for the elderly or disabled. Despite these benefits, most people are reluctant to adopt smart homes mainly because of the challenges of ensuring personal privacy and confidentiality. The devices interconnected by the Internet of Things (IoT) generate data which can be used to extrapolate individuals' habits and behaviours and to exploit them. This chapter discusses the data generated by Internet of Things devices in homes, the security threats faced by the users of smart home, and to suggest possible solutions to these challenges.*

**Keywords:** *Internet of Things, Cyber security, Smart homes, Privacy, Confidentiality.*

## 1 Introduction

The 20<sup>th</sup> Century home is becoming smarter. What was previously thought to be the preserve of science fiction is quickly becoming a reality as modern homes are quickly filling with smart devices. These devices are able to communicate with each other and respond to simple commands providing the residents with customised home environments. The smart devices such as smart TVs, smart fridges, smart locks, and smart cameras that can be controlled with a touch of a button or a voice command are novelties providing users with high levels of convenience and accessibility to services and information. These smart homes are as a result of the adoption and implementation of Internet of things (IoT).

Internet of things is a relatively new concept and has varied definitions. The Internet Engineering Task Force (IETF) defines IoT as a network of physical objects or 'things' embedded with electronics, softwares, sensors and connectivity to enable objects to exchange data with the manufacturer, operator and/or other connected devices (IETF, 2018). Weber and Weber (2010) describe IoT as a world where physical objects are seamlessly integrated into the information network and where the physical objects can become active participants in business processes. In that environment, services are available to interact with these 'smart objects' over the Internet, query their state and any information associated with them, taking into account security and privacy issues. From the above definitions one can conclude that the IoTs is essentially a network of smart devices, physical and otherwise.

In Kenya, the uptake of IoT home technologies has been slow. This has mainly been due to the lack of reliable and affordable Internet connectivity. However, this is changing quickly. Safaricom, a major Internet services provider in the country, connected 28,000 homes to the Internet in 2017 (Njanja, 2018). Other home Internet providers such as Zuku and Faiba have approximately 10,000 and 36,000 subscribers countrywide respectively (CAK, 2018). This increase in availability of home Internet connectivity in Kenya is likely to create a higher demand for IoT devices as more people take advantage of the connectivity to explore the convenience of smart connections within their homes. In anticipation of this scenario the Communications Authority of Kenya (CAK) on 15<sup>th</sup> of May 2018 created and published a guideline for type approval and use of IoT devices in Kenya. The guideline requires that IoT devices be assigned a 15-digit Mobile Station International Subscriber Directory Number (MSISDN) where there is need for the devices to use existing cellular networks.

The benefits of a smart home include, but are not limited to, energy efficiency through the use of automated lighting systems, better home security since one can use connected devices such as smart cameras to set up home surveillance and receive instant notification in case of security breaches, convenience of having appliances that can anticipate your need and perform automated tasks with little or no promoting. These benefits have led to the rapid growth of the home automation market with industry giants such as Amazon, Samsung and Google developing home automation systems. Despite these benefits, concerns about the security of IoT devices in home devices have remained the Achilles heel of home automation systems. Having smart devices in a home has the effect of increasing the threats to the security and privacy of the residents.

This chapter identifies the types of data that home IoT devices generate, examines ways in which IoT devices pose security and privacy violation and threats to home automation users, and suggests possible solutions to these challenges.

## 2 Methodology

The research was a desktop research and therefore primarily uses secondary data. The researcher reviewed relevant online literature on IoT systems adoptions in homes. The literature on IoT in homes in Kenya is scanty since the adoption of the technology is in its infancy in the country. The scope of the chapter is limited to security and privacy threats posed by IoT in homes therefore IoT applications outside the home were not considered.

## 3 Data Generated by IoT Devices in Home Automation

To better understand the security threats that IoT devices pose to home owners, it is necessary to know what kind of data these devices generate and transmit. This section explains the types of data which are generated by IoT devices in homes.

### 3.1 Identification and location data

Internet of Things works when all the smart devices ('things') in the network are identifiable, can communicate, and can interact with other smart things in the network (Sedrati and Mezrioui, 2018). In order to be identified, each 'thing' needs to have a unique identifier. This is provided through the use of sensors such as Radio Frequency Identification (RFID) tags which are embedded in the smart devices. These sensors can form ubiquitous networks on which the devices can identify each other and be able to link to a network such as the Internet (Bonsor and Fenlon, 2018). It is important to note that IoT devices generate data about their identity, features and location. This information is stored on sensors for transmission over the wireless networks. If compromised, an RFID tag can provide this information to unauthorised users. It is possible, therefore, that IoT devices in homes can be tracked by their manufacturers or sellers if they have access to the tags or sensors attached to them.

### 3.2 Activity (use) data

The IoT devices in homes are often used to automate repetitive activities such as controlling light switches, locking and securing the home and even operating appliances such as washing machines, ovens or fridges. As these devices are activated to perform their tasks, they generate data. A smart fridge, for instance, can collect data on its contents and note how often each item is used before it is replaced. If the food packaging/containers have sensors, then data from each of the items can be extracted by the fridge and a list generated when a specific commodity is running low or needs to be replaced. It is estimated that by the year 2019, IoT devices will be generating over 500 zettabytes of data per year (CISCO, 2018). This data generated by home IoT devices can be mined by organisations and patterns of use and behaviour of the users of the smart devices inferred from the information produced.

### 3.3 Interaction data

Internet of Things devices need to communicate with each other in order to receive and send commands to enable them to activate. In order to seamlessly integrate several IoT devices on a central network and be able to control them, there is need to have a central hub. This hub acts as the main IOT that controls the other devices in the network. Most home automation systems come equipped with a central hub such as Echo for Amazon home kit; home pod for Apple home kit; and Samsung's smart things hub. Where there is no hub installed or with singular devices, user smart phones act as the hub creating a centre from which users can control their devices. These hubs enable interaction between smart devices and as such they store a lot of information about devices on the network. This information includes device identities, passwords or activation codes.

## 4 Security Challenges of IoT in Home Automation

Home automation systems need to provide residents with security and privacy. However, these systems are often under threat of attacks that may lead to private information leaking or unauthorised access being acquired into the network. Some of these security challenges facing the home systems include the following:

### 4.1 Hacking

In order for IoT devices to communicate, they need to be connected to the Internet or to a network. This connection is done via wireless networks such as Z-wave, Zigbee, Bluetooth LE, Wi-Fi or 6LoWPAN (Lethaby, 2017). These wireless modems are preferred because they consume less energy than wired communication. Unfortunately, though, the lower the energy means they have to run on lower frequencies. This leads to lower security features since there is inadequate bandwidth to carry heavy encryptions that would secure this channel better. Consequently, most of these wireless networks are vulnerable to being hacked and data that being transmitted stolen. This vulnerability was demonstrated when hackers were able to initiate a Z-wave downgrade attack. The hackers are able to control Z-wave devices such as smart doors and open them at will. This was possible because although a new encryption protocol had been developed

for Z-wave products (S2), the system was backward compatible allowing for support of the initial less secure software (S0). The attackers then caused the devices to downgrade from S2 to S0 and were able to easily hack into the device (Fox-Brewster, 2018). Such security loopholes once exposed prompt the manufacturing companies to patch them. However, these patches often apply only to new devices rather than the already purchased devices hence unless all already sold devices are replaced or upgraded the security risk remains unabated.

#### 4.2 Home digital assistants

Home digital assistants are artificial intelligence softwares that aid in the control and access of IoT devices in the home environment. These softwares are usually installed in the hubs and are voice prompted. They accept input through voice commands and activate other linked IoT devices in the home network on demand. Examples of digital assistants include Siri (Apple) and Alexa (Amazon). To work effectively, digital assistants 'learn' more about their users by collecting information about them by recording commands and uploading them to a cloud which then analyses the information and responds to the request. Digital assistants are usually activated by 'wake words'. However, there are instances when the devices have been activated without direct commands. These are instances in which the digital assistants have been inadvertently triggered by unintended phrases and performed tasks that were not explicitly demanded. An example is when Alexa recorded a couple's conversation and forwarded it to another user without their knowledge or consent (Chokshi, 2018). These digital assistants are essentially constantly 'listening' even when they have not been activated. It follows, therefore, that users of IoT devices can be under constant surveillance of their devices. This is in violation of the user's privacy.

#### 4.3 End user laxity in ensuring security

End users of IoT devices often present a security challenge to their systems especially if they demonstrate laxity in securing them or are ignorant of threats posed by use of their IoT Devices. End users may pick weak and easily guessed passwords such as the family surname to connect their devices on their home networks. There are also instances when end users do not change or replace default passwords on purchased IoT devices. These inbuilt passwords can easily be found online and used to gain entry into devices and reset them (Lamb, 2018).

#### 4.4 Shared data and privacy agreements

The data generated by IoT devices are either stored locally (on the devices) or on service servers. Service providers, therefore, have access to lots of data about an individual and can exploit them for financial gain such as advertising. Most IoT manufacturers implement privacy policies that should control what data they can collect and length of time they can store collected data. Most service providers will require user permission to share or use the data collected from their IoT devices with other businesses. However, these other businesses are not usually known by the end users.

Considering the amount and type of data generated by IoT devices, a lot of private information can be inferred from the information collected. Despite the fact that most IoT manufacturers and service providers have end user policy agreements, these policies only bind the manufacturers or service providers but not the other companies that users have provided consent to share their information with. In Alexa's privacy policy, for example, it states that information collected will be shared with other companies that Amazon does not control (Amazon, 2018). A list of these companies is not provided hence the end user who signs this agreement policy is essentially accepting to have his/her information shared and used by organisations other than the one he has signed the agreement with. Additionally, most of these policies are usually written out in legal language which is difficult for end users to understand and consequently most users accept terms and conditions without actually reading them and understanding the implication of their consent.

### 5 Possible Solutions to the Security Concerns

It is clear from the foregoing that while IoT devices provide convenience to users, they also open up homes to security threats and privacy violations. Some of the solutions one can implement to prevent violation of their privacy and secure their homes while using IoT are:

1. Users should secure their wireless network. This requires the use of secure protocols such as WAP2 which is a more secure form of WiFi. In addition, they should use strong passwords and change the default passwords which the purchased products were supplied with.
2. When not in use, users should ensure that IoT devices are inactive, especially for devices that have digital assistants. If a user wishes to have a private conversation, they may need to unplug the devices and not just rely on the 'sleep' function.
3. The users should update their device software. This may be a costly time consuming endeavour but an important one because when new threats emerge, new solutions are provided to counter them. If the device is not updated it will remain vulnerable to threats.

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# Digital Media Usage and Prevalence of Internet Addiction among Undergraduate Students in South Africa

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## Abstract

*The use of Internet and digital media in the academic sector has significantly improved knowledge creation. The Internet has particularly proven itself to be a valuable resource in the enhancement of knowledge production and dissemination. The purpose of the study on which this chapter is based was to establish how excessive non-academic use of the Internet detrimentally affects daily lives of undergraduate students. A survey was conducted of 390 university undergraduate students, comprising mainly of adolescents or young adults, who were selected using stratified random sampling at two South African universities. The universities selected were Fort Hare and Nelson Mandela. Data was collected using the Modified Internet Addiction Test for Undergraduates (MLATU), a modification of Internet Addiction Test (IAT) questionnaire. 282 (72.3%) of the respondents indicated that they make use of the Internet daily with 34.8% spending more than 10 hours. More than 60% have access to at least two electronic devices. Most of the respondents stayed online longer than intended ( $\bar{x}$  2.88), slept less at night due to Internet use ( $\bar{x}$  2.63) and hence spent less time studying owing to Internet surfing ( $\bar{x}$  2.27). Furthermore, the amount of time spent on the Internet had a significant relationship with the level of influence the use of the Internet had on respondents ( $B = 0.250$ ,  $t = 4.850$ ,  $p < 0.05$ ). The findings are indications that the excessive amount of time spent on the Internet served as a distraction from school work; a situation that disadvantaged students in academic productivity. These findings suggest that the uncontrolled use of new media is both a hazard and a potential danger to academic productivity. This is the first study in South Africa that empirically investigates Internet use pattern by undergraduate students, Internet use rate and problematic Internet use among undergraduate students.*

**Keywords:** Internet addiction, Internet use, Undergraduate Students, Problematic Internet use, South Africa.

## 1 Introduction

The Internet has changed the way people communicate, study, access and use information and information resources. It is perhaps one of the most noteworthy technological advancements of the late 20<sup>th</sup> century and has made communication and information sharing easier and faster. The academic environment has not been left out in this digital revolution as the introduction of the Internet into the academic world has greatly improved the advancement of knowledge frontiers. According to Kandell (1998), while academia always has been in the forefront of Internet use, the primary focus had been on faculty research and communication. By providing dissemination of, and access to, enormous academic resources in almost all fields of human endeavour throughout the world, the Internet has become an invaluable tool for learning, teaching and research in institutions of learning (Ojedokun and Owolabi, 2003). Widespread Internet availability can substantially benefit people by enhancing their access to a broad range of information while creating an avenue for social communication and entertainment (Byun et al., 2009).

Internet use has become a common practice across generations (Anunobi, 2006), making it an indispensable part of modern life in accordance with the information technologies that have been growing rapidly (Ozkisi and Topaloglu, 2015). Askoy (2012) opines that the reason for the rapid growth is the global availability of the Internet which significantly makes it different from other information media. It is reported that ease of work and time-saving are the reasons for Internet use among students (Bashir, Mahmood and Shafique, 2008; Deniz and Geyik, 2015). According to a study on North American Colleges and Universities, over 80% of faculty and administration believe that web-based technology is a key contributor to student success. The study also noted that 62% of faculty in the USA and Canada use the Internet to prepare coursework; 56% use the web to supplement textbooks; while 51% use it to ensure up-to-date course content (Deniz and Geyik, 2015). A study by Ruzgar (2005) on the purpose of Internet use and learning via Internet among Turkish college students concluded that the Internet has become an integral part of college life and its usage is almost 100% among students.

This study argues that non-academic related use of the Internet could have a detrimental effect on the daily life of undergraduate students

## 2 Research Objective and Questions

The aim of this chapter is to ascertain the extent of Internet use and the prevalence of Internet addiction among undergraduate students in the Eastern Cape Province, South Africa. The specific objectives of the study on which the chapter is based were to:

1. Identify the Internet use rate of undergraduate students in universities in the Eastern Cape;
2. Describe the Internet use pattern of undergraduate students in universities in the Eastern Cape; and
3. Indicate how the Internet use pattern and Internet use rate affect undergraduate students in universities in the Eastern Cape.

In order to achieve the above research aim, the following research questions were raised based on the research objectives:

1. How much time do undergraduate students spend utilising the Internet?
2. What are the Internet use patterns of undergraduate students in universities in the Eastern Cape?
3. How does the Internet use pattern and Internet use rate affect undergraduate students in universities in the Eastern Cape?

Two null hypotheses were tested in this study as shown below:

$H_0$ 1: There is no significant relationship between the amount of time spent on the Internet and increased level of influence of Internet use.

$H_0$ 2: There is no significant relationship between Internet use pattern and an increase in the level of influence of Internet use.

## 3 Methodology

A survey research design was utilised for the study with data being collected and analysed using both qualitative as well as quantitative research methods. Questionnaires and focus group discussions were employed to collect data from undergraduate students at two selected universities in the Eastern Cape Province, South Africa: University of Fort Hare (UFH) and Nelson Mandela University (NMU). Undergraduate students enrolled for a 3 or 4-year Bachelor's degree programmes were included in the population of the study. Data was collected between February and April 2016 and first year students were excluded because at the time of collecting data, they had barely spent a semester in their respective campuses.

The study utilised the stratified sampling technique. Five strata were created using faculties/degree programmes common to both universities. The strata that were constituted are as follows: Stratum 1: Faculty of Social Science & Humanities/Arts (SSH/Arts); Stratum 2: Faculty of Science & Agriculture; Stratum 3: Faculty of Law; Stratum 4: Faculty of Education; and Stratum 5: Faculty of Management & Commerce/ Economic Science (M&C/ Eco. Sci.).

The total number of registered students for the 2015 academic session at both UFH and NMU was 11,416 undergraduate students. The institutional planning offices of both universities assisted the researchers with the complete list of registered students for the academic session. The minimum representative sample size for the study was determined to be 372. This was achieved using the Raosoft® sample calculator, with an error margin of 5%, a significant level of 95%, a response distribution of 50%, and an estimated population size of 11,416. The least effective sample size was calculated to establish the minimum number of participants that could adequately represent the population of the study.

Young's Internet Addiction Test questionnaire was modified to determine the influence of Internet use on respondents. Six focus group discussion sessions consisting of between five to eight discussants were carried out. 450 questionnaires were administered, and 412 were retrieved. Only 390 of the retrieved questionnaires were usable, giving a response rate of 86.7%. A test-retest reliability method using Cronbach Alpha was adopted to determine internal consistency, reliability and overall reliability of each of the variables identified in the study. The coefficient alpha for the scale, as a whole, was 0.90. Ethical guidelines for human subjects were ensured by submitting the research proposal and research instruments to the Faculty Research and Higher Degrees Committee, University of Fort Hare Research and Ethics Committee and The Research and Ethics Committee at the Nelson Mandela University. Ethical clearance certificates were received from both universities.

## 4 Results and Discussion

Respondents were asked to indicate how much and how often they make use of the Internet. The Internet use pattern of respondents showed that 282 (72.3%) of the respondents use the Internet daily, 96 (24.6%) use it every other day while 12 (3.1%) use the Internet occasionally. The use of the Internet has become essential for students because it is a daily necessity for academic work (Bidin, Shamsudin, Asraf, and Sharif, 2011). Previous studies (Odell, Korgen, Schumacher and Delucchi, 2000; Otunla, 2013; Waithaka, 2013) have also reported daily use of the Internet by students. Internet

usage has also been reported to be more prevalent among younger and more educated people (Bashir et al., 2008). This result is in contrast with findings from Adekunmisi, Ajala and Iyoro (2013) where results revealed that most (70%) of the respondents used the Internet weekly. The researchers attributed this factor to the high cost of accessing the Internet in Nigeria as the majority of the Internet centres were privately owned by individuals whose aim was purely for profit (Adekunmisi et al., 2013). A report by the Pew Research Center (2016) stated that while Internet access has been rising in emerging and developing nations, those in developed world who have Internet access are voracious users. In addition, the report revealed that roughly three-quarters of adult Internet users across the 40 countries surveyed in 2015 say that they use the Internet at least once a day, with majorities in many countries saying that they access the web “several times a day” (Pew Research Center, 2016).

Respondents were requested to specify how much time they spent accessing the Internet daily. The findings revealed that 56 (14.6%) of the participants spend less than an hour accessing the Internet daily, 98 (25.5%) spend between 1-3 hours while majority of the respondents 132 (34.4%) spend 10 hours or more daily accessing the Internet. Qualitative results from the focus group sessions also indicated that respondents spend an average of 4-6 hours daily using the Internet. One respondent reported that:

*“Just think of how much you spend on your phone, you just keep going and going, ...six hours minimum”.*

This result amplifies the research findings by Wood (2015) which established that Internet use among female college students was found to be an average of 10 hours a day on their cell phones while male students spent nearly eight hours. The activities that respondents engage in while using the Internet were also polled. Various activities were grouped together into academic, communication, entertainment, and social networking uses. Participants were asked to indicate how much they utilised these services while using the Internet.

Table 1: Internet use pattern of respondents

<b>Academic</b>						
	Never (%)	Rarely (%)	Weekly (%)	Twice weekly (%)	Daily (%)	Mean
Take online lectures and classes	174 (44.6)	97 (24.9)	47 (12.1)	21 (5.4)	45 (11.5)	2.13
Reading E-books	121 (31.0)	138 (35.4)	64 (16.4)	23 (5.9)	33 (8.5)	2.23
Downloading journal articles	75 (19.2)	157 (40.3)	95 (24.4)	33 (8.5)	22 (5.6)	2.40
Looking up reference materials	20 (5.1)	109 (27.9)	126 (32.3)	49 (12.6)	81 (20.8)	3.16
Information surfing for study	11 (2.8)	44 (11.3)	121 (31.0)	49 (12.6)	156 (40.0)	3.77
Assignments	3 (0.8)	64 (16.4)	144 (36.9)	75 (19.2)	98 (25.1)	3.52
Research	14 (3.6)	76 (19.5)	123 (31.5)	62 (15.9)	102 (26.2)	3.43
<b>Communicating</b>						
Send and receive emails	7 (1.8)	40 (10.3)	58 (14.9)	33 (8.5)	251 (64.4)	4.24
Make and receive calls	57 (14.6)	65 (16.7)	33 (8.5)	22 (5.6)	206 (52.8)	3.67
Video chatting	166 (42.6)	136 (34.9)	22 (5.6)	28 (7.2)	32 (8.2)	2.02
Meeting new friends	74 (19.0)	150 (38.5)	65 (16.7)	24 (6.2)	74 (19.0)	2.67
Keeping in touch with friends	7 (1.8)	26 (6.7)	51 (13.1)	22 (5.6)	278 (71.3)	4.40
<b>Entertainment</b>						
Play and download music	25 (6.4)	89 (22.8)	65 (16.7)	50 (12.8)	160 (41.0)	3.59
View and download videos	23 (5.9)	74 (19.0)	74 (19.0)	49 (12.6)	170 (43.6)	3.69
Play podcast	178 (45.6)	108 (27.7)	27 (6.9)	24 (6.2)	42 (10.8)	2.06
Watching online TV	122 (31.3)	92 (23.6)	46 (11.8)	25 (6.4)	103 (26.4)	2.73
<b>Social Networking</b>						
Facebook, Twitter, Myspace	14 (3.6)	30 (7.7)	31 (7.9)	19 (4.9)	295 (75.6)	4.42
Instant messaging (Whatsapp, BBM)	19 (4.9)	8 (2.1)	14 (3.6)	2 (0.5)	344 (88.2)	4.66
Talking in chat room	210 (53.8)	85 (21.8)	11 (2.8)	16 (4.1)	63 (16.2)	2.06
Create or maintain a personal blog	266 (68.2)	74 (19.0)	16 (4.1)	8 (2.1)	19 (4.9)	1.54

It has been acknowledged that information needs are difficult to study empirically. Thus, most user studies focus on information seeking activities rather than on actual information needs (Case, 2002). Results from the study revealed that Internet use for communication purposes ranked first ( $\bar{x}$  3.4), followed by social networking ( $\bar{x}$ 3.17), entertainment ( $\bar{x}$  3.02) with academic purposes in the fourth place ( $\bar{x}$  2.95).

Jones (2002) reported that undergraduate Internet users are heavier users of instant messaging and online chat; 76% of them make use of electronic resources for entertainment such as chatting and social networking, download films, music or playing games and shopping. Other studies such as Deniz and Geyik (2015) revealed that searching for homework or projects and getting knowledge for academic purposes via Internet is was of less priority than playing games, shopping online or surfing the Internet. The researchers asserted that information technologies and Internet play a key role in the daily life of university students but most of the students do not use the Internet for course-related readings and academic research needs (Deniz and Geyik, 2015).

As earlier reported, academic use which is the primary purpose for providing free campus-wide Internet access, did not rank first among undergraduate students' Internet use pattern. Hence, Young (1998) Internet addiction test questionnaire was modified to measure the influence of the Internet as well as accurately interpret its impact on the everyday life of the respondents.

Table 2: Internet use influence on Undergraduate students' routine

Situations	Never (%)	Rarely (%)	Very often (%)	Always (%)	Mean
Go late for classes or other appointments because I was spending time on the internet	170 (43.6)	142 (36.4)	62 (15.9)	10 (2.6)	1.77
Less sleep at night because of using the internet	51 (13.1)	100 (25.6)	178 (45.6)	60 (15.4)	2.63
Stay online longer than intended	33 (8.5)	78 (20.0)	179 (45.9)	99 (25.4)	2.88
Missed a meal rather than interrupt use of the internet	164 (42.1)	121 (31.0)	74 (19.0)	30 (7.7)	1.92
Spent less time studying due to internet surfing	81 (20.8)	149 (38.2)	130 (33.3)	28 (7.2)	2.27
Reply chats or surf the internet while attending a lecture	92 (23.6)	131 (33.6)	119 (30.5)	45 (11.5)	2.30
Enjoy excitement of the internet more than spending time with friends in person	115 (29.5)	147 (37.7)	91 (23.3)	35 (9.0)	2.12
Try to spend less time on the internet and fail	119 (30.5)	107 (27.4)	114 (29.2)	45 (11.5)	2.22
Spend study time surfing the internet for non-academic purposes	74 (19.0)	113 (29.0)	164 (42.1)	34 (8.7)	2.41
When the internet is down, I usually feel bored, empty and joyless	90 (23.1)	93 (23.8)	103 (26.4)	101 (25.9)	2.56
Check emails Facebook before something else that I need to do online	26 (6.7)	57 (14.6)	152 (39.0)	154 (39.5)	3.12

Source: Research data

From the results in Table 2, the majority of the respondents ( $\bar{x}$  3.12) check their emails and Facebook account before anything else that they need to do on the Internet, stay online longer than intended ( $\bar{x}$  2.88), sleep less at night because of Internet use ( $\bar{x}$  2.63) and usually feel bored, empty and joyless when the Internet is down ( $\bar{x}$  2.56). Other notable influences the use of the Internet has on undergraduate students are: they spend study time surfing the Internet for non-academic purposes ( $\bar{x}$  2.41), reply to chats or surf the Internet while attending a lecture ( $\bar{x}$  2.30). It also emerged that many of the respondents try to spend less time on the Internet and fail ( $\bar{x}$  2.22).

The findings also revealed that 238 (61%) of the respondents very often/always have less sleep at night because they spend time using the Internet. This finding concurred with similar studies where inadequate sleep was found to have a negative effect on the productivity of students academically (Akin and Iskender, 2011; Asdaque, Khan, Asad and Rizvi, 2010; Chong Guan, Isa, Hashim, Pillai and Harbajan Singh, 2012; Qiaolei Jiang, 2014). Most undergraduate students 278 (71%) noted that they very often/always stay online longer than intended, while 198 (50%) admitted spending study time surfing the Internet for non-academic purposes. Furthermore, 158 (40%) of the respondents spend less time studying due to Internet surfing and also try to spend less time on the Internet and fail.

Wood (2015) reported that approximately 60% of college students admit to cell phone addiction, and some indicated they get agitated when it is not in sight. Morahan-Martin (2005) established that Internet abuse resulted in symptomatic problems such as depression, sexual disorders, or loneliness. Park et al. (2011) established that Internet-addicted group had comprehension sub-item scores that were significantly lower than those of the non-addicted group. The level of Internet addiction was significantly linked to academic performance decrement among young people in China, as reported by Jiang (2014).

Other forms of distractions noted in this study among respondents were the divided attention of replying of chats or surfing the Internet while attending a lecture (42%). As many as 78% of the respondents check their emails or Facebook walls before anything else that they need to do online. A respondent during the focus group discussion session said:

*"Most times you want to read your books, and you log on to social media first, you could just spend the entire time on Facebook and before you know it, you're tired and want to sleep".*

It can be inferred from Table 2 that the Internet has a negative influence on undergraduate students in many ways. Due to the Internet's popularity, most of these negative influences could go unchecked by Internet users. For example, a study of relationship problems among Internet users revealed that 53% of Internet addicts had serious relationship problems that led to marital discord, separation and even divorce (Young, 1998). This is contrary to findings by Deniz and Geyik (2015) who reported that undergraduate Internet users in Turkey do not consider themselves addicted to the Internet despite the long hours they spend online because they can go offline whenever they wish.

The following null hypotheses were tested in this study:

$H_0$ 1: There is no significant relationship between the amount of time spent on the Internet and increased level of influence of Internet use

A regression analysis was carried out to predict whether the amount of time spent on the Internet has any influence on undergraduate students' routines. The result is presented below.



Table 3: ANOVA for Internet use influence and amount of time spent

ANOVA <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1023.674	1	1023.674	23.519	.000 <sup>a</sup>
Residual	15364.174	353	43.525		
<b>Total</b>	<b>16387.848</b>	<b>354</b>			

Source: Research data

From Table 3, the analysis of variance (ANOVA) test shows that  $F = 23.519$ ,  $df = 354$  and  $p = 0.000$ . Since  $p$ -value  $< 0.05$ , this shows that the amount of time spent on the Internet has a significant relationship with the level of influence the use of the Internet has on undergraduate students.

Table 4: Regression coefficient

Coefficients <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
<b>(Constant)</b>	22.498	.832		27.028	.000
Amount of time spent on the Internet	1.129	.233	.250	4.850	.000

Source: Research data

The result from Table 4 above shows the regression coefficient for the amount of time spent using the Internet and the influence of Internet use. The result indicates that for every unit increase in the amount of time spent using the Internet, there is a 1.129 increase in the level of influence of Internet usage ( $B = 0.250$ ,  $t = 4.850$ ,  $p < 0.05$ ). From the above result, it is inferred that the higher the amount of time undergraduate students spend using the Internet, the higher the negative influence of the Internet (negative influences: less sleep at night, stay online longer than expected, inability to hold back on spending more time on the Internet, among others) on their daily routines.

$H_0$ : There is no significant relationship between Internet use pattern and an increase in the level of influence of Internet use

This hypothesis was to measure whether Internet use pattern predicts the level of influence Internet usage has among undergraduate students.

Table 5: ANOVA for Influence of Internet use and Internet use pattern

ANOVA <sup>b</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2063.289	4	515.822	12.914	.000 <sup>a</sup>
Residual	12062.503	302	39.942		
<b>Total</b>	<b>14125.792</b>	<b>306</b>			

Source: Print out of a table derived from the data and findings of the study

From Table 5, the analysis of variance (ANOVA) test shows that  $F = 12.914$ ,  $df = 306$  and  $p = 0.000$ . Since  $p$ -value  $< 0.05$ , this reveals that there is a joint significant relationship between Internet use pattern of undergraduate students (Internet use for social networking, academic, communication, and entertainment) and the level of influence the Internet has on their daily routine.

Table 6: Regression coefficient

Coefficients <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	16.724	2.265		7.382	.000
Academic	-.138	.074	-.103	-1.855	.065
Communication	.096	.108	.054	.892	.373
Entertainment	.331	.097	.212	3.420	.001
Social Networking	.514	.137	.224	3.750	.000

Source: Research data

The result from Table 6 shows that the regression coefficient for relationship between Internet use pattern (internet use for social networking, academic, communication, and entertainment) and the influence of Internet use. They indicate that for every unit increase in academic use of the Internet, there is a 0.138 decrease in the level of influence that the Internet has on undergraduate students' daily routine. For every unit increase in social networking use of the Internet, there is a 0.514 increase in the influence of Internet use on undergraduate students' daily routine. The same applies to

communication use at 0.096 increase and entertainment use at 0.331.

The results show that entertainment and social networking have a statistically significant positive effect on influence of internet use. Therefore, the second hypothesis of the study significant is rejected. It is concluded that Internet use pattern, as measured by entertainment and social networking, has a statistically significant relationship with Internet use influence. On the other hand, the effect of academic use of the Internet is negative and not statistically significant (as it is only statistically significant only at 10% level). It can be concluded from the result that academic use of the Internet decreases negative influence of Internet use on undergraduate students' daily routine although it is not statistically significant. Communication, entertainment and social networking use of the Internet increase the negative influence of the Internet on undergraduate students' daily routine with communication being not statistically significant.

## 5 Conclusion

This study established that although the use of the Internet is essential in the academic community, uncontrolled use of the Internet for non-academic and/or non-work related purposes can be detrimental to students' wellbeing. As many as 104 (26.7%) of the respondents said they very often/always missed a meal rather than interrupt the use of the Internet; and a staggering 126 (32.3%) said they very often/always enjoy the excitement of the Internet more than spending time with friends in person (see Table 2). Previous reports have identified these effects of Internet use to be a sign of Internet addiction (Jiang and Leung, 2012; Lan and Lee, 2013; Roberts, Yaya and Manolis, 2014; Stavropoulos, Kuss, Griffiths, and Motti-Stefanidi, 2015).

Several factors contribute to the academic wellbeing of learners, including diet, sleep and state of health (Coniglio, Sidoti, Pignato, and Giammanco, 2012; Jiang and Leung, 2012). The results from the study revealed that many of the students do not have control over the amount of time they spend on the Internet. Their time was spent mainly on social networking and communication purposes rather than academic purposes and consequently faced academic difficulties. Other negative influences identified in this study include spending less time studying due to Internet surfing (230 or 59%) and replying to chats or surfing the Internet while attending a lecture (223 or 57.2%). These may consequently increase students' academic challenges. According to Onwuegbuzie and Jiao, (1998) academic difficulties have led many students to drop out of school. These results confirm addictive behaviours among many undergraduate students in the population sample using Young (2008) assessment criteria of work related/family difficulties as a result of Internet use.

The study advances the position that the more time undergraduate students spend on the Internet, the higher the level of excessive Internet use influence. Internet use for academic purposes was found to decrease Internet use influence on undergraduate students. Similarly, the use of the Internet for entertainment and social networking purposes was found to increase the level of Internet use influence. Whereas Internet use has been reported to enhance academic productivity (Bidin et al., 2011; Ojedokun and Owolabi, 2003), compulsive use of the Internet could also lead to dismal academic performance and a decline in academic completion through put. The choice of activity that undergraduate students engage in on the Internet can also be concluded to have increased the negative influences resulting in the use of the Internet. Prolonged use of the Internet on academic or work related activities cannot be referred to as Internet addiction as this use contributes to achieving a productive means or tasks being carried out on the Internet.

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# Perception of Librarians Towards the Use of Cloud Computing Technologies in Nigerian University Libraries

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## Abstract

*This chapter examines the awareness, perceptions and readiness of librarians towards the use of cloud computing in Nigerian universities. The objectives of the study on which this chapter is based were to measure the level of awareness, perception, readiness as well as challenges facing librarians in the use of cloud computing for effective service delivery in academic libraries. Cross-sectional survey design was employed for the study. Questionnaires were used for data collection. The questionnaire was strongly validated with a reliability index ranging between 0.535 – 0.9.14. The population of the study consisted of librarians in Nigerian university libraries out of whom 150 from 12 universities were randomly selected as the sample for the study. The data was analysed using SPSS version 20.0. The findings of the study revealed that 60% of the librarians under study have a poor perception of the use of cloud computing technologies in libraries due to their low level of awareness of the technology. The findings further revealed a low level of readiness among the libraries and librarians to use cloud computing. The findings offer libraries a better understanding of the effects the adoption and use of cloud computing could have as well as relevant insights on current situation. The research contributes by bringing to the fore current issues on cloud computing and how it can be used to improve upon library services in the Nigerian universities. The findings will present libraries with reliable information when it comes to considering their investment as far as implementation of cloud computing is concerned.*

**Keywords:** Perception, Librarians, Information professionals, Cloud computing, University libraries, Nigeria.

## 1 Background Information

The position of academic libraries in the provision of information for achieving the teaching, learning and research objectives of lecturers, students and researchers must be held in high esteem if the universities want better ranking among its contemporaries. Academic libraries are the heart of every high institution of learning. They are responsible for managing the basic ingredients (information) needed for achieving academic excellence. The proliferation of Information and Communications Technologies (ICTs) has led to the generation of information resources in different formats. The traditional methods of handling information in libraries are no longer effective. Development and advancements in web technologies have opened new paths to rapidly spread information and in varying formats worldwide.

University libraries in Nigeria are in a dilemma. They are confronted with lots of interesting technologies but limited in resources and expertise needed to put these technologies into proper use. Resources allocated to libraries have continued to dwindle in the face of recession being experienced across most part of Africa and beyond. Higher institutions will benefit greatly by harnessing the power of cloud computing. Cloud computing is a technology that provides scalable advantages to its users through its various models on a virtual platform. The benefits include cost cutting as well as efficiency in service delivery (Atolaibi, 2013). This chapter discusses the perception of librarians on the use of cloud computing technologies in the libraries of the universities in North-Western Nigeria.

Gartner (2009) defines cloud computing as a style of computing where scalable and elastic Information Technology (IT) capabilities are provided as a service to multiple customers using Internet technologies. Gosavi, Shinde and Dhakulkar (2012) opines that cloud computing is an emerging computer paradigm where data and services reside in massively scalable data centres in the cloud which can be accessed from any connected devices over the Internet. Tadwalker (2009) states that cloud computing derived its name from cloud which represents data centres, technologies, infrastructure and services delivered through Internet. This view is similar to that held by Kennedy (2009) in his argument that the term cloud is used to include things like virtual servers which are difficult to locate as users are completely unaware of where their data is being stored or managed. This whole idea put together has been captured by Yuvaraj (2013) as he fine-tuned the “Cloud” element of cloud computing to an acronym that stands for **C**omputing resources; **L**ocation independent; which can be accessed via **O**nline means; **U**sed as a **U**tility and is available on **D**emand (CLOUD). This brings to the fore the abounding capabilities of cloud computing technologies and its ability to take libraries to an unimaginable height when properly applied.

Good knowledge of the use of ICTs is very important in order to effectively operate and apply technologies towards achieving the objectives of a library. Libraries and Information centres therefore must have in place the necessary

technological infrastructures (readiness factor) that will provide an enabling platform for skilled human resources to operate smoothly and productively. Trivedi (2013) outlined technology, organizational and environmental readiness as not only a determinant of cloud computing but also, they constitute key attributes for the measurement of cloud computing application within an organization. Technological readiness which incorporate technological infrastructure as well as IT and human resources have been reported to influence the adoption of new technology (Kuan and Chau, 2001; To and Ngai, 2006; Oliveira and Martins, 2010; Pan and Jang, 2008; Wang et al., 2010; Zhu et al., 2006). Wang et al., (2010) as cited in Low, Chen and Wu (2011) identified technological infrastructure as the installed network technologies and enterprise systems which provide a platform on which the cloud computing applications can be built, while IT and human resources provide the knowledge and skills to implement cloud-computing related IT applications. Strong fears about the country of domicile, privacy and data security of cloud computing have been expressed by scholars. These fears have however been reduced as data centres are now built in regions across Africa thereby residing the data close to the owner.

Cloud computing is a well-designed platform that provides infrastructure, software, services for delivering on-demand computing services to everyone with connectivity to a network. It can also be deduced from the above perception that cloud computing is a web technology that is used to provide services to its clientele through a virtual platform. The user never gets to see the storage facilities or the complexities of the technology put in place for the provision of the services the user enjoys. In this era of dwindling budgets, libraries and information centres that can afford the cost of adopting cloud computing can now breathe a sigh of relief as it has in place various packages in its models (PaaS, SaaS, IaaS) to suit their individual needs while taking into consideration their financial inadequacies. Some of the advantages of cloud computing to libraries includes cost saving, flexibility and innovation, user centric, openness, transparency, interoperability, availability anytime anywhere, connect and converse, create and collaborate.

## **2 Statement of the Problem**

Globally, the information landscape is in a constant state of change. At the centre of the debate is the development of the knowledge society. This has led to the commoditisation of information and knowledge in the market place of ideas. Additionally, the information environment is characterised by the information explosion, or glut, on the web that has forced information centres to look for effective methods of providing quality services to the clients. Modern technological trends brought by personal computing and networking revolutions are making information centres to create online communities through cloud computing. Cloud computing is the emerging trend of handling and supporting information services that takes advantage of numerous open source applications, modules and components. It creates a platform for the globalisation of information services, unlimited access to information and communication services, and mass provision of information services.

With the above scenario, Nigerian university libraries must change their traditional practices of handling information services as they are unable to address the informational and technological needs of the clients where the emphasis is on quality of the services. Cloud computing provides an avenue for providing better information services with the greatest ease and at a scalable rate. The Nigerian situation raises concerns since low level of awareness amongst the librarians cripples their capacity to harness its potential to the benefit of their users. The level of readiness among the libraries, librarians and information centres is also appalling as issues ranging from technical, environmental and organisational barriers continue to forestall efforts made over time. It is against this backdrop that the study surveyed the perception of librarians in the use of cloud computing in Nigerian university libraries.

## **3 Research Objectives and Questions**

The broad objective of this chapter is to examine the perception of librarians in the use of cloud computing facilities in Nigerian university libraries. Specifically, the chapter examines the perceptions of librarians towards the use of cloud computing by librarians in Nigerian university libraries; assesses the level of readiness of librarians towards the use of cloud computing by librarians in Nigerian university libraries; and explores the challenges hindering the use of cloud computing by librarians in Nigerian university libraries. The chapter seeks answers to these questions: (1) What is the perception of librarians towards the use of cloud computing in Nigerian university libraries? (2) What is the level of readiness of librarians towards the use of cloud computing in Nigerian university libraries? (3) What are the challenges hindering the use of cloud computing by librarians in Nigerian university libraries?

## **4 Methodology**

The study on which this chapter is founded employed a cross-sectional survey research design. The quantitative methodology was used in measuring the level of awareness, gathering the perception and understanding the level of readiness of librarians towards the use of cloud computing in Nigerian University Libraries. A structured questionnaire was used to elicit responses from a sample population of 150 respondents drawn from a total population of 250 librarians

using the Research Advisor (2006) tool for determining sample size. The administration of the questionnaire was done through WhatsApp. The researcher created a group consisting of all the identified respondents on the WhatsApp application. This provided a platform where issues arising from the respondents could be resolved. It also allowed for reminders to be sent to respondents. These regular reminders contributed to the high response rate recorded in the study. A total of 125 (83%) questionnaires were filled and returned. However, only 120 (80%) were found to be usable for the study. Data extracted from the returned questionnaires was analysed through SPSS version 20.0.

## 5 Findings and Discussions

This section presents and discusses the findings of the study.

### 5.1 Background of the respondents

This section contains the profile of the respondents. It summarises characteristics such as gender, qualification, employer, and other demographic information. In terms of gender 81 (67.5%) of the respondents were male while 39 (32.5%) were female. The general inequality and educational gap between male and female in Nigerian can clearly be seen in the ratio of male to female librarians found in the academic libraries studied.

The findings also revealed a large number of the respondents 80(66.7%) had at least a Master’s degree while the remaining 40(33.3%) are Bachelor’s Degree holders. This implies that the respondents were persons with a good level of education. Most, 71(59.17%) of the respondents had a work experience of 5-9 years. This was followed by those with 1-4 years of working experience who were about 33(27.50%). The respondents with 10 years and above working experience were 13(10.83%) while those with less than a year were just 3 (2.50%).

### 5.2 Awareness towards cloud computing

A good percentage 105(87.5%) of the respondents indicated they had no idea about cloud computing while 15(12.5%) indicated to have some knowledge of cloud computing. More than half 72(60%) of the respondents are “somewhat familiar” with the technology. This was followed by 20(15.0%) respondents that indicated “familiar” and the least where 10(8.3%) who indicated that they are “not familiar” with cloud computing technologies. It was, however, discovered from individual submissions of the respondents that some of them actually use some cloud computing features without knowing.

More than half 62(51.7%) of the respondents indicated that they do not have any form of cloud computing facilities in their respective libraries while 58(48.3%) stated that they have cloud facilities in their libraries. The study however discovered that the response given by some of the respondents are to some extent beclouded by their poor level of familiarity with the cloud computing technologies. This is so because some of the respondents who said they have no idea of cloud computing technologies were later testifying to the availability of the same technology in their libraries.

### 5.3 Perception towards cloud computing

There are many kinds of cloud computing facilities available for delivering effective library services. This is however, determined by the level of familiarity of cloud computing by the individual user of the facility. Table 1 below presents the types of cloud computing facilities ever used by the respondents. It was discovered that file sharing services such as Google Drive, Dropbox with 76(63.3%) are the most used. This is followed by Contact Support Services such as Google and Yahoo contacts with 63(52.5%) while Image editing services such as PicMonkey, iPicey are the least used by the respondents.

Table 1: Cloud facilities used by the librarians

Types of Cloud Computing Services Available	I have Used it Before	Never Used it Before	Total
Video Services: YouTube, Vimeo	59 (49.2%)	61 (50.8%)	120 (100%)
File sharing services: Google Drive, Drop Box	76 (63.3%)	44 (36.7%)	120 (100%)
Information collection services: Survey Monkey, Google Forms	37 (30.8%)	83 (69.2%)	120 (100%)
Calendar services: Google Calendar, Doodle	24 (20%)	96 (80.0%)	120 (100%)
Online presentation service: Prezi, Slide Share	34 (28.3%)	86 (71.7%)	120 (100%)
Contact support services: Google & Yahoo contacts	63 (52.5%)	57 (47.7%)	120 (100%)
Online doc editing services: Google Drives, Zoho Docs	29 (24.2%)	91 (75.8%)	120 (100%)
Image editing services: PicMonkey, iPicey	8 (6.7%)	112 (93.2%)	120 (100%)

Source: Extracted by the researcher using SPSS version 20.0 from questionnaires

Respondents were asked to state whether they prefer an electronically-enhanced cloud computing system over the existing traditional system. Most of the respondents, 95(79.2%) indicated “Yes” while a few respondents, 25(20.8%) preferred to stay with the existing traditional system. Many librarians accept technological tools even if they are unaware of their benefits.

The respondents were asked to validate the benefits of cloud computing by indicating the extent to which they agreed or disagreed with these benefits as they perceived. A higher percentage of respondents at 45(37.5%) agreed that cloud computing indeed reduces upfront cost while the other 26(21.7%), 25(20.8%) and 5(4.2%) strongly agreed, were neutral and disagreed respectively. Another 19(15.8%) of respondents, however, strongly disagreed if it had this benefit. On hardware and software scalability, 14(12.7%) and 12(10.9%) of respondents strongly agreed while 47(42.7%), 35(31.8%) were neutral with 9(8.2%). However, 10(9.1%) strongly disagreed. Other benefits of cloud computing, such as how it allows the library to focus on its core business and facilitating access to latest technology, had 14(12.7%), and 31(28.2%) respondents strongly agreeing, 27(24.5%) and 19(17.3%) staying neutral and 13(13.6%) and 23(20.9%) strongly disagreeing respectively. Table 2 presents these results.

Table 2: Benefits of cloud computing

S/No	Benefits Of Cloud Computing	SA	A	N	D	SD	Total
1	Reduces upfront costs	26(21.7%)	45(37.5%)	25(20.8%)	5(4.2%)	19(15.8%)	120(100%)
2	Helps the library to be more flexible	33(28.2%)	45(37.5%)	19(15.5%)	8(5.5%)	15(11.8%)	120(100%)
3	Allows the library to better focus on its core business	14(12.7%)	39(35.5%)	27(24.5%)	15(13.6%)	15(13.6%)	120(100%)
4	It is easier to implement than traditional on-premise technology	15(13.6%)	35(31.8%)	34(30.9%)	13(11.8%)	13(11.8%)	120(100%)
5	Increases staff mobility through remote and mobile information access	36(32.7%)	39(35.5%)	18(16.4%)	10(9.1%)	7(6.4%)	120(100%)
6	Provides improved scalability of hardware according to demand	14(12.7%)	27(24.5%)	47(42.7%)	13(11.8%)	9(8.2%)	120(100%)
7	Provides improved scalability of software according to demand	12(10.9%)	41(37.3%)	35(31.8%)	12(10.9%)	10(9.1%)	120(100%)
8	Facilitates access to the latest technologies	31(28.2%)	37(33.6%)	19(17.3%)	0(0%)	23(20.9%)	120(100%)
9	Improves collaboration between different department and faculties	35(31.8%)	38(34.5%)	11(10.0%)	13(11.8%)	13(11.8%)	120(100%)
10	Embracing cloud computing would make our library more effective and efficient ultimately leading to better service delivery	37(33.6%)	41(28.2%)	19(17.3%)	6(5.5%)	17(15.5%)	120(100%)
	Has other benefits (specify)	-	-	-	-	-	-

Source: Extracted by the researcher using SPSS version 20.0 from questionnaires

### 5.4 Readiness towards cloud computing

The government’s drive towards cloud computing will give birth to general wide policy and set the pace for other agencies and institutions to key into cloud computing. However, with 117(97.5%) of the respondents stating that in reality, there is no government wide plans towards cloud computing, it is obvious what the future holds for cloud computing in Nigeria in general and in particular, Nigerian university libraries.

In regard to organizational plans towards cloud computing; poor level of awareness among respondents have translated into somewhat poor organisational plan towards cloud computing. Among the respondents, 44(36.7%) stated that their organisations have plans for the use of cloud computing. Another 45(37.5%) stated that they have no plans, while 31(25.8%) said they virtually have no idea on whether or not there is a plan to adopt cloud computing in their library.

On the availability of facilities, 41(32.2%) of the respondents confirmed that there is bandwidth, infrastructure and 42(35.0%) agreed that there is management support while 42(35.0%) agreed that they have senior leadership support, and also 41(34.2%) said they have technical skills. However, 16(13.3%), 11(9.2%), 8(6.7%), and 11(9.2%) strongly disagreed on those same issues respectively. The availability of budget had 9(7.5%), 37(30.8%) and 16(13.3%) of the respondents strongly agreeing, neutral and strongly disagreeing respectively. The Table 3 below summarises these results.

Table 3: Adequacy of resources for cloud computing in libraries: organizational readiness

Readiness For Cloud Computing	SA	A	N	D	SD	Total
Bandwidth	12 (10.0%)	41(32.2%)	16(13.3%)	35(29.2%)	16(13.3%)	120 (100%)
Infrastructure	14(11.7%)	42(35.0%)	11(9.2%)	42(35.0%)	11(9.2%)	120 (100%)
Management / senior leadership support	14(11.7%)	42(35.0%)	42(35.0%)	14(11.37%)	8(6.7%)	120 (100%)
Technical skills	11(9.2%)	41(34.2%)	21(17.5%)	36(30.0%)	11(9.2%)	120 (100%)
Budget	9(7.2%)	29 (24.2%)	37(30.8%)	29(24.2%)	16(13.3%)	120 (100%)
Recognition or reward incentives for individuals to drive cloud or innovation initiatives	9(7.5%)	19(15.8%)	43(35.8%)	28(23.3%)	21(17.5%)	120 (100%)

Source: Extracted by the researcher using SPSS version 20.0 from questionnaires



The respondents were also asked to state whether they have any form of training on cloud computing. A large percentage 92(76.7%) of the respondents indicated they have not received any form of training, while 22(18.3%) indicated they have been trained at some point on the use of cloud computing.

Possessing the requisite skills is a prerequisite for the effective use of cloud computing technologies. To this end, 79(70.5%) of the respondents indicated they possess at least some form of ICT skills needed for them to utilise the technology. 28(25.5%) indicated they have no skills while 5(4.5%) said they have no idea of it.

### 5.5 Challenges facing the use of cloud computing

Three categories of challenges facing the use of cloud computing in organisations have been identified in literature. These are technical, organisational and environmental challenges. The respondents were asked to validate the presence of these challenges by indicating how strongly they agree or disagree with them. Table 4 presents their responses.

Table 4: Challenges of cloud computing

<b>Technical Challenges</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>
Lack of requisite skills and competencies	21(17.5%)	51(42.5%)	9(7.5%)	23(19.2%)	16(13.3%)	120 (100%)
Privacy of data	17(14.4%)	36(29.9%)	22(18.6%)	35(28.9%)	10(8.2%)	120 (100%)
Multi-tenancy, i.e. different organization data hosted on the same server	11(9.3%)	42(35.1%)	29(23.7%)	29(23.7%)	10(8.2%)	120 (100%)
Security lapses - Cyber-attacks, Virus, Malwares	29(24.5%)	56(46.8%)	6(5.3%)	20(17.0%)	8(6.4%)	120 (100%)
Poor IT infrastructure currently in place	27(22.7%)	60(50.5%)	5(4.1%)	14(11.3%)	14(11.3%)	120 (100%)
Low system performance	17(14.4%)	52(43.3%)	25(20.6%)	15(12.4%)	11(9.3%)	120 (100%)
Lack of support from vendors	17(14.4%)	35(28.8%)	35(28.9%)	31(25.8%)	6(5.2)	120 (100%)
<b>Organisational Challenges</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>
No departmental or agency strategic initiative	20(16.7%)	41(34.2%)	17(14.2%)	19(15.8%)	23(19.2%)	120 (100%)
Lack of senior management /executive support	15(12.4%)	60(50.5%)	16(13.4%)	19(15.5%)	10(8.2%)	120 (100%)
User resistance	14(11.3%)	42(35.1%)	20(16.5%)	37(30.9%)	7(6.2%)	120 (100%)
Higher operational expense for cloud	14(11.3%)	37(30.9%)	25(20.6%)	41(34.0%)	4(3.1%)	120 (100%)
Job insecurity i.e. IT department downsizing	15(12.4%)	33(27.8%)	26(21.6%)	32(26.8%)	14(11.3%)	120 (100%)
Shortage of cloud computing skills	22(18.6%)	62(51.5%)	20(16.5%)	14(11.3%)	3(2.1%)	120 (100%)
Risk of failure of adopting cloud computing to be greater than the benefits of a success	11(9.3%)	33(27.8%)	46(38.1%)	25(20.6%)	5(4.1%)	120 (100%)
<b>Environmental Concerns</b>	<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>	<b>Total</b>
Lack of approved cloud standards	23(80.8%)	19(15.8%)	34(28.3%)	27(22.5%)	17(14.2%)	120 (100%)
No national cloud computing policy in place	16(13.3%)	32(26.7%)	41(34.2%)	8(6.7%)	23(19.2%)	120 (100%)
No national, local, departmental or agency cloud adoption strategy or guidelines in place	15(12.5%)	36(30.0%)	27(22.5%)	16(13.3%)	26(21.7%)	120 (100%)
Epileptic power supply	38(31.7%)	36(30.0%)	10(8.3%)	10(8.3%)	26(21.7%)	120 (100%)
Poor network broadband	47(39.4%)	41(34.0%)	18(14.9%)	6(5.3%)	8(6.4%)	120 (100%)

Source: Extracted by the researcher using SPSS version 20.0 from questionnaire

More than 50% of the respondents tended to agree with all the components of the technical challenges. Another 51(42.5%) agreed to the lack of requisite skills and competencies while 56(46.8%) affirmed that security lapses such as cyber-attack, virus and malware constitute challenges to cloud computing. Poor IT infrastructure was also confirmed by 60(50.5%) of the respondents. In the same vein, 16(13.2%), 10(8.2%) and 14(11.3%) strongly disagreed to the challenges of lack of requisite skills and competencies, privacy of data, and poor IT infrastructure respectively.

For organisational challenges, 20(16.7%), 14(11.3%), 15(12.4%) and 11(9.3%) strongly agreed to no departmental or agency strategic initiative, user resistance, and job insecurity (IT department downsizing). The risk of failure of adopting cloud computing was greater than the benefits of success. However, on the same related components 17(14.2%), 20(16.5%), 26(21.6%), 46(38.1%) were neutral respectively as to whether they constitute challenges or not.

In terms of environmental challenges, the lack of approved cloud standards cited by 19(15.8%) of the respondents and the lack of a national cloud computing policy 32(26.7%), epileptic power supply 36(30.0%), as well as poor broadband 41(34.0%) were also confirmed by respondents to constitute challenges. A total of 51(42.8%), however, disagreed that the above components of environmental concerns actually constitute challenges in the use of cloud computing in academic libraries.

## 6 Conclusion

The poor level of awareness of cloud computing among the staff of the libraries studied has led them to develop a poor perception on how cloud services operate. Furthermore, they are unaware of the benefits that come with it. This has

also limited them from learning more skills and also putting other features of cloud computing to full use. It is worth noting that the knowledge of cloud computing possessed by some members of the library studied are not applied at an institutional level for library service delivery but rather for personal use. This is so because some of the respondents indicated they have no idea of some of the features of cloud computing while in real sense they actually make use of them without knowing it.

## 7 Recommendations

In view of the above findings, the author recommends the following:

1. There is need for the management of the universities to develop a policy document that will serve as a guiding principle for cloud operations within the library. This can also be achieved through the improvement of readiness indicators such as bandwidth, infrastructure, management/senior leadership support, technical skills and improved budgetary allocations to libraries.
2. There is need to organise training programmes on cloud computing for library staff. This can be made possible through in-house trainings and sponsorship to attend conferences, workshops and seminars to build new skills, competencies and ways of improving general library services through cloud computing. Experience from the seminars and conferences attended will hopefully shape the perception towards the general benefits and use of cloud computing in libraries
3. Every digital environment depends on electricity and the Internet. Therefore, the management of libraries who are yearning for effective library services through the use of cloud computing must make substantial provision for alternative means of generating electricity due to the insufficiency and instability of the power supplied in recent years. There is also a need for broadband Internet connection.

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# Using QR codes to Promote Information Services and Products in Academic Libraries in Kenya

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## Abstract

*A quick response (QR) code is a matrix barcode readable by smart-phones and other mobile phones with cameras. The QR code typically appears as a small white square with black geometric shapes. The information encoded in a QR code can be a URL, a phone number, an SMS message, a V-card, or any text. QR codes use low level but cost-effective technologies which can be applied to support diverse library functions given that virtually all academic library users have mobile phones. The purpose of study which led to this chapter was to explore how QR codes can be used to enhance the access and use of academic library services and products through effective promotion. The specific objectives of the study that generated this chapter were to assess the level of use of QR codes in academic libraries in Kenya; examine the factors which influence the use of QR codes in academic libraries in Kenya; and propose how QR codes can be used to promote the services and products of academic libraries in Kenya. This study applied an exploratory survey design. Primary data was collected from systems librarians in chartered private and public universities in Kenya. Additional data was collected from relevant literature through documentary analysis. This study confirmed that a large number of systems librarians in Kenya are unaware of QR codes technologies. Consequently, only four academic libraries in Kenya are currently using QR codes. The libraries already using QR codes have adopted them because they are portable; can be read using diverse devices; are simple to use; and do not require advanced ICT skills. Academic librarians in Kenya are encouraged to adopt QR codes to support library orientation; promote outreach events; disseminate information about digital spaces from which users can download essential files; create games; and promote library spaces.*

**Keywords:** QR Codes, library promotion, library marketing, academic libraries, Kenya.

## 1 Introduction

Academic libraries have been traditionally described as the ‘life wire’, ‘nerve centre’ of any university. They are neutral places where students and faculty from different disciplines meet not only to share, exchange and challenge ideas but to also bring ideas to life; they are part of an educational process (Thanuskodi, 2009; Igbokwe *et al.*, 2010). In the 21<sup>st</sup> century, academic libraries face a myriad of problems. In the past the main challenges revolved around insufficient funding and the paucity of information resources; today we talk of ‘information explosion’, ‘advancing technologies’ and ‘millennials’. The situation is characterised by technological and infrastructure ‘trauma’; diverse and incessantly changing needs and expectations of library customers; continuous budget decline; negativity towards libraries; need for librarians to update and/or acquire technology skills; and the shift to a ‘user-centred’ paradigm (Chutia, 2015; Chaudhry *et al.* 2002; Yi, 2016). Management challenges include pressures of attaining performance indicators, demonstrating value for money, and fostering a ‘business-like’ approach (Pinfield *et al.* 2017). Nicholson (2015) terms this the ‘McDonaldisation’ of academic libraries whereby library services are commodified and dominated by ‘managerialism’.

Clearly, academic libraries are under extreme pressure. The value of a library to a university’s strategy and its priority in budget allocation can no longer be taken for granted. As university managers make tough decisions about where to allocate scarce resources, academic libraries have to defend their worth. Marketing and promotion is vital for libraries to enhance their visibility and usage. By adopting marketing principles and techniques, libraries can understand their users’ needs better, justify their budget requests, communicate more effectively, achieve greater efficiency and optimal results in the delivery of services and products (Spalding and Wang, 2016).

Libraries have recognised this need. Ndung’u (2016) observes that the shift in collections and services, competition for funds, and the need to justify expenditure is moving librarians out of a comfort zone and seeing them initiate and implement marketing and promotional activities. Spalding and Wang (2016) refer to the misconceptions many users have about libraries with many believing that the World Wide Web (WWW) provides access to the entire world’s knowledge. In academic libraries, students and faculty are not aware that their passwords afford them access to databases that are not free on the web; they underestimate the contribution information literacy programmes can make to their teaching and learning goals. It is imperative therefore, that libraries continually create and communicate their role and value in the institution so as to raise their profile and enhance visibility.

According to Bhardwaj and Jain (2016), application of the concept of marketing in academic libraries started in the period 1969 to 1973 when scholars wrote a number of articles in the field. Marketing as a concept is considered a business philosophy that makes the customer the focus of all organisational activities. It is defined as the process of planning and executing the conception, pricing, promotion and distribution of goods, services and ideas to create exchanges with target groups that satisfy customer and organisational objectives (Kotler, 1996). Igbokwe *et al.* (2010) explain that marketing was adopted in libraries as a way of ensuring that library users' needs are met. It is indeed a factor of survival in the world of information competition and dwindling financial resources. Marketing is thus conceived in this chapter as the activities performed to promote library services and products to the satisfaction of users.

Academic institutions invest big sums of money in collection development. These collections, as observed by Kaur and Rani (2007), many a time, remain underutilised resulting in wastage. Since availability of information does not always mean accessibility and use, libraries have the responsibility to ensure that their services and products are used. A survey of literature shows that libraries have used various approaches to attract users, generate non-user awareness, create awareness about the available resources as well as cause users and non-users to act (Yi, 2016). Promotional tools that are used include digital media; e-mail lists; blogs and podcasts; print materials such as posters, hand-outs and giveaways; events such as tours and workshops; library publications; contests; brochures; direct mail; peer training; word-of-mouth; Web 2.0 applications and displays (Yi, 2014; Ndung'u, 2016). Yi (2016) found that rigorous and disciplined marketing approaches have been embraced by libraries.

## 2 Literature review

According to Ashford (2010), quick response (QR) codes are a type of barcodes, appearing as a small white square with black geometric shapes, which are readable by smart-phones. Rouillard (2008) reports that QR codes were developed in 1994 by Denso-Wave, a Toyota subsidiary, and were initially used for tracking inventory in vehicle parts manufacturing. Shin *et al.* (2012) explain that a QR code consists of black modules arranged in a square pattern on a white background. According to Jupiter (2011), the QR code was designed to allow its contents to be decoded at high speed. Ashford (2010) adds that QR codes can hold much more information than a regular barcode. The information encoded in a QR code can be a uniform resource locator (URL), a phone number, an SMS message, a V-card, or any text.

Soon (2008) avers that QR codes are popular because they have a higher data density than ordinary barcodes; can be used free of charge; have a data structure standard which is not a prerequisite for current usages; have an all-direction high speed reading capability; exhibit resistance to distortion when used on curved surfaces; possess data restoration capacity because they are resistant to smudged or damaged symbols; and possess ease of encryption thus enhancing the confidentiality of data. According to Ashford (2010) and Walsh (2010), QR codes are a convenient way to add the virtual to the physical so as to provide useful content, often at the time of need. The codes are a low-threshold technology which is low-cost, easy to implement, and easy to use. Their ease of use is such that they can prompt a mobile phone to display encoded text, go online to URLs, ring a phone number, start a text message or import contact details on a V-card. They are also decoded fast and save the user's time to obtain the information or help needed.

QR codes have been used in various industries. One such use was reported by Rouillard (2008) who stated that McDonald's food chain uses QR codes to inform users about the nutritious value of its burgers. Forssman *et al.* (2016) reported the use of QR codes to map an archaeological site in South Africa. They concluded that the use of QR codes in archaeological research enhances studies by improving the accuracy of site records, and by posing an efficient alternative to conventional recording methods. They also identified the benefits that QR codes offer archaeologists to include: 1) the ability to record information rapidly and reduce the occurrence of errors; 2) the availability of free code-generating and -recording applications; 3) the safe storage of data that is immediately loaded online or stored in the code itself; 4) a reduction in the amount of paper used in recording contextual information; and, importantly, 5) its ability to augment publications by allowing the reader to view additional or non-essential information, enhancing the content of research.

Kwanya *et al.* (2014) suggest that research and academic libraries can use QR codes to direct users to library resources, instructional videos or useful web sites as well as applications or contact information from their mobile phones. Walsh (2010) explains that academic libraries can use QR codes to provide virtual reference services through SMS; directions to a physical library or virtual library tours; context-appropriate information resources; supplementary information; or to store information for future reference as well as other forms of user support at the point of need. QR codes can also be stored on library posters, bulletin boards, catalogues, staff directory pages, study room doors, receipts, magazines or business cards. Kwanya *et al.* (2014) argue that the use of QR codes removes the need of the user to memorise or type the URL of a resource. They explain further that the fact that QR codes are scanned using mobile devices, which are becoming steadily ubiquitous in research and academic environments, also makes them handy for library users.

QR codes are considered suitable for marketing and promotion in libraries. According to Ashford (2010), QR codes can be used in library exhibits to link to songs, videos, web sites, surveys, contests or other information that augments

the exhibits; library stacks and end caps or magazine areas that point to online electronic holdings of print materials or related subject guides; resources which link to library audio tours for orientations; print hand-outs to link to additional information on mobile-friendly sites; text that loads the library's text message reference service and other contact information into the patron's phone; art shows or permanent art in libraries linking to the artists' web sites; catalogue records to offer patrons basic information about an item, including the location and call number; staff directory pages and research guides that go to mobile-friendly sites for later reference; audio book cases for author interviews or books for reviews; study room doors connecting to room reservation forms; and link to individual videos or YouTube playlists of videos.

The use of QR codes in academic libraries has been reported by many studies. Walsh (2010) reports that at the University of Huddersfield in the United Kingdom, QR codes are used to deliver context appropriate help and information directly to the users at the point of need. The other academic libraries reported to be using QR codes include the University of Colorado at Boulder which is using QR codes on signage to link patrons to maps and instructions (Hicks and Sinkinson, 2011); the San Jose State University Library which is using QR codes to link to mobile versions of their websites (Oasay, 2011); the University of Miami Library is using the codes to support readers' advisory functions (Miami University Libraries, 2011); while Indiana University's Fine Arts Library is using QR codes in course syllabi to link to library resources (MacDonald, 2012). Mohamed (2014) conducted a study at the University of Cape Town on the potential to use QR codes to support the delivery of information services to law students. The study revealed a lack of awareness of the value of QR codes among students and librarians. She recommended that libraries should be encouraged to experiment with QR codes to deliver services. At the Nnamdi Azikiwe Library in the University of Nigeria, QR codes are used to provide quick access to various resources, social media platforms, and to chat with a librarian. Closer home, a study by Kasusse and Holmner (2016) reported that Makerere University library used QR codes to help voters to identify their polling stations correctly during the 2016 presidential elections in Uganda. This study, however, does not report whether the library used QR codes to support the delivery of its core services.

Although the use of QR codes was initially confined to Japan, its popularity is increasing by the day as the symbols appear in magazines, advertisements, product wrappings, t-shirts, passports, business cards and on subway billboards in many countries. In spite of its popularity, some challenges hamper its widespread use. Shin *et al.* (2012) explain that QR codes have limited interaction capacity. They also explain that the fact that QR codes can only be used on smart-phones somehow limits their use by persons who do not have smart-phones. Other challenges affecting the use of QR codes are identified by Walsh (2009) to include a lack of appropriate knowledge and hardware devices (smart-phones) to encode and decode QR codes effectively; lack of awareness of QR codes amongst librarians and users; and potential prohibitive data charges on users' mobile phones.

### 3 Rationale of study

It is evident from the foregoing that literature on the application of QR codes in libraries in Africa is limited with only a few cases being reported. No study on the use of QR codes to support library services was identified in Kenya. This finding may imply that libraries in Kenya do not use QR codes or that no study has been undertaken to identify and report the use of QR codes in Kenyan libraries. Recognising the fact that Kenya is one of the countries in Africa with a high mobile-phone density, the potential of libraries in the country to use QR codes to reengineer the design and delivery of their services is high. Therefore, low or non-use may be a result of a lack of awareness amongst librarians about the potential value of QR codes in supporting the delivery of library services. This chapter draws the attention of the academic librarians to QR codes as a means of promoting its adoption to support their activities.

As pointed out earlier, academic libraries are currently competing with alternative sources of information exemplified by the Internet. Most of the library users hardly visit the physical library spaces. In fact, some of them never visit the library at all. Their information universe revolves around Google, their friends, and friends of their friends. Academic libraries must intervene to mitigate this loss of patronage (user flight) which, to a large extent, is caused by a lack of awareness of what the libraries have to offer. One way of averting user flight is by intensifying the promotion and marketing of library services and products. Given that QR codes are mobile-phone based, they stand a high chance of reaching most of the library users who are constantly on their mobile phones.

This chapter explores how QR codes can be used to enhance the access and use of academic library services and products through effective promotion. The specific objectives of the study that generated this chapter were to assess the level of use of QR codes in academic libraries in Kenya; examine the factors which influence the use of QR codes in academic libraries in Kenya; and propose how QR codes can be used to promote the services and products of academic libraries in Kenya.

## 4 Methodology

This study applied an exploratory survey design. According to Shields and Ranganathan (2013), exploratory survey is research conducted for a problem that has not been studied more clearly. Babbie (2015) explains that exploratory surveys are used on concepts which are new and have not been studied exhaustively. According to Powell (2006), exploratory surveys can increase the researcher's familiarity with the phenomenon under study and help to clarify concepts and identify priorities for future studies. Babbie (2015) adds that exploratory surveys are flexible and address diverse research questions. According to Pinsonneault and Kraemer (1993), the whole purpose of an exploratory survey is to elicit a wide variety of responses from individuals with varying viewpoints in a loosely structured manner. The authors used an exploratory survey approach because the use of QR codes is relatively new in the Kenyan context and has not been studied exhaustively.

The study aimed to collect primary data from systems librarians in all chartered private and public universities in Kenya. According to the Commission for University Education (2017), there are 31 chartered public and 18 chartered private universities in Kenya. Therefore, the population of the study comprised all the 49 systems librarians in these chartered public and private universities. Given the low number, the authors used a census to include all the systems librarians in the study. Primary data was collected through online semi-structured questionnaires developed using Google Forms. A list of all systems librarians and their contacts was compiled using content from university library portals. Both e-mail and telephone were used to contact the systems librarians and invite them to participate in the study. Online data collection approach was preferred because of its ease of use, low cost, convenience, and lack of intrusion on the privacy of respondents. Additional data was collected from relevant literature through documentary analysis. The collected data was analysed thematically and presented using descriptive statistics.

## 5 Findings and Discussions

A total of 35 systems librarians responded to the study. This represented a response rate of 71.4 per cent. Authors such as Morton *et al.* (2012), Baruch and Holtom (2008) as well as Baruch (1999) observe that response rates in empirical studies have been on a decline for many years now. Nonetheless, they emphasise that high response rates lead to large data samples which ultimately generate findings which have a higher credibility among the stakeholders. Several authors have recommended thresholds for response rates. For instance, Roth and BeVier (1998) suggest 50 per cent as the minimal level while Fowler (2013) suggests 60 per cent. The response rate of 71.4 %, inspires confidence that the findings of this study meet the minimum response threshold and are, to that extent, valid.

### 5.1 Familiarity with QR codes in academic libraries in Kenya

The majority 21(60%) of the respondents reported that they were familiar with QR codes while the rest were not. This finding indicates that a large number of academic librarians in Kenya are unaware of the technology and its potential benefits to their libraries. Since the respondents were systems librarians who should keep abreast of emerging technologies, this finding is worrying given that QR codes have been in use for decades. Walsh (2010) reports a 2009 study on the awareness of QR codes by students at the University of Huddersfield in the United Kingdom. The study revealed that only 8 per cent of the students were aware of QR codes. He adds that at the time, the percentage of the library staff who knew about QR codes was even lower than that of the students. Awareness of QR codes among librarians in Africa has grown over the years as highlighted in the literature review. Therefore, the low awareness level of the technology amongst systems librarians in academic libraries in Kenya is cause for worry.

Out of those who confirmed familiarity with QR codes, only four (4) librarians indicated that their libraries were using the technology. Asked whether they knew other academic libraries in Kenya using QR codes, 13(61.9%) reported that they did not know of any. These results corroborate the finding on awareness of QR codes and indicate that the level of use of QR codes in academic libraries in Kenya is extremely low. Nonetheless, adoption of technologies is known to start with a few, the early adopters, who embrace and popularise the innovation. Thereafter, the innovation is adopted by a critical mass that relies on the experience of the early adopters with the technology. The authors forecast that the level of use of QR codes in academic libraries in Kenya will grow as more librarians become aware of the technology through the experience of their peers. As with any other technology, it is probable that some academic libraries may not use QR codes at all.

### 5.2 Current use of QR codes in academic libraries in Kenya

The respondents who were familiar with QR codes reported that they were aware that academic libraries in Kenya use the technology in many ways. Some of these are reported verbatim hereunder:

*"We use WebOPAC QR Code. This enables access between smart phone and library management server to retrieve real time status of the documents they are searching for in the library's shelves."*

*“We place QR codes on e-book dummies to facilitate quick access to e-book collections and provide a visual representation of what cannot be seen.”*

*“We use QR codes to link e-resources and e-books subscribed to by the consortium. These are put on brochures and posters and given to members.”*

*“We place QR codes on printed books to link readers to related online resources.”*

*“QR codes are used as links to academic videos, demonstrations, to point out to e-resources, library tutorials, etc.”*

*“Shelf guides are placed on a shelf to show the classes contained in that shelf; researchers’ profiles.”*

*“QR codes are used to provide hyperlinks to surveys, notices, e-resources, staff profiles, website, and social media pages.”*

The respondents explained that they use freely available online tools to generate QR codes which they then put on such physical resources such as print books, posters, brochures, doors, shelves and other devices. Asked to explain the factors which have so far influenced the use of QR codes in academic libraries in Kenya, most respondents identified portability (17), ability to be read using diverse devices (16), simplicity of the technology (14), and low requirement for advanced ICT skills (14) as the drivers of the use of QR codes in Kenya. Factors impeding their popularity also emerged. They include low ICT skills, user disinterest and resistance to change. These factors present a need for continual education efforts in the library, both for librarians and library users. Figure 1 summarises these results.

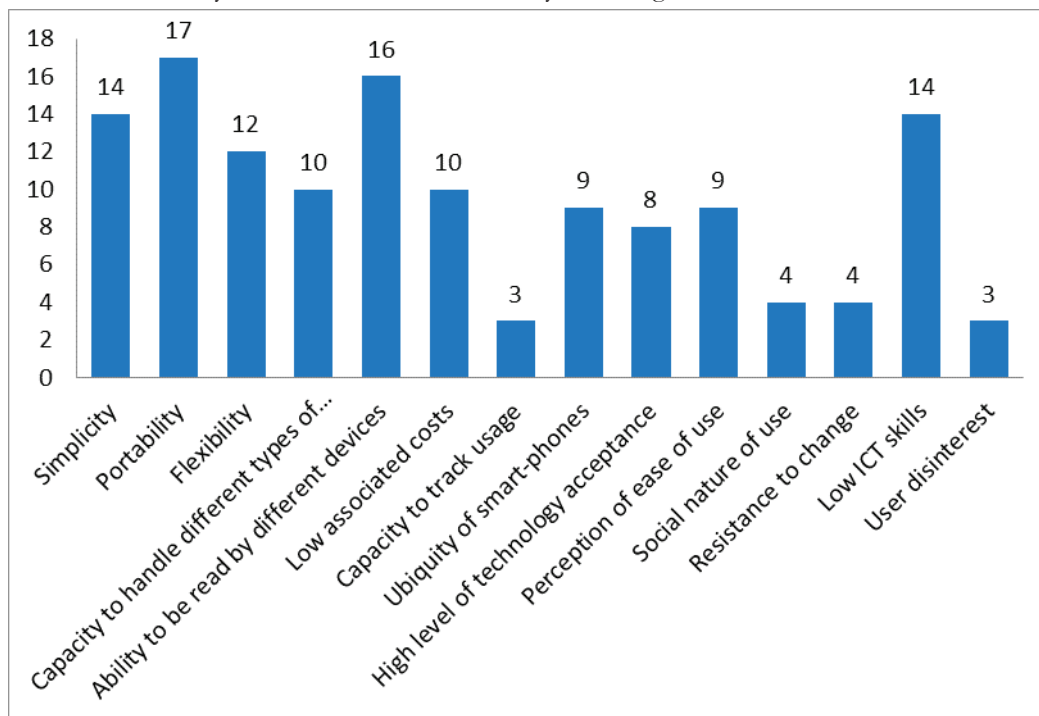


Figure 1: Factors influencing the use of QR codes in academic libraries in Kenya

### 5.3 Marketing of academic libraries in Kenya using QR codes

Academic libraries face many challenges with regard to marketing and promotion of services and products. Those identified by the respondents include cutthroat competition with alternative sources of information such as search engines; lack of awareness of new services and products acquired or made available in the library; declining visits to the physical library; failure by library patrons to make the best use of library resources; poor perception of the image and place of the library in today’s connected information universe; and inadequate budgetary support for marketing and promotion programmes.

Asked to indicate the seriousness of the challenges, 56% of the respondents said that they were “serious”; 40% perceived them as “very serious” while only 4% considered them as being “not serious”. These findings imply that 96% of the respondents consider inadequate marketing as a serious challenge hampering the effective access and use of library services and resources. These findings are in tandem with the view of Yi (2016) that libraries in the modern generation are not the only option for students and faculty. They, therefore, have to devise and deploy effective marketing strategies to attract and/or retain library users. Essentially, libraries which will not market themselves adequately risk being rendered redundant or irrelevant by their actual and potential users.

As reported above, only four academic libraries in Kenya were identified as using QR codes. The respondents provided the following views, reported verbatim, about the potential of QR codes to enhance the marketing of academic libraries

services and products in Kenya:

*“I feel QR codes if well displayed and clearly understood by users can promote library services and resources and increase the usage. Most, if not all users, have smart phones so QR codes can be an effective way of promoting library services and products/resources.”*

*“QR codes can be used in innovative ways to provide unique services to users but unless users are informed on how to use the QR codes, it ends up being a waste of time.”*

*“I think by adopting the use of QR codes, it will reduce the cost of collection development and space utilisation in academic libraries.”*

These statements indicate that these libraries are experiencing success with the use of QR codes and are able to see the potential of increased application. Indeed, the use of these codes as posited by Shettar (2013) makes it possible to deliver required information to 21<sup>st</sup> century library users and give them quick access to information wherever and whenever they want it. Their flexible nature allows for scores of applications in marketing and promotion initiatives in academic libraries.

## 6 Conclusion and Recommendations

Academic libraries in Kenya are facing serious challenges emanating from poor marketing of their services, space and products. Consequently, many of their actual and potential users do not make the best use of their services and products. QR codes are a low level but cost-effective technology which can be applied to support library promotion programmes given that virtually all academic library users have mobile phones. This study confirms that a large number of systems librarians in Kenya are unaware of QR code technologies. Results of this study further indicate that only four academic libraries in Kenya are currently reported to be using QR codes. These libraries perceive QR codes as having a great potential in marketing and promotion of their services and products. These libraries have adopted QR codes because they are portable; can be read using diverse devices; they are simple to use; and do not require advanced ICT skills.

Based on the findings of this study, the authors recommend the following opportunities to use QR codes in the promotion of services and products of academic libraries in Kenya:

1. *Library orientation* – Librarians can utilise QR codes to improve library orientation programmes in the university. Ordinarily, orientation is offered to new users, that is, new students or faculty in a university setting. Despite the fact that orientation is useful, many potential library users do not participate effectively in library orientation programmes. Some of them think they know everything they need to know about libraries while others see no need to spend time getting inducted to a library they do not intend to use. To allow new library users to learn about the library at their comfort, QR codes can be used to link library video, audio and or virtual tours introducing new users to the library spaces, resources and services.
2. *Signage* – Academic libraries are large and can be confusing even to the frequent users. QR codes can be pasted on library signage to inform the users where they are, where they have been, and where they could go. This will not only enhance findability of library resources; it will also make library usage less taxing for the users who would rather be somewhere else. To be effective, librarians should organise library spaces in a systematic manner to enable ease of description and identification. Such enhanced signage could also facilitate the benefits of serendipity whereby users discover resources, locations and services they did not know about before coming to the library.
3. *Games* – Most academic librarians are netizens – born in the Internet age. This group of users prefers infotainment to traditional communication. They love fun and cherish services and products delivered conveniently in an exciting manner. Librarians can create strategic games and fun pages which promote the location and use of library resources. For instance, libraries can create treasure hunts of library materials consisting of QR codes spread throughout the library as cues. Such games would enhance the understanding of the users about library processes, systems and spaces. The games can also increase the users’ familiarity with library services and materials thereby leading to better patronage.
4. *Digital marginalia* – In this era of citizen media, many people rely on the recommendations of their friends, peers or “friends of friends” to identify valuable resources. In the ancient libraries, readers made comments on the margins of the books to provide information or explain points made in the page. These markings in the form of text or underlines were known as marginalia. They helped subsequent readers of the material to interpret or contextualise the content. Today, marginalia has migrated to cyberspace, for instance, in the form of ratings and social bookmarks. QR codes can be used on print books to link to web locations where people who have used the books provide their assessment of the book. This information can be useful for people experiencing information overload and who may not commit time to do original search for materials.
5. *Contacts* – Librarians in the digital age strive to take library services beyond the library walls. This is largely achieved by providing remote access to library services and products. In spite of its advantages in “opening” the library around the clock, remote access is hinged on self-service with limited access to librarians. QR codes can be used



to provide contacts to librarians who can offer help at the point of need. The QR codes can be placed on physical facilities in and outside the library, business cards, merchandise, freebies, shelves, hostel noticeboards and other spaces library users are able to access easily. This way, the library users are linked faster and easily to such reference services as Ask-a-Librarian and live chat.

6. *Outreach* – Academic libraries in this era need to reach out to their users. This is usually through events, promotional materials and publicity campaigns. QR codes placed on posters, flyers, bookmarks, and banners can be used to provide quick links to campaign materials, events and pages. This strategy can mobilise library users to participate and benefit from library organised events and activities. Thereafter, the codes can provide hyperlinks to additional information and contacts to keep discussions and engagement alive.
7. *Downloads* – Libraries generate a lot of content in terms of guides, manuals, software and other learning materials. QR codes can be used to disseminate links to digital locations where these can be downloaded easily. The users can also be enabled to share the links or materials within specific organisational frameworks.
8. *Electronic resources* – Academic libraries in Kenya through consortia now provide access to a large number of academic electronic databases. This format of academic literature is relatively new and librarians have to work towards not only increasing awareness but also training library users on how to access and use electronic resources. QR codes linking to individual database can be pasted on publicity materials and subject guides. Once scanned, the QR code saves the URL and location of the database, in a complete and clear manner, to the mobile device for later use.

As academic librarians struggle to find relevance in a world that is increasingly technological and interest students who are more social and connected than ever, QR codes have great potential. They provide easier ways to not only make resources available and visible but also to increase engagement with today's student. While success with QR codes will vary among institutions, librarians have to be continually creative and experiment with different uses, increase the odds of how to use the codes and provide education as they seek to add value to the learning, teaching and research experience.

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# The Purposes and Challenges of Using Clinical Informatics among Medical Doctors in Selected Teaching Hospitals in Nigeria and South Africa

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## Abstract

*This chapter examines the purposes and challenges of using clinical informatics among medical doctors at the University College Hospital (UCH), Ibadan, Nigeria and King Edward VIII Hospital, South Africa. A positivism research approach largely through a survey design was used in the study on which the chapter is based. The sample for the study was drawn from 408 medical doctors in two purposively selected teaching hospitals. Questionnaires were administered to the medical doctors. The findings revealed that the main purposes of using clinical informatics are for medical diagnosis, knowledge sharing and effective healthcare delivery. The challenges point to insufficient ICT facilities, low clinical informatics literacy and technophobia among the doctors. The study concludes that the clinical informatics environments in the two teaching hospitals are inadequate and there is poor access to clinical informatics resources among the medical doctors. The authors recommend more investment in clinical informatics resources for effective and value-based healthcare delivery. The chapter is significant and makes tangible contributions to technology acceptance and use in clinical medicine from developing country contexts in Africa by acknowledging the increasing role of information and communication technology in diagnosis, prescription, treatment, monitoring and overall management of patient care in an environment characterized by complex diseases. The findings may inform policy and practice as well as contribute to research and teaching in social informatics.*

**Keywords:** *Clinical informatics, Health informatics, Social informatics, Teaching hospitals, Nigeria and South Africa*

## 1 Introduction

Effective healthcare services are the most noticeable part of any health system, particularly to healthcare users and the general public. Adequate health services can be in various forms such as promotion, prevention, treatment, diagnosis and rehabilitation which may be delivered in health facilities or in any other places. However, the World Health Organisation-WHO (2007) observes that effective healthcare service delivery depends on various key resources, particularly, availability of information and communication technology for the use of medical doctors in performing their job functions. World Health Organisation adds that good healthcare services are those which deliver effective, safe and good quality healthcare to users and with minimal waste.

The need to strengthen healthcare services through the use of clinical informatics is a key contributor to achieving the Sustainable Development Goals (SDG); as well as reducing child mortality, maternal mortality, the burden of HIV/AIDS, tuberculosis and malaria which are common in many Africa countries. Thus, effective healthcare is at the centre of SDGs. Understandably, health is fundamental to the global agenda of reducing poverty and a major way of promoting human development in both developed and underdeveloped countries (WHO, 2005).

Safeguarding healthy lives and promoting the well-being of citizens all over the world are very important for sustainable development. It is in line with this that new Sustainable Development Goals came to existence to replace MGDs with the mandate to end poverty (SDG 1), hunger (SDG 2), universal health coverage (SDG 3) and a host of others. The goals were created through agreement between the United Nation Development Programme and the United Development Group (United Nations, 2016). The integration of ICT in health is vital to the achievement of the Sustainable Development Goals (SDGs) (United Nation, 2016).

World Bank (2015) acknowledges the importance of ICT in meeting the SDGs, particularly in health care, in both developed and underdeveloped countries by building medical evidence. The adoption of ICT provides better healthcare which in turn assists in achieving SDGs in relation to specific goals in terms of health (World Bank, 2015). This indicates that the availability and accessibility of ICTs in healthcare delivery provides strong evidence-based information that can assist medical doctors in taking clinical decisions.

One of the basic goals of every government is to provide adequate and effective healthcare delivery to their citizenry. Access to adequate medical information is imperative for successful healthcare delivery, particularly, for medical doctors all over the world. Moon, Hossain and Shin (2012) admit that access to accurate medical information, in various health care facilities, is necessary for medical doctors to take effective medical decision. Attama and Ezema (2005) argue that access to and use of information is necessary for medical doctors for problem solving and decision making.

The availability of accurate, timely, reliable and relevant clinical information is most essential for medical practice because it has tremendous benefits of improving the efficiency and increasing the quality of medical care. World Health Organisation (2005) opines that a well-functioning healthcare system is one in which medical doctors adopt the use of clinical informatics for reliable and timely health information and decision making.

## 2 Contextualisation

Nigeria and South Africa are two of the dominant countries on the continent of Africa. Nigeria has a population of 194, 704 888 million (United Nation, 2017), with thirty-six states which are divided into six geo-political regions. They are North East, North Central, North West, South West, South East and South-South. There are twenty-six teaching hospitals and twenty-five federal medical centres in the country (Federal Ministry of Health, 2004). However, there is no data about the total number of general hospitals which are being managed by various state governments in Nigeria. South Africa, on the other hand, has eight teaching hospitals. The country is divided into nine provinces, namely the Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga, Northern Cape, North West, Western Cape and KwaZulu-Natal. The estimated population of South Africa in 2017 was 57,242,231 million (United Nations, 2017). There are 4,200 public health facilities in South Africa with a total of 165,371 qualified doctors in the country (South Africa Infor, 2012). Nigeria has three tiers of medical care: primary, secondary and tertiary healthcare (National Strategic Health Development Plans Framework 2010). South Africa has five structures of healthcare system which are primary healthcare (clinics), district hospitals, regional hospitals, tertiary (academic hospitals) and central hospitals (academic).

The two countries face the same health challenges, which include high levels of HIV/AIDS, tuberculosis, and low life expectancy rate (Chikotie, 2013; Onu and Agbo, 2013). The governments of the two countries have made various attempts, in the past, to promote clinical informatics in their countries. The Nigerian government embarked on the promotion of clinical informatics in 1980 through a research project championed by the Computer Center of Obafemi Awolowo University Teaching Hospital, Ile-Ife and University of Kuopio, Finland (Idowu, Cornford and Batin, 2008). It also introduced a software package called State Hospital Network (SHONET) which is used for sharing hospital resources over computer network (Idowu et al., 2008). The Ministry of Health in South Africa, on its part, inaugurated a committee to look at the effective ways of promoting clinical informatics in public hospitals across the country with the aim of developing clinical informatics practices (National Service Delivery Agreement, 2012).

Two teaching hospitals, the University College Hospital in Ibadan, Nigeria and King Edward VIII Hospital in Durban, South Africa were selected for this study. The University College Hospital, Ibadan was founded in 1952 and is affiliated to University of Ibadan as its teaching hospital. The hospital was established in response to the need for the training of medical personnel and other healthcare professionals for both the country and the West African sub regions (UCH, 2011). The hospital run courses at undergraduate and postgraduate residency training programmes in all specialities of internal medicine, surgery, obstetrics and gynaecology (UCH, 2011).

King Edward VIII Hospital was founded in the year 1950 (Ahamed, 2013). The hospital is the second largest hospital in the southern hemisphere, and provides regional health services to Kwa-Zulu Natal (KZN) and the Eastern Cape (Department of Health Province of KZN, 2014). It is also the teaching hospital of the Nelson Mandela School of Medicine which is affiliated to University of KwaZulu-Natal. It offers courses in various fields of medicine such as obstetrics and gynaecology, general medicine, general surgery and paediatrics (Department of Health, 2014).

The two teaching hospitals were selected for several reasons. The first is that, they belong to the first generation of teaching hospitals in the two countries and are therefore well established in terms of funding in regard to infrastructural and human development. King Edward VIII is the only teaching hospital in the province of KwaZulu-Natal just as the University College Hospital, Ibadan, is the only federal teaching hospital, in Oyo State, Nigeria.

Furthermore, the affiliated universities of the hospitals were ranked high in 2018 by Webometrics ranking (2018) among the universities in Africa. King Edward VIII hospital was selected because University of Kwazulu-Natal in South Africa was ranked 6<sup>th</sup> while University College Hospital was selected because University of Ibadan, Nigeria, was ranked 19<sup>th</sup> out of 1417 universities that were listed in the assessment. In Africa the two hospitals selected are public teaching hospitals.

## 3 Purposes of the study

Access to effective clinical informatics is important as it enhances healthcare delivery. Unfortunately, inadequate use of clinical informatics by medical doctors prevents them from rendering effective and quality healthcare services to people through preventive, diagnostic, restoration and rehabilitation cares. Ruxwana, Herselman and Conrate (2010) observed that clinical informatics tools are not being used in most teaching hospitals in Africa because of limited suitable resources.

Inadequate access to and use of clinical informatics among medical doctors have brought about medical errors and mis-diagnoses. Many people are casualties of medical doctors' inability to access and use informatics tools effectively. Medical errors could have been prevented if medical doctors had access and the ability to use clinical informatics

effectively (Idowu *et al.*, 2008). Ushie, Salami and Jegede (2013) estimate that not less than 44,000 to 98,000 patients died annually from wrong diagnosis in the United States of America. In Nigeria, 13 to 43% of the instances where stroke has been misdiagnosed due to lack of access and use of clinical informatics tools have been reported (Imam and Olorufemi, 2006). Similarly, in South Africa, 40% of medical doctors admitted to have made medical errors due to lack of access and use of clinical informatics in the administration of drugs to the patients (Labusschagne *et al.*, 2011).

This study seeks to extend the frontier of knowledge, by addressing the paucity of literature on accessibility and use of clinical informatics among medical doctors in teaching hospitals in Nigeria and South Africa. A review of literature revealed that no comprehensive study had been done on the use of clinical informatics in the two countries. Studies mainly focused on the Internet and computers used among medical doctors in the two countries (Cline and Luiz, 2013; Nwargu and Adio; 2013; Ruxwana *et al.*, 2010; Idowu *et al.*, 2008).

The study focuses on this gap, by providing insightful literature on the access to and use of clinical informatics among medical doctors in the two teaching hospitals in Nigeria and South Africa and providing new data on clinical informatics practices from this sample. The aim of the study was to establish the purposes and challenges of clinical informatics in selected teaching hospitals in Nigeria and South Africa with the view to providing theoretical and practical knowledge for the wide usage of clinical informatics for clinical practices in the two countries. Based on this the study responds to the following research questions: (1) What are the purposes of using clinical informatics in the selected teaching hospitals? (2) What are the challenges that medical doctors face in the use of clinical informatics tools in the selected teaching hospitals?

#### 4 Methodology

The study adopted a positivism approach based on quantitative methods. The study largely used a survey design. The use of survey design encourages and enhances effective gathering of standardised information through the use of a questionnaire. The sample was drawn from medical doctors in the two purposively selected teaching hospitals in Nigeria and South Africa distributed as shown in Table 1.

The population of the study comprised of medical doctors in the two selected teaching hospitals. To reduce bias, ten similar departments were further selected. Cochran 1968 formulae for sample size calculation were used to calculate sample size. The sample size for UCH and KEH were 274 and 134 respectively. Questionnaires were administered to the medical doctors during their clinical meetings and out of 274 questionnaires distributed at UCH, 176 questionnaires were returned and out of 134 questionnaires administered to the respondents at KEH, 82 questionnaires were returned.

Table 1: Distribution of respondents by medical departments

Medical Department	UCH		KEH V111		TOTAL 16 *(258)	
	Frequency (176)	%	Frequency (82)	%	Frequency	%
Anaesthesia	16	9.1	11	13	27	10
ENT	11	6.3	02	04	13	05
Medicine	30	17	18	22	48	19
Surgery	22	12.5	12	14	34	13
Orthopaedics and Trauma	15	8.5	07	08	22	09
Paediatrics	19	10.8	10	12	29	11
Psychiatry	15	8.5	04	05	19	07
Radiology	15	8.5	05	06	20	08
O and G	25	14	10	12	35	14
Haematology	08	4.5	03	04	11	04
<b>Total</b>	<b>176</b>	<b>100</b>	<b>82</b>	<b>100</b>	<b>258</b>	<b>100</b>

\*Note: N=258 is the total number of respondents that completed the questionnaires from the

#### 5 Findings of the Study

This section presents the key findings of the study based on the objectives and research questions of the study.

##### 5.1 Purposes of using clinical informatics among medical doctors in the selected teaching hospitals

The respondents consisted of medical doctors from ten departments in King Edward VIII Hospital, Durban, South Africa, and the University College Hospital, Ibadan, Nigeria. A total of 82(31.8%) respondents from King Edward Hospital participated in the study and 176(67.2%) respondents participated from the University College Hospital. The high number of medical doctors at UCH, Ibadan, Nigeria may be attributed to the hospital having high medical personnel compared to King Edward VIII hospital, Durban, South Africa.

The majority of the respondents from the two hospitals admitted that they used clinical informatics primarily for medical

diagnosis purposes. About 77(93.9%) respondents from KEH VIII hospital admitted that they used clinical informatics for medical diagnostic purposes while 153(93.9%) from the University College Hospital agreed that they used the clinical informatics for the same purposes. In addition, the respondents from King VIII hospital claimed that they used clinical informatics for decision making. This was represented by 67(72.9%) while 147(83.6%) respondents from UCH admitted that they also used the clinical informatics for the same purpose. In another development, 65(79.2%) respondents from King Edward VIII hospital maintained that they used clinical informatics for disease management. Likewise, 65(79.3%) admitted that they used clinical informatics tools for knowledge sharing. Another set of 133(75.5%) respondents from UCH claimed that they used clinical informatics for research purposes. On the other hand, 138(78.4%) agreed that they used clinical informatics for disease management. Another finding of the study indicates that medical doctors in the two teaching hospitals used clinical informatics for knowledge sharing. This was indicated by results of the study where 65(79.3%) respondents from KEH and 126(71.6) from UCH affirmed respectively. Table 2 presents these results.

Table 2: Purposes of using clinical informatics

Purpose	Hospital	SA	A	N	D	SD	Median
		N (%)	N (%)	N (%)	N (%)	N (%)	
Use clinical informatics for medical diagnostic	KEH	27(32.9)	50(61.0)	5(6.1)	0	0	2
	UCH	54(30.7)	99(56.3)	21(11.9)	2(1.1)	0	2
Use clinical informatics for decision making	KEH	27(32.9)	40(48.8)	8(9.8)	3(3.7)	4(4.9)	2
	UCH	48(27.3)	99(56.3)	17(9.7)	8(4.5)	4(2.3)	2
Use clinical informatics for research purposes	KEH	26(31.7)	32(39.0)	11(13.4)	6(7.3)	7(8.5)	2
	UCH	40(22.7)	93(52.8)	21(11.9)	17(9.7)	5(2.8)	2
Use clinical informatics for disease management	KEH	22(26.8)	43(52.4)	6(7.3)	7(8.5)	4(4.9)	2
	UCH	29(16.5)	109(61.9)	18(10.2)	18(10.2)	2(1.1)	2
Use clinical informatics to share knowledge with professional colleagues and medical students	KEH	29(35.4)	36(43.9)	9(11.0)	3(3.7)	5(6.1)	2
	UCH	35(19.9)	91(51.7)	24(13.6)	26(14.8)		2
Use clinical informatics for communication purposes to alert patients about their treatments	KEH	14(17.1)	38(46.3)	11(13.4)	13(15.9)	6(7.3)	2
	UCH	30(17.0)	71(40.3)	34(19.3)	36(20.5)	5(2.8)	2
Use clinical informatics for the treatment of patients	KEH	20(24.4)	40(48.8)	11(13.4)	3(3.7)	8(9.8)	2
	UCH	30(17.0)	79(44.9)	30(17.0)	33(18.8)	4(2.3)	2
Use clinical informatics to promote effective healthcare delivery	KEH	28(34.1)	34(41.5)	9(11.0)	3(3.7)	8(9.8)	2
	UCH	33(18.8)	98(55.7)	30(17.0)	13(7.4)	2(1.1)	2
Use clinical informatics for administrative information	KEH	22(26.8)	29(35.4)	20(24.4)	6(7.3)	5(6.1)	2
	UCH	30(17.0)	71(40.3)	36(20.5)	34(19.3)	5(2.8)	2
Use clinical informatics for treatment and practice in the hospital	KEH	19(23.2)	37(45.1)	8(9.8)	9(11.0)	9(11.0)	2
	UCH	33(18.8)	96(54.5)	23(13.1)	22(12.5)	2(1.1)	2

SA= Strongly Agree, A=Agree, N= Neutral, D= Disagree, SD= Strongly Disagree

### 5.2 Challenges faced by medical doctors while using clinical informatics tools in the selected teaching hospitals

The question sought to identify the challenges facing the use of clinical informatics among medical doctors in the two teaching hospitals. Non-availability of clinical informatics came first in both teaching hospitals. At the KEH hospital, 75(91.5%) of the respondents admitted that they face a problem of non-availability of necessary clinical informatics resources. Likewise, 168 (95.4%) respondents from UCH indicated that clinical informatics tools are not available to them. Another interesting finding of the study revealed that in both teaching hospitals, there is challenge of training opportunities among the respondents. Specifically, 76(87.6%) respondents KEH and 165(93.7%) at UCH respectively confirmed this. Lack of technical support is another challenge identified among respondents in the two teaching hospitals. Supporting, this was 66(80.5%) from KEH and UCH 166(94.3%). Table 3 presents these findings.

Table 3: Challenges facing the use of clinical informatics

Challenge	Hospital	SA	A	N	D	SD	Median
Non-availability of desired clinical informatics tools	KEH	46(56.1)	29(35.4)	3(3.7)	2(2.4)	2(2.4)	2
	UCH	97(55.1)	71(40.3)	7(4.0)	1(0.6)	0	2
Absence of sufficient training programme on clinical informatics' use	KEH	46(56.1)	30(36.6)	4(4.9)	0	2(2.4)	2
	UCH	90(51.1)	75(42.6)	6(3.4)	4(2.3)	1(0.6)	2
Poor ICT skills on the part of medical doctors	KEH	21(25.6)	32(39.0)	13(15.9)	6(7.3)	10(12.2)	2
	UCH	39(22.2)	88(50.0)	23(13.1)	10(5.7)	16(9.1)	2
Lack of technical support	KEH	35(42.7)	31(37.8)	10(12.2)	3(3.7)	3(3.7)	2
	UCH	68(38.6)	98(55.7)	7(4.0)	2(1.1)	1(0.6)	2
Limited and unreliable supply of electricity	KEH	20(24.4)	31(37.8)	17(20.7)	7(8.5)	7(8.5)	2
	UCH	67(38.1)	75(42.6)	20(11.4)	9(5.1)	5(2.8)	2

Challenge	Hospital	SA	A	N	D	SD	Median
Limited access to clinical informatics resources	KEH	19(23.2)	45(54.9)	11(13.4)	3(3.7)	4(4.9)	2
	UCH	63(35.8)	70(39.8)	21(11.9)	9(5.1)	13(7.4)	2
Technophobia	KEH	4(4.9)	21(25.6)	21(25.6)	14(17.1)	22(26.8)	2
	UCH	16(9.1)	44(25.0)	39(22.2)	28(15.9)	49(27.8)	2
Negative attitude towards clinical informatics	KEH	4(3.7)	7(8.5)	11(13.4)	22(26.8)	38(46.3)	2
	UCH	12(6.8)	16(9.1)	16(9.1)	56(31.8)	76(43.2)	2

SA= strongly agree, A=Agree, N= Neutral, D= Disagree, SD= strongly disagree

## 6 Discussions of the findings

Clinical informatics is increasingly used for medical services. The study revealed that medical doctors in the two teaching hospitals used clinical informatics for medical diagnosis, decision making and disease management. Related studies (Chiffi and Zanotti, 2014) concur that medical diagnosis, decision making, knowledge sharing and disease management are the major reasons for using clinical informatics among medical doctors in the United States. Using clinical informatics resources in medical examination can prevent wrong treatment and misdiagnosis and assist medical doctors with analysing medical data and testing patients accordingly. Early diagnosis is also very important in the medical examination of patients because it helps medical doctors to quickly identify the next line of action.

In the past, medical examinations could only be performed by physically looking for symptoms and interacting with patients to determine what is wrong. With the advent of clinical informatics, there have been various innovations and developments that have made clinical diagnoses more accurate, evidence-based and faster results are achieved. These innovations include Diagnosis Image Archiving (DIA) equipment such as Computerised axial tomography (CAT) and Magnetic Resonance Imaging (MRI). Hasting Centre Report (1991), Olorode and Oladuni (2002) and Maharana *et al.* (2009) concur that appropriate medical diagnosis is one of the main reasons medical doctors use clinical informatics facilities.

Additionally, medical doctors used the clinical informatics for knowledge sharing with their professional colleagues, treatment of patients and use of clinical informatics to promote effective healthcare delivery were revealed. Panahi (2014) affirms that knowledge sharing is necessary to improve the quality of care among medical doctors in teaching hospitals. Panahi highlights knowledge that medical doctors can share to include sharing of clinical experiences, skills, know-how or know-who. This is known to have a significant impact on the quality of medical diagnosis and decision. Lai (2005) confirms that clinical informatics tools are convenient for sharing and disseminating knowledge among medical doctors. The survey report of McGowan *et al.* (2012) confirms that 60% of medical doctors in US teaching hospitals use clinical informatics to share knowledge with their professional colleagues.

In Africa, Olatokun and Adebeyejo (2009) corroborate the finding in their study on the use of ICTs among medical doctors in a Nigerian teaching hospital. It was revealed that one of the reasons why health workers in the country used ICTs is for knowledge sharing. Ajuwon (2006) affirms that the use of clinical informatics promotes effective knowledge sharing among medical doctors in Nigeria. In the same vein, a study by Asemahagn (2014) on knowledge sharing among health workers in Ethiopia revealed that 218(70%) of medical doctors in a teaching hospital acknowledged the importance of knowledge sharing in their medical practices.

Further, medical doctors use clinical informatics for treatment of patients as affirmed in related studies (Kilbridge and Classen 2008). Bates, Leape, Culler, Laird and Teich (1998) assert that clinical the use of informatics by medical doctors contributes toward effective treatment of patients through improving access to clinical information and reducing reliance on memory. Nwargu, Adegunwa and Soyannwo (2013) also focused on cancer patients at a teaching hospital in Nigeria. They reveal how medical doctors, in the hospital, used ICTs in the treatment of patients with advanced cancers.

Many challenges face clinical informatics in the study area; among them are lack of facilities and training. The medical doctors identified the unavailability of clinical informatics tools as the main challenge in the two teaching hospitals. Lack of clinical informatics facilities is not new in the developing countries (Wattas, Maharaham and Biswal, 2009). The absence of sufficient training programmes on clinical informatics seems to be another important challenge that is also widely shared (Gatero, 2011; Houshayari, 2012 Asangansi *et al.*, 2008; Mugo and Nzuka, 2014; Olok, 2015; and Adeleke *et al.*, 2015).

## 7 Conclusion and recommendations

Medical doctors in the two teaching hospitals used clinical informatics for medical diagnosis, decision making, knowledge sharing, and disease management. This indicates that clinical informatics is being used for medical purposes in order to promote effective healthcare delivery. In addition, various challenges facing the use of clinical informatics were identified among them are lack of facilities and trainings. The medical doctors also identified the unavailability of clinical

informatics tools as another challenge hampering the use of clinical informatics in the two teaching hospitals. Based on these, the recommendations were made. The study recommends the provision of adequate clinical informatics tools in various medical departments in the two teaching hospitals and the need for incentives to encourage the usage. There is a need for hospital management to increase their level of investments in clinical informatics education and training. Medical doctors need to improve their ICT skills in order for them to be able to harness the potential benefits of using clinical informatics. Workshops to transfer knowledge and skills to the doctors are strongly recommended. Government support is encouraged to support the reported challenges.

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# Research Infrastructure in Kenyan Universities: Library and Information Communication Technology

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## Abstract

*Research infrastructure plays a vital role in knowledge and technological advancement. Research infrastructure is important in academic research because excellence in research requires sound infrastructure for data collection, management, processing, analysis and archiving. This chapter examines the state of research infrastructure in Kenyan universities and recommends strategies for improvement. Questionnaires and interviews were used to collect data from university academic staff, librarians and Information Communication Technology (ICT) staff drawn from two universities in Kenya. A sample of 110 was selected from a population of 427. The results indicate that library and Information Communication Technology (ICT) are the major research infrastructure in Kenyan universities. University libraries have created institutional repositories to preserve, archive and provide access to the works of faculty and researchers. However, there is inadequate documentation on research output and scholarly publication. Library and ICT units in Kenyan universities experienced challenges including: inadequate funds, inadequate current and relevant reading resources, unreliable Internet access and inadequate staff. University libraries rely mostly on e-resources obtained through the Kenya Library and Information Services Consortium (KLISC). The study recommended enhanced research funding and improved access to research infrastructure.*

**Keywords:** *Research infrastructure, Kenya, Universities, Library, Information Communication Technology.*

## 1 Introduction

Research infrastructure is a fundamental requirement for research work supporting organised research and researcher education while maintaining and developing the university's research capacity. Components of research infrastructure include: laboratories, libraries, databases, communication networks among others. According to Organization for Economic Co-operation and Development (2004), universities play a vital role in the research and innovation system. Migosi, Muola and Maithya (2012) observe that research is a pillar of any university system and as such universities in Kenya are required to conduct research and disseminate findings. To achieve excellence in research requires access to excellent research infrastructure. In Kenya, the Commission for University Education (CUE) has set up standards and guidelines for universities. For example, every university should provide appropriate and adequate facilities to cater for the number of programmes on offer and students' enrolment. The facilities include libraries and Information Communication Technology (ICT) infrastructure (CUE, 2018). According to Obioha (2005), ICT plays an immense role in information sourcing, generation, processing, storage, retrieval and dissemination. Similarly, the library is vital in providing equal access to information and education. The library contributes to the achievement of university aspirations by providing high quality research and learning environment and access to scholarly collections and resources across multiple sites (Monash University, 2018).

Migosi *et al.* (2012) and Ngome (2003) observe that one of the key factors that have stunted the growth of research in the Kenyan university system is inadequate research funds. A large portion of support (although inadequate) for postgraduate and staff training and research is contributed by donors and international organisations. Rotich (2010) also points out that it is not easy for Kenyan universities to support research because most of them are severely constrained by inadequate funds. Therefore, most research activities depend on donor support. However, Kenyan universities are making progress by increasing allocation of funds to research using internally generated funds and mobilising research grants from donors. The University of Nairobi, for instance, has in particular intensified collaboration with local and international partners, which has resulted in a substantial increase in the available research grants.

## 2 Problem and Purpose of the Study

The demand for university education in Kenya has increased drastically and has outpaced supply. Report by the Public Universities Inspection Board (Republic of Kenya, 2006) notes that accelerated growth in student numbers in universities has not been matched by expansion of physical facilities and academic infrastructure and some of the existing infrastructure was in inadequate and dilapidated. Universities in Kenya are required by law to provide appropriate and adequate facilities to cater for the number of programmes on offer and students' enrolment. These include library and Information Communication Technology (ICT) infrastructure. Those universities that do not comply are severely

restricted. High standard research infrastructures are crucial to the success of any university. This chapter explores the current state and developments in research infrastructure, in terms of library and ICT facilities, and recommends strategies for improvement. The chapter specifically provides insights into the current state of research infrastructure in Kenyan universities; the adequacy of funds allocated for research; as well as the challenges libraries and ICT units in Kenyan universities face which affect their capacity to support research adequately in the institutions.

### 3 Research Methodology

The study which generated data for this chapter used an exploratory research design. An exploratory research is a valuable means of understanding what is happening, seeking new insights, asking questions and assessing the phenomena in new light (Yin, 1994). An exploratory research design was appropriate because there was need to explore the full nature of the phenomenon. An assessment was conducted on the research infrastructure and adequacy of funds allocated to research by universities. The study adopted mixed methods research approach. Both qualitative and quantitative data was collected. The need to investigate research infrastructure in selected Kenyan universities required a qualitative approach while there were aspects of quantification of data, for example, rating research infrastructure in percentages and response rates that required a quantitative approach. According to Straus and Corbin (1990), quantitative and qualitative methods can be combined in the same research project providing greater insights into the findings. Technical University of Kenya and Strathmore University, located both in Nairobi, constituted the target population. The study sites were selected purposefully to bring out the differences and similarities between the public and private chartered universities in terms of resource availability. The population for the study consisted of academic and administrative staff, library and Information Communication Technology (ICT) personnel from Technical University of Kenya (TUK) and Strathmore University (SU). The sample size for this study was 110 comprising of eighty (80) lecturers both from TUK and SU, 15 chairpersons of departments and 15 key informants from the two universities. The key informants were seven (7) directors/deans of schools, two (2) research directors, two (2) librarians, two (2) Information Communication Technology (ICT) directors and two (2) Deputy Vice Chancellors in charge of academic and research from both universities.

Purposeful sampling was used to select the key informants while stratified and simple random sampling techniques were used to select the university lecturers. The researcher divided the lecturers into groups basing on schools then used simple random sampling to draw the sample. Simple random sampling is the sampling method in which each member of the population has an equal chance of being selected. The researcher distributed 95 self-administered questionnaires where 80 questionnaires were distributed to lecturers and 15 to the chairpersons of departments of the two universities. The response constituted 70 (87.5%) questionnaires from lecturers and 10 (66.7%) questionnaires from the chairpersons of departments. Interviews were conducted with key informants from both universities.

### 4 Findings and Discussions

The findings of the study are presented and discussed hereunder according to the objectives of the study on which this chapter is based.

#### 4.1 State of research infrastructure in Kenyan universities

One of the objectives of the study was to assess the state of research infrastructure in Kenyan universities. The lecturers were asked about the research infrastructure in their universities and to rate their state. The infrastructure reported were: library, laboratories, ICTs and research sites. Other research infrastructure cited were: directorate of research, online libraries and plagiarism checkers. The Table 1 below presents the perceptions of the respondents on the state of research infrastructure in the two selected universities.

Table 1: Perceptions on the state of research infrastructure at Technical University of Kenya and Strathmore University (multiple responses)

Infrastructure	State of infrastructure									
	Very good		Good		Fairly good		Poor		Very poor	
	%	N	%	N	%	n	%	n	%	n
Library	25	17	37	26	27	19	8	6	2.8	2
ICT	25	17	34	24	23	16	7	5	11	8
Laboratories	18	13	18	13	-	-	2	2	-	-
Research sites	10	7	25	17	25	17	2	2	-	-

Source: Research data

The state of the library and ICT varied from institution to institution. Findings indicate that 42(60%) of the lecturers did not rate the laboratories stating that it was not applicable to their areas of specialisation. Another 27 (38.5%) were unable to rate the research sites. This was because the research directorate in their university was new and they had not done

much in terms of creating research sites. Findings revealed that the state of research infrastructure in private chartered universities is better than the public universities where most lecturers indicated that the state of research infrastructure is poor.

The chairpersons of departments reported that library and ICT were the major research infrastructure in the universities. However, the response about research sites and laboratories was very low indicating that laboratories were not applicable to their areas of specialisation. The study sought the views of the librarians, ICT directors, research directors and Deputy Vice-Chancellor in-charge of academics and research on the state of research infrastructure in their institutions. On the side of the library, one respondent said that the library was not well stocked and that the available space was inadequate considering the large number of users. This finding concurs with that of Eshiwani (2009) who noted that Kenyan universities lack text-books and journals. The respondent added that they have challenges acquiring print resources and relied mostly on e-resources acquired through the Kenya Library and Information Services Consortium (KLISC) whose mandate is to bring together university libraries for the benefit of students, lecturers and researchers. Conversely, another respondent reported that they have a well-stocked library and it is one of the best libraries in the country. These findings show that the state of research infrastructure and resources varies from one university to another. It was observed that there is a big difference between public and private chartered universities. The results are in agreement with those of Gudo, Olet and Oanda (2011) who found that 100% and 47% of librarians in private and public universities, respectively, were satisfied with available print journals.

The results showed that the libraries have digital repositories where all the research output from their universities is stored. This finding is similar to that of UNESCO (2018) which observed that many libraries in Africa have established institutional repositories. However, documentation of research output and scholarly publications was inadequate and takes long periods of time before getting into the library.

The study also found out that universities offer free and unlimited access to the Internet to researchers and students. However, it was observed that the Internet speed was low while the coverage was weak. Nonetheless, one university has a fully incorporated ICT in all areas with high speed and bandwidth provided by Kenya Education Network (KENET). The KENET is a national research and education network that promotes the use of ICT in teaching, learning and research in higher education institutions in Kenya.

#### **4.2 Adequacy of funds allocated for research by universities**

The study assessed the adequacy of funds allocated to research by universities. The respondents were 70 lecturers, 10 Chairpersons of Departments and Deans or Directors of Schools. Out of the 70 lecturers, 53 (76 %) said their universities allocate funds for research; 12 (17%) said no funds were allocated for research and 5 (7%) said they were not aware of funds allocated for research. It was noted that the five lecturers, who said they were not aware of research allocations, were new. Probed further as to how adequate the funds allocated to research were, 9 (12.8%) said the funds are adequate; 35 (50%) said the funds were inadequate; 7 (10%) said the funds were more than adequate; and 2 (2.9%) did not know whether the funds were adequate, inadequate or more than adequate. About the proportion of funds allocated to research as compared to the total budget of the university, most of the respondents were not aware of the percentage. The respondents who said it was most adequate said that the proportion of funds allocated to research as compared to the total budget of the university was 20% and above; those who said it was adequate said it was 10-20%; while those who said it was inadequate were of the view that it was less than 10%. On their part, 9 (90%) chairpersons of departments said there were no funds allocated to conduct research by their university while 1 (10%) said that there were funds allocated for research by the university. There was one respondent who said that the funds are inadequate and the proportion of funds allocated for research as compared to the total budget of the university was less than 10%.

In response to the adequacy of funds allocated to do research, all the key informants said their institutions allocate funds for research but the funds were not adequate. They said researchers needed more funds. The finding indicates that the proportion of the funds allocated to research compared to the total budget of the university was less than 10%. The key informants suggested that more funds should be allocated but that researchers should also look for alternative ways to fund their research. This could be achieved, for instance, by applying for research grants. Universities should partner and collaborate with other universities and also engage the private sector through business projects to generate funding.

The findings have revealed that funds allocated for research by universities in Kenya are inadequate. Similarly, it is evident that university library budgets keep fluctuating from year to year. According to the Commission for University Education (2018), all universities in Kenya, both private and public, ought to spend at least 10% of their total institutional budgets on information resources to support the on-going and appropriate needs of the library. However, this regulation is yet to be adhered to by most institutions of higher learning in Kenya.

### 4.3 Challenges of ICTs in libraries

The findings revealed that ICT units and libraries in academic institutions in Kenya face a number of challenges including: high costs of acquiring and upgrading the current systems; inadequate staff; unreliable Internet access; lack of current and relevant reading resources; lack of appropriate furniture; space constraints; vandalism and inadequate funding. According to Otike and Omboi (2010), the library is of no use if it does not have suitable information materials. For the university library to support the mission of the institution, it is required to regularly acquire sufficient current and relevant information materials. These findings are in line with those of UNESCO (2018) that inadequate funding, inadequate staffing, and lack of facilities or infrastructure are the greatest barriers to adoption of Open Access (OA). Ayiro (2015) also pointed out that university libraries are overcrowded while book collections are out-dated and inadequate. Okwakol (2008) also noted that library facilities and information systems in almost all the universities are antiquated with books and scholarly journals which are not only few but very old and therefore irrelevant to the current needs and priorities.

The results are also in agreement with those of Gudo *et al.* (2011) who observed that lack of relevant books, inadequate use of the Internet and general lack of reading space created the major constraints to student learning and access to library resources. Ndethiu (2007) also pointed out that lack of adequate reading resources posed a challenge to students reading habits.

Appearance of ICT on the global scene has caused a revolution in libraries and the only way to satisfy users demand is to use ICT in information service delivery. Kenyan universities are not exceptional and therefore should keep pace with new inventions in ICT. In this technological era, library users mostly prefer e-resources to print resources. This poses a challenge to libraries with inadequate ICT systems.

### 5 Conclusion

The study established that the state of research infrastructure in universities varies from institution to institution. The majority of the respondents revealed that their institutions have libraries and ICT infrastructure. However, the respondents were of the view that the research infrastructure is inadequate as compared to the number of users. They recommended more investment in the same so as to cater for the needs. The findings obtained indicate that funds allocated for research by universities are inadequate and library budget keeps on fluctuating from year to year. High cost of acquiring and upgrading the current systems, inadequate staff, lack of current and relevant reading resources, space, vandalism and inadequate funding are some the challenges university libraries in Kenya face.

### 6 Recommendations

Improved access to research infrastructure may be achieved by investing more on the provision of reliable Internet connectivity and library. Since most libraries in Kenyan universities have access to current electronic academic resources through KLLISC, librarians should improve their skills and embrace emerging technologies to promote the use of ICT in information dissemination and management. The Internet speed should be improved to enable sharing of researches and scholarly materials globally. Research centres should be created by universities. Staff expertise should also be improved, for example, by employing more professors to nurture the young researchers and scholars and also through training. Universities should provide good environment for research. Laboratories should be in good conditions and researchers and scholars should be provided with computers to enable them to undertake research.

Universities should allocate more funds to research by also obtaining funds from other sources without relying on the two per cent from the government. Universities should collaborate with funding agencies, train the staff on how to source for funds, and engage in business to acquire more funds for research. If funds are increased, the universities will be able to pay for journal subscriptions, buy current and relevant books, improve Internet connectivity, acquire new ICT systems and establish Open Access (OA) repositories for information storage and dissemination.

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SECTION 6:  

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TECHNOLOGY  
AND  
INFORMATION  
ETHICS  

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# Cyber-Ethics and Behavioural Theories: A Literature Review

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## Abstract

*This chapter reviews extant literature on selected cyber ethical behaviour theories, specifically the Theory of Planned Behaviour as the theoretical foundation for investigating cyber ethical behaviour. It highlights the strength and weakness of the most salient cyber ethical theories and broadens awareness of literature and the peculiar pattern in which the theory of planned behaviour has been employed in previous research. Qualitative analysis was adopted for this research. The findings show that the reviewed cyber ethical theories; namely Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) were relevant in describing cyber ethical behaviour in various settings. It provides different but complimentary views on the extent to which TPB is applied in different cyber technology ethics studies. It also shows that scholars in Africa are contributing, although sparsely, to the field of cyber ethical research and need to do more to fill the gap in literature from Africa on the subject. The TPB may be an effective framework to identify and understand cyber ethical behaviour thereby enabling the development of tailored strategies targeting unethical cyber technology use. The findings give insight into empirical evidence and studies related to cyber technology violations and crimes and may be useful in guiding institutional management in tracking cyber technology user behaviour. This chapter can spur further debate and create a vignette of cyber ethical behaviour in Africa from a theoretical perspective.*

**Keywords:** *Theory of Reasoned Action, Theory of Planned Behaviour, Cyber-ethics, Cybertechnology, Cyber behaviour, Cybercrime.*

## 1 Introduction and Background

The rise and proliferation of cyber technologies, the profound influence the Internet has had on human behaviour and the immense traffic in cyberspace in recent times, have led to a complex new environment with highly controversial ethical, social and legal issues arising. In this regard the degree of empirical interest generated in Cyber-ethics has been routinely reinforced by the increased misuse of cyberspace in recent years (Tavani, 2013).

Unfortunately, owing to the poor economic conditions of many countries and the periodic global recession, many unemployed users of this technology have been motivated to access skill sets that enable them to use the Internet unethically to their advantage and for private gain or pleasure (Xu, Hu and Zhang, 2013). The need to understand the moral dilemma posed by misbehaving users in cyberspace and the need to address this anomaly motivated the creation of the field of Cyber-ethics in the early 1980s with empirical studies that helped to define the field (Johnson, 1985; Jamil, Shah and Tariq, 2013; Tavani, 2013).

Cyber-ethics is a dynamic field of study that identifies ethical issues in the use of cyber technology and the corresponding moral, legal and social implications; and the evaluation of the emergent societal policies and laws from its impact on society (Tavani, 2013; Spinello, 2012) The phenomenon of Cyber-ethics is still at an infant stage in Africa. Few studies have been conducted to explore Cyber-ethics and the behaviour of users of cyber technology in Africa.

Studies have related Cyber-ethics to a range of attitudes and behaviour associated with cyber practices such as cybercrime, software piracy, online porn, non-authorised surveillance, identity theft, privacy violation, hacking/carding, right/left online extremism, spamming, plagiarism and copyright infringement, fraudulent online banking, cyber-squatting and cyber stalking, spoofing, phishing, flaming and trolling, and the writing and dissemination of viruses, among others (Schultz, 2005; Quigley, 2007; Tavani, 2013).

The reasons why cyber technology users engage in these unethical practices are multifaceted. Some arguments that cyber technology ethicists generally associate with the unethical use of the Internet or cyberspace include the lack of awareness of ethical guidelines regarding the proper use of cyberspace; a tendency among users to focus solely on the benefits of the legal and illegal use of cyberspace (Argandona, 2012); and the increased dependence on cyberspace (Warkentin, and Willison 2009). Others believe that the gap between personal and institutional rights, the ethical neutrality of cyberspace, and notions such as the perceived lack of victims, situational factors, personal factors and anonymity (Williams, Nicholas and Rowland, 2010) are other reasons that can be attributed to unethical engagement in cyberspace. Sargolzaei and Nikbakht (2017) argue that ignorance and deliberate spite have contributed significantly to the increased violation of Cyber-ethics among users. Thus, the increase in the unethical use of cyberspace can be said to be due to the absence of regulations guiding the use of cyber technology which creates the perception that all behaviour is allowed in the context of cyber technology use.



Various studies have examined factors influencing Cyber-ethics behaviour. These have identified common denominators the awareness of Cyber-ethics, attitudes towards Cyber-ethics, unpublicised policies, and demographic factors (Alleyne, Soleyn and Harris, 2015; Martz and Shepherd, 2007; Thomas and Ahyick, 2010). Generally, the results from these studies revealed that cyber users did not regard their unethical use of cyber technology and digital piracy as a violation. Nwosu, Adebawojo and Ifeoma (2017), Odo and Odo (2015) and Mutula (2013) determined that unethical behaviour is common but has not been thoroughly studied by researchers in Africa.

The study on which this Chapter is anchored examined the extent to which theories of Cyber-ethics behaviour like the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) successfully explain unethical behaviour in cyberspace. Thus, as an initiative to explore Cyber-ethics misuse behaviour, this chapter examines and discusses theories relevant to predicting and explaining actual behaviour and behavioural intentions within the context of cyber behaviour. The first section of this review summarises various Cyber-ethics behavioural theories and dovetails into the two major theories that have been adopted in determining or predicting users' behaviour in the context of cyber technology and cyberspace. It also examines the characteristics of the TRA and TPB. The review concludes by asserting the application and implications of TPB in Cyber-ethics studies.

## 2 Cyber-ethics and Behavioural Theories

Different theories and models exist in literature regarding the field of Cyber-ethics but only a few of them are being used in publications by researchers and authors. Theories or models that are often used in a field of study shape and inform the scope of practice and equally determine the socialisation and training of its experts and practitioners (Schepers, Hagenzieker, Methorst, Van Wee and Wegman 2014; Glanz, 2010).

Different socio-psychological theories exist in literature regarding Cyber-ethics and behaviour. They are grouped under ethical decision theory or model. The theories include:

- Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975);
- Theory of Planned Behaviour (TPB) (Ajzen, 1985);
- The Technology Acceptance Model (TAM) (Davis, 1989);
- Model of PC Utilisation (MPCU) (Thompson *et al.*, 1991);
- Social Cognitive Theory (SCT) (Bandura, 1986);
- Moral Intensity Model (Jones, 1991);
- General Theory of Marketing Ethics (Hunt and Vitell, 2006);
- Self-Control General Theory of Crime (Gottfredson and Hirschi, 1990).

All these social psychology models and theories are classified as behavioural intention models that are adopted in information, cyber technology and Cyber-ethics-related studies. The models and theories listed above focus on behavioural intent as an important determinant of an individual's behaviour in cyberspace. The diversity and dynamic nature of these theories have made them applicable in different contexts and study phenomena in research. The TRA and the TPB are, however, the focus of this chapter because these models explain why users act in the way they with regard to cyber technology.

## 3 Methodology

This study leading to this chapter carried out a review of extant literature on Cyber-ethics and behavioural theories. The review was restricted to empirical studies published between 2007 and 2017 generally on the related fields and models. Electronic databases such as Web of Science, SCOPUS, Google Scholar, IEEE, Ebsco Host and Sabinet e-Publication were searched to determine the number of articles that have used any of the identified socio-psychology models or theories. The searches were conducted using established procedures set out in literature (Randolph, 2009). The justification for searching these specific databases was based on Abayomi, Neil, and Thokozani, (2016), assertion that the electronic databases in a study must contain many potentially relevant papers, reports and items of grey literature that are peer reviewed. The study also adopted the structured keyword search and relevant peer reviewed articles alongside matching criteria on the study of Cyber-ethics and various theories and models highlighted in Figure 1. Other search combinations were applied to retrieve relevant literature from the electronic database, including: Theory of Planned Behaviour and Cyber-ethics, Theory of Planned Behaviour and Computer Ethics, Theory of Planned Behaviour and Internet Ethics and Cyber Technology Behaviour and Theory of Reasoned Action, among others. Studies were judged for inclusion in this review based on their titles, abstracts, keywords, being full text and being published in the English language.

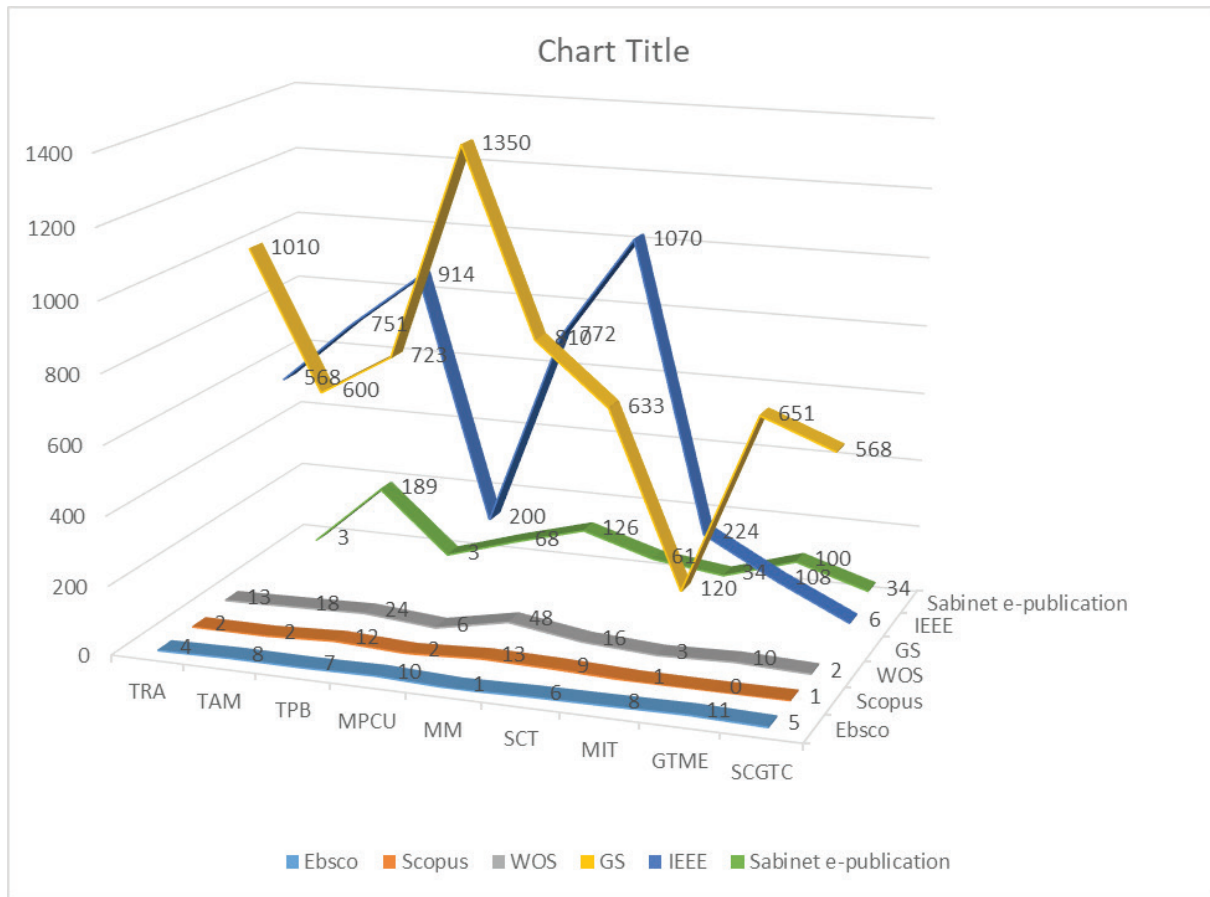


Figure 1: Publications on Cyber-ethics behaviour theories

The results in Figure 1 depict a small number of publications in the Sabinet e-Publication on the phenomenon of Cyber-ethics and the Theory of Planned Behaviour (6 for TRA and TPB) while the Web of Science featured 24 articles, Scopus had 12 publications, and Ebsco Host had 7 articles on the topic. The highest number of publications based on the search terms was recorded in the IEEE database (914) followed by Google Scholar (723). It was noted that there were a few overlaps among the publications in the Web of Science, Scopus and Ebsco Host.

### 4 The Theories

Theoretical approaches to Cyber-ethics studies that have relied on models of behavioural change seek to identify precursors and patterns of Cyber-ethics-related behaviour such as the ethical and unethical use of cyber technology (Coreil, 2010). While some factors are theorised as directly influencing behaviour, others influence behaviour as mediating variables.

#### 4.1 Theory of Reasoned Action (TRA)

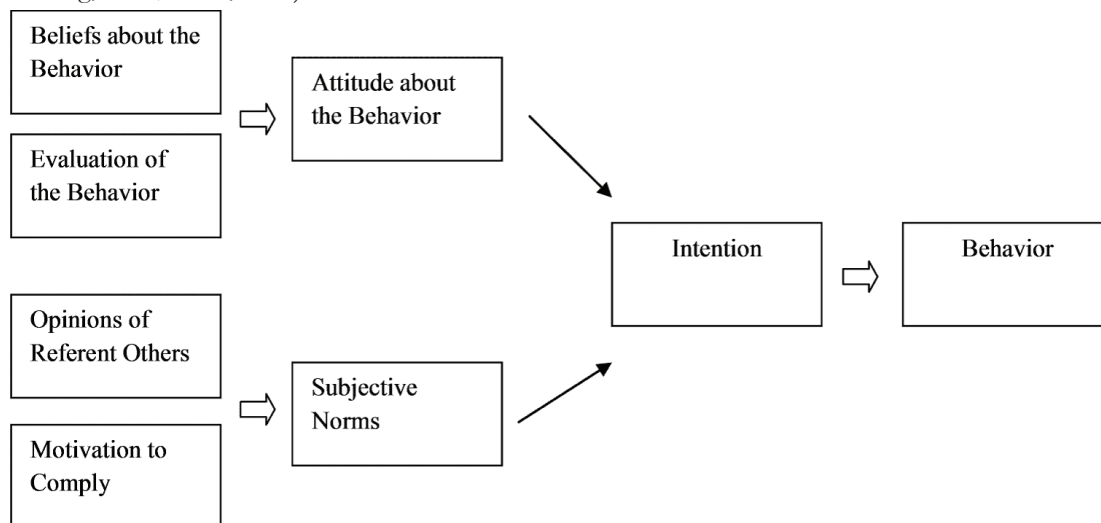
Fishbein and Ajzen (1975) propounded the Theory of Reasoned Action (TRA) which was later refined by Ajzen and Fishbein (1980). According to the theory, an individual’s behaviour is determined by his/her intention to engage in a particular action, with both behaviour and intention being collectively influenced by the individual’s attitude and subjective norms. The TRA is premised on the argument that human beings are rational decision makers who consistently measure and evaluate their beliefs regarding behaviour before developing their attitudes towards that behaviour.

The TRA states that beliefs influence attitudes while attitudes are considered to be the basis of behaviour. In other words, negative or positive attitudes influence the intention of performing or not performing an activity. According to Ajzen and Fishbein (1980), individuals are usually quite rational and systematic in the use of information available to them. As such, people consider the implications of their actual behaviour before they decide to engage or not to engage in a given behaviour.

A central factor in the TRA is the individual’s intention to act in a certain way. Behavioural intent focuses on the impulse to act in a certain way and indicates the strength that a person is eager to put into the act, or how willing they are to act. Ajzen (1991:181) stated it thus, “The stronger the intention to engage in behaviour, the more likely should be its performance”. He noted that the extent of volitional control exercised by the individual determines whether his or her behavioural intent will translate into behaviour.

Fishbein and Ajzen (1975: 216) perceive attitude as “an individual’s positive or negative feelings (evaluative affect) about performing the target behaviour”. Individuals develop attitudes towards behaviour by evaluating their beliefs regarding that behaviour. Fishbein and Ajzen (1975) explain that for each attitude towards behaviour, individuals must multiply the strength of their belief by the outcome evaluation and then add up the entire set of resulting weights to form the attitude. The relevance of this theory in cyberspace behaviour is that when cyber technology users believe that the tools are an invention that can be used anyhow with no tangible repercussions, they will be motivated to engage in unethical practices when using them. Attitude concept is the contiguous match to ethical judgment in the TRA (Cronan and Al-Rafee, 2008). Johnson (2017) also discovered that attitude towards the behaviour using linear regression indicates a significant effect on the intention of users of cyber technology to follow information security policy. In a related study, Jafarkarimi, Saadatdoost, Sim and Hee (2016) noted the significant influence of attitude on the relation between prediction and behavioural intention in identifying the influential factors in social networking sites.

Another crucial construct in the TRA is subjective norms. Fishbein and Ajzen (1975: 302) describe the subjective norm as “the person’s perception that most people who are important to him think he should or should not perform the behaviour in question”. According to Fishbein and Ajzen (1975), individuals multiply the normative belief strength by the motivation to comply with that referent and sum up the entire set of resulting weights to determine their behavioural intention. The TRA considers behavioural intention rather than attitude as the main precursor of actual behaviour. A person’s specific action is determined by the attitude of the person towards the object, intention or feeling (either negative or positive). It is a cognitive thing, where you reason out an attitude before you act; one’s attitude towards behaviour is caused by one’s beliefs and the repercussion of performing the behaviour. In this case, when users of cyberspace discover that other people are engaged in unethical practices online, they have a higher tendency to also engage in such unethical behaviours. Cho, Chung and Filippova (2015;23) state that, “As the degree of communication increases, people become more reliant on outside social norms”. Research on unethical cyber behaviour has uncovered that the news media’s portrayals of cybercrimes may increase the level of occurrence of these types of behaviour in society, and given the continuous portrayals in the media, the individual may believe and perceive that many people have positive attitudes towards such unethical cyber practices (Cho *et al.*, 2015). Studies have shown that subjective norms are a significant determinant of some Cyber-ethics misuse behaviour and the intention to engage in this behaviour (Phau and Ng, 2010; Yoon, 2011).



**Figure 2: Theory of Reasoned Action Model**

The research model in Figure 2 indicates that users’ beliefs and evaluation of misuse cyber behaviour will influence their attitude toward Cyber-ethics, which, along with normative beliefs, (opinion of referent others and motivation to comply) will influence Cyber-ethics intention and eventual behaviour.

The major criticism of the TRA is that it strongly describes human behaviour as being cognitive without taking into consideration the affective nature of humans which also plays a role in their decision-making processes. The TRA also addresses human behaviour as an individual issue while ignoring the collective context in which individuals perform (Dutta-Bergman, 2005). It should be noted that proponents of the TRA assert that the subjective norm explains the role of significant others in the environment in an individual’s decision-making; human decision making is still driven by an individual-motive orientation, thus keeping the locus of decision-making with the individual. Dutta-Bergman (2005), however, has disagreed and argued that all individual decision making is influenced by the collective society, which then is a weakness of the TRA. However, the TRA and TPB are some of the most commonly adopted attitude theories in cyber technology studies due to their flexibility and adaptability to a variety of behaviours (Miller, 2017).

#### 4.2 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) was propounded by Ajzen (1985, 1991) as an improvement of the Theory of Reasoned Action (Ajzen and Fishbein, 1980). The TRA posits that attitude and subjective norms are the causes of individual intentions to carry out a given behaviour. In other words, the intention to engage in a behaviour correlates with actual behaviour. This theory has provided a strong support for determining volitional behaviour and has been used by researchers in various fields of human endeavour to explain the social cognitive processes of human behavioural decision making.

When Perceived Behavioural Control (PBC) was added to TRA, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) emerged. TPB affirms that behavioural intention is the strongest determinant of actual behaviour while the direct precursors of behavioural intention are the individual's attitudes, subjective norms, and perceived behavioural control (PBC) (Ajzen, 1991). The TPB and TRA have been used extensively in research in a variety of social and human behavioural studies, particularly those associated with the ethical use of cyber technology (Goles, *et al.* 2008; Taylor and Todd, 1995; Jamil, Shah and Tariq, 2013), digital piracy (Yoon, 2011), unethical behaviour (Chatterjee, Sarker and Valacich, 2015), perceptions of cyber technology and ethics (Chiang and Lee, 2011), and academic dishonesty (Baase, 2013).

In practice, researchers have generally considered the TPB as a sound choice for explaining behaviour where ethical considerations are an issue. Some have sought to add variables or constructs to the TPB, for instance, ethical predispositions (Hikwa and Maisiri, 2013), anticipated guilt (Wang and McClung, 2012), moral obligation and aspects of law (Wu, Chen, Chen and Cheng, 2014), deterrence effects (Quinn, 2013), and the synthesis of the TPB with other models (Wu, Chen, Chen and Cheng, 2014).

Intention is a crucial predictor of behaviour because cyber-ethical actions are expressed haphazardly or in a premeditated manner (Ajzen, 1985). Individual willingness to act in a certain way is strengthened by the degree of control the individual has over the performance of the target behaviour (Ajzen, 2005). In other words, if the individual holds a strong intention to carry out the target behaviour, then the likelihood of the action being carried out is increased. The model, in categorical terms, argues that behavioural intent is caused by three factors: the attitude toward the behaviour, subjective norms, and perceived behavioural control.

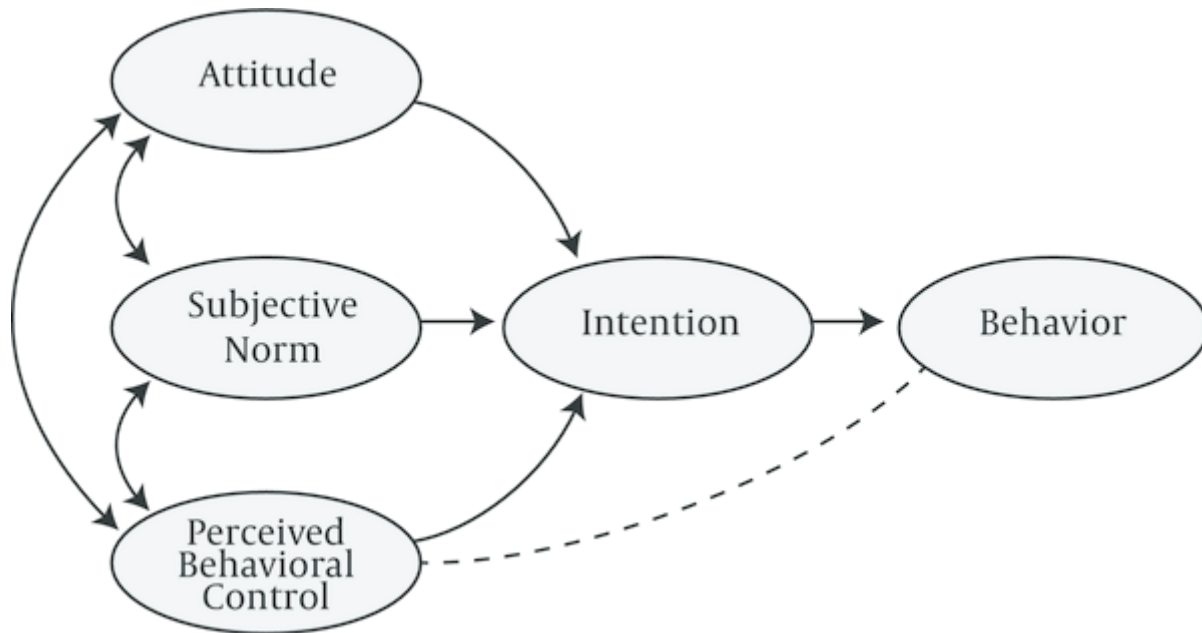
Individual attitude is different from a belief because it shows some affinity towards the object of attention. Consequently, a person's attitude towards Cyber-ethics misuse behaviour may be negative or positive to various degrees. Subjective norms simply mean the perceptions people have regarding how their reference group or significant others think or feel about the action they intend to express. The third and final determinant of intentional behaviour is the perceived behavioural control or feeling of competence and ability to act out the behaviour of interest (Ajzen, 2005).

Perceived behavioural control is made up of two main factors, the first being internal control, which refers to the extent to which individuals see themselves as suitably competent, self-controlled, and able to perform some action. The second is external control, which refers to the extent to which individuals feel that other factors, such as the cooperation of colleagues, resources, or time constraints, could prevent or facilitate the behaviour (Kraft, Rise, Sutton and Roysamb, 2005). PBC is therefore based on:

- Control beliefs: the motivation to behave in a particular manner, influenced by the perception of how difficult the behaviour is likely to be.
- Perceived power: the motivation to behave in a particular manner, influenced by the perception of how successful that behaviour is likely to be.

PBC is critical in explaining people's behaviour, especially when they do not have complete control due to situational factors (Ajzen, 2005).

Cyber users will tend to engage in good or bad Cyber-ethics behaviour when they see it in a positive light; when they see other people, more especially their significant others, doing it; and when they believe that they have the resources and opportunities to do so.



**Figure 3: Theory of Planned Behaviour Model**

Source: Soorgi, Miri and Sharifzadeh (2015)

The TPB, as applied in empirical studies, is very extensive. Its citation, as reported by Ajzen (2011), is very high, growing rapidly from 22 citations in 1985 to 4550 in 2010. The theory is also supported by extensive studies that have used it and a compendium of meta-analytical studies that synthesise the evidence by consistently supporting the utility of the theory across different contexts.

In this study, it is assumed that attitude represents the positive or negative evaluation of students' engagement in cyber behaviour and the ethical use of cyber technology. For instance, students who hold a positive view of unethical cyber behaviour are likely to engage in digital piracy and the unethical use of cyber technology. In contrast, students who hold positive and favourable evaluations of Cyber-ethics misuse behaviour are not likely to engage in unethical cyber behaviour and may view negative vices in cyberspace as an unfavourable option.

Normative beliefs or subjective norms reflect perceived social pressure by referent or significant others on the individual student to engage in the behaviour (Ajzen, 2006). This reflects the perceptions that individuals have about the beliefs of others (such as peers, faculty or family members), who they consider to be important (Harding *et al*, 2007). Specifically, in this context, it is the perception that a student has about whether others will approve or disapprove of his or her behaviour. For instance, using the social norms theory, Berkowitz and Bier (2005) showed that peers had an influence on young adults' involvement in unethical behaviour. Similarly, the social learning theory (Bandura, 1986) posits that humans learn by observing their peers. In general, the theory suggests that if a student perceives that social pressure and social norms encourage unethical cyber behaviour, his or her intention to engage in digital piracy and unethical use of cyber technology will be stronger.

Behaviour is believed to be determined by intention and PBC. Strong behavioural control is characterised by a belief in one's ability to successfully accomplish a desired task (such as digital piracy and the unethical use of cyber technology) (Ajzen, 2006). Based on this, students who are highly motivated by unethical behaviour are more likely to engage in digital piracy. PBC is based on students' past experiences with the cyber behaviour in question and their perceptions of their ability to control factors in their environment that either facilitate or inhibit their ability to engage in unethical cyber behaviour given the available cyber resources (computers, laptop, tablet, smartphone and internet connectivity, time) and opportunities. In general terms, the greater the perceived control of the behaviour and the more favourable a student's attitudes are, the stronger his or her perceptions are that the norms support cyber behaviour violations; and the stronger his or her perceptions are that he or she can control the outcome of their cyber behaviour, the more likely he or she will be to engage in digital piracy and the unethical use of cyber technology.

The foregoing is a discussion of three factors: attitude towards behaviour, subjective norms related to cyber behaviour and ethical use of cyber technology, and perceived behavioural control, which all work together to influence students' intention to engage in cyber behaviour and the use of cyber technology. In the Theory of Planned Behaviour, intention is the proximal predictor or antecedent of behaviour (Ajzen, 1991). Ajzen (2006: 102) states that: "Given a sufficient degree of actual control over the behaviour, people are expected to carry out intentions when the opportunity arises". Therefore, when benefits are perceived to outweigh the cost of performing the action (that is, when attitude and social

norms regarding unethical use are favourable and perceived behavioural control is high), unethical or Cyber-ethics misuse behaviour will likely occur.

## 5 Implications

One of the major strengths of the TPB is that it can be applied easily to a variety of behaviours in different contextual milieus, such as cyber technology, marketing, human resource management, health, business communication, politics, and education, to name a few. It is also easy to comprehend, hence its wide adoption by researchers. The theory predicts the intention to perform different kinds of behaviours with high accuracy (Ajzen, 2011). The TPB is very popular and is widely accepted by researchers because of the amount of variance that it accounts for in behavioural intention and behaviour. Armitage and Conner (2001) applied the theory in a review of 185 studies and found that it accounted for an average of 27% variance in actual behaviour, and 39 per cent in behavioural intention.

Its simplicity is another strength of the TPB that has lent it wide empirical support as a model of choice for predicting intentional behaviour (Hasbullah, Mahajar and Salleh, 2014). It should be noted that the simplicity of a theory is a quality associated with strength and the utility of theories (Collins, 2007). As such TPB is one of the most relevant theories for studying causes of Cyber-ethics misuse behaviour because its high ability to predict intention and behaviour. The constructs of the theory are well defined, and the theory can be flexible when applied in non-Western countries or environments.

One of the weaknesses of the TPB is that it is more effective in some situations than in others. Studies by Conner and Armitage (1998) and Sniehotta *et al.* (2014) showed that TPB showed a lesser ability to predict behaviour when applied in longitudinal studies rather than correlational studies. The same weakness was revealed when TPB was applied in studies in which the population was not university students and when outcome measures were taken objectively rather than as a self-report.

Others have criticised the theory of planned behaviour for lack of guidance to promote changes in behaviour. TPB is more effective in determining patterns and measuring and predicting behaviour but does not specify the means or methods that could be employed in order to change behaviour (Hobbis and Sutton, 2005).

Other authors assert that the experimental tests of the theory are few, and these few did not support the theory's assumption (Vagias, Powell, Moore and Wright, 2014). The theory has been criticised for its exclusive focus on rational reasoning, excluding unconscious influences on behaviour (Webb and Sheeran, 2006) and the role of emotions beyond anticipated affective outcomes (Teel, Dietsch and Manfreda, 2015). Likewise, the static explanatory nature of the TPB does not help in the understanding of the evidenced effects of behaviour on cognition and future behaviour (Pradhananga, Davenport and Olson, 2015).

## 6 Conclusion and Recommendations

Studies over the past two decades have provided important information on TRA and TPB as frameworks in explaining and predicting Cyber-ethics misuse behaviour, particularly the determinant factors of human behaviour in cyber technology. Although the TRA and TPB have often been criticised, they have been consistently adopted as choice theories in studies of users' intentions with respect to technology and cyber ethical violations by users because their strengths far outweigh their weaknesses. It is worth noting that the conceptual framework of intention-based models can be described as follows: intention to use and actual use are impacted by people's reaction to using cyber technology; and intention to use influences behaviour while actual use, in turn, influences how people will react to cyber technology in the future (Venkatesh *et al.*, 2003). Researchers have pointed out that the TPB that built on the TRA, are well established intention models grounded in a large body of research (Riemenschneider, Harrison and Mykytyn, 2003).

This has been the reason for the popularity of these theories in behavioural research. Furthermore, the TPB has served as the principal theoretical model for a wide variety of experimental information ethics studies that adopted quantitative correlational methods to validate their extended TPB models (Al-Nuaimi, Al-Aufi and Bouazza, 2017).

The TPB, which is the improved version of the TRA, has been a significant theoretical foundation in behavioural research for many years, and its vital role is likely to continue given its comprehensive inclusion of behavioural components. The immense body of research on TPB provides opportunities for researchers to improve the theory. In acknowledging the dynamic nature of TPB, Cyber-ethics' researchers should investigate the addition of new precursors and salient extant concepts to better understand cyber behaviour and behavioural intention. The researcher calls on scholars in the field of human behaviour in general, and Cyber-ethics' studies, to apply the TRA and TPB with a more diversified population and in a variety of contexts to test the integrity of such theories in predicting user behaviour in such situations.

Furthermore, there is a need for more African scholars to apply the theoretical approach in conducting studies in the field of Cyber-ethics. The TRA and TPB will then serve as established theories in this endeavour. Experimental tests should also be conducted by interested researchers to confirm the practical applicability of the TRA and TPB. This will

contribute to knowledge significantly and might go a long way in establishing the TRA and TPB as saliently practical theories in all fields related to human behaviour. Issues of relevant measurements of attitude, behavioural intention, subjective norms and perceived behavioural control must also be seriously addressed by researchers to make the TRA and TPB more cogently applicable to behaviour in the field of Cyber-ethics.

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# The Influence of Infobesity on the Information Seeking Behaviour of Undergraduate Students in Tangaza University College

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## Abstract

*Infobesity is the condition of individuals who exhibit difficulty in understanding issues and effectively making decisions because they have too much information about that issue. Persons who suffer from infobesity exhibit queer information seeking behaviour characterised by skimming of just a few pages of information and then bouncing off never to return. Most of the undergraduate university students are netizens who are intensive users of emerging technologies to create, collect or share information. Available evidence indicates that although netizens wallow in vast volumes of information, they hardly benefit from the information due to the consequences of infobesity. This chapter investigates the characteristics and prevalence of infobesity amongst university students in Tangaza University College as well as its impact on their information seeking behaviour. The study leading to this chapter applied exploratory research design. Data was collected from undergraduate university students through online questionnaires using Google Forms. The collected data was analysed thematically and presented using descriptive statistics. The findings confirm the fact that infobesity is real amongst undergraduate students in Tangaza University College. It is evident that infobesity is a consequence of vast amounts of information they are exposed to and the ease with which they are able to create, use or share information.*

**Keywords:** *Infobesity, Information overload, Undergraduate students, Tangaza University College, Kenya.*

## 1 Introduction

Maxwell (2014) explains that people presently operate in a world in which information is dominant. He further explains that access to information has been enhanced through technology to the extent that no one needs to leave their comfort spaces to look for or find information. Virtually anyone can access any information they need with just a few presses of keys or clicks on a mouse. As more and more information becomes available, the craving for more information is increasing thereby leading to infobesity. According to Brophy and Bawden (2005), the term infobesity was coined by James Morris, the Dean of the School of Computer Science at Carnegie Mellon University blending information with obesity. Scardamaglia (2013) states that the term is associated with information overload which refers to the sensory overload caused by an over-abundance of and over-indulgence on information. Thus, the term infobesity draws a parallel between excessive consumption of information and the consequences of unhealthy dietary practices of over-indulging in food. In this analogy, abundant, cheap but low quality information is compared to the less nutritious fast foods which are easily accessible but ultimately harmful to the health of the consumers.

Bell (2004) argues that infobesity is a term used to denote a situation of personal information overload, particularly if caused by a poor information “diet” akin to feasting on fast food. Kwanya (2016) explains that infobesity is a condition caused by an uncontrolled feasting on the vast volumes of data that is currently available in the infosphere as a consequence of the big data syndrome. According to Eppler and Mengis (2004), infobesity occurs when information received becomes a hindrance rather than a help, even though the information may be potentially useful. Generally, a lot of information is currently produced from all corners of the world especially from interactive communication media platforms such as email, WhatsApp, Facebook and YouTube among others.

There is consensus that infobesity is a consequence of the growing ubiquity of big data. Bohn and Short (2012) reported that as early as 2008, Americans consumed 1.3 trillion hours of information outside work daily translating to about 12 hours per day per person. Sturmer and Roy (2015), citing Jocelyn Brewer, estimated that people averagely consume the equivalent of the content of 174 newspapers every day from the mass media, social media and other information sources. Lewis (2018) argues that infobese persons consume information they really do not need in their circumstances. She opines that infobese people ironically concentrate on meaningless fluff for the purposes of instant entertainment. She further explains that the situation is getting worse each day with the presence of click bait headlines leading Internet users to visit sites of less informational value in cyberspace. The situation is further exacerbated by the fact that information is increasingly becoming cheap due to efficient production and consumption systems.

Maxwell (2014) argues that infobesity is currently an epidemic because of the readily-available sources and channels of

information making it easier for people to become infobese. Therefore, it is increasingly becoming practically possible for any web user to succumb to occasional or frequent bouts of infobesity. Bawden and Robinson (2009) observed that infobesity may be a mechanism through which users attempt to cope with information overload. The more information they come across, the more they consume leading to infobesity. Therefore, they keep searching for and collecting information endlessly as a means of ensuring that they keep abreast of developments in their diversified areas of interest. Infobesity can be caused by a rapidly increasing rate of new information being produced; the ease of duplication and transmission of data across the Internet; an increase in the available channels of incoming information; ever-increasing amounts of historical information to dig through; contradictions and inaccuracies in available information; a low signal-to-noise ratio; as well as lack of a method for comparing and processing different kinds of information. Therefore, infobesity manifests itself in many ways. Table 1 presents the symptoms of infobesity as suggested by Kwanya (2016).

Table 1: Symptoms of infobesity

S/N	Infobesity issue	Symptom
1	Information consumption	A compelling urge to consume available information without necessarily paying meaningful attention to it thereby doing more viewing rather than reading.
2	Fear of missing out	A deep feeling of an obligation to constantly stay connected to myriad sources and channels of information because of the fear of missing out (FOMO).
3	Tolerance levels	Low tolerance to delays in accessing and consuming information.
4	Information universe	A narrow information universe comprising of echo chambers confined by the Internet and associated technologies.
5	Information format	Preference for synthesised and ready-to-use information rather than raw data.
6	Information mind-set	A hyper-text mind-set conceiving issues in terms of hyperlinks, touch screens and clicks.
7	Information analysis	Perception of non-existent information patterns due to inability to correctly analyse and interpret available information leading to a condition known as apophenia.
8	Know-it-all attitude	Intoxication with information (infoxication) leading to a false sense of knowledge of everything.
9	Attention span	Reduced attention to information.
10	Physical/psychological condition	Physical or psychological conditions such as fatigue, stress, decision paralysis, distraction, sluggishness, irritability and low productivity.

Source: Kwanya (2016)

Other symptoms of infobesity include; never turning off digital devices even when they are not in use and preferring to keep them close by, using information without verifying it as long as it is easily accessible, an urge to multi-task leading to low productivity, and hurry syndrome in which people always perform tasks in a hurry so as to keep pace with time. Infobesity can also exhibit symptoms like habituation or over-stimulation of the brain making it to shut down into an illusory state; a plugged-in compulsion in which people feel a strong urge to check and attend to messages as a means of keeping in touch, inability to concentrate, inability to be creative because of the vast amounts of information to process leaving little time for reflection, burnout and procrastination leading to time wastage, and setting lower quality goals by accepting good-enough solutions rather than perfect ones, a situation referred to as satisficing.

Infobesity is evidence making the old adage “too much of something (good) is dangerous” seem true. Infobesity makes information users to suffer more from information than benefit from it. Ruff (2004) explains that excess information actually becomes noise which is unusable for decision making or performance of tasks. Infobesity is a facet of informational noise and has several effects on the information seekers which are mostly negative. One of the major implications of infobesity for information seekers is the fact that they have to face a whole range of challenges to locate the required information which results into information fatigue and associated anxieties. Some of the challenges include; less knowledge despite the quantum of what is known (which is insignificant to the available information), too much information can lead to brain freeze or fatigue and anxiety which can lead to information avoidance hence the loss of valuable information by the user or information seeker, information addictions due to the urge of getting more information leading to over-dependence on sources like the Internet, shorter attention spans due to too much information being available, ineffective long-range thinking resulting from the availability of virtual information in large quantities for users to select from and from varied information sources, information contamination which could lead to wrong and slow decision making thereby causing serious mistakes and failures, thinking of the past and immediate future without quite much attention of the present due to the presence of vast amounts of information.

Maxwell (2014) argues that people’s capacity to absorb information is not limitless. Therefore, infobesity leads to an information saturation level which may be described as content shock. This view is anchored on the cognitive-load theory which postulates that the human brain has limits on the information it can process effectively. Kwanya (2016) explains that persons who suffer from infobesity exhibit strange information-seeking behaviour characterised by the skimming of just a few pages of information and then bouncing off, never to return. He explains further that this behaviour can be perceived as a form of promiscuity in which people suffering from infobesity exhibit acute infolust in

cyberspace.

Whereas Kwanya (2016) suggests that people can deal with infobesity by going on a data diet, Sturmer and Roy (2015) recommend digital detox. Other strategies of preventing or coping with the effects of infobesity include; using content filtration and aggregation solutions, time planning, prioritising and task scheduling, strengthening information literacy skills, as well as reducing reliance on technology by using manual approaches and tools as much as possible.

## 2 Undergraduate Students as Netizens

Infobesity is a condition most netizens experience. The term netizen is used to refer to active, habitual users of the Internet. Such people are so committed to communities on the Internet to the extent that they can be considered citizens of the Internet (Hauben, 1995). Thompson (2014) avers that the term was adopted in the mid-1990s to describe those who “inhabit” the Internet. Michael Hauben, a pioneer Internet advocate and author, is credited with coining the word in 1995 (Horvath, 2001). He argued that although netizens may be citizens of and living in specific countries, they interact and create online communities with other people using the Internet. The Internet and associated technologies have broken down spatial barriers, thereby, eliminating restrictions to cross-border interactions.

Netizens use digital networks such as the Internet to find information, communicate and express ideas. Therefore, they spend time to create and share content, respond to queries, as well as discuss and debate pertinent issues with other people online. Netizens are not drawn to the Internet to make profit. Conversely, they devote their time and energy to make the Internet useful and “habitable”. Netizens have a strong desire to express themselves freely, be it in person or on any social media. When they have an opinion, they let it be known. They exhibit a need to be constantly connected to the web and demonstrate an intense desire to understand the digital environment, how it works and how to make it better. Netizens have shifted to digital forms of communication like texting, video calling and chatting as opposed to physical interactions or paper-based communication. Most netizens were born and raised with the Internet. Frand (2000) suggests that a large population of netizens comprise of the “Google” generation.

Current undergraduate students in Kenya fit this description because they are typically in their late teens or early twenties. While the age-brackets may vary globally, the general trends are similar. According to Frand (2000) most students (except mature students) entering colleges and universities then were younger than the microcomputer and even younger now; are more comfortable working on a keyboard than writing in a spiral notebook; and are happier reading from a computer screen than from paper in their hands. He adds that they prefer being connected to and remaining in touch with friends and family at any time and from any place. Oblinger and Hagner (2005) observe that the digital-age students express a need to move between varied forms of communication and are easily bored with traditional learning methods.

Currently, the Internet and associated technologies have influenced many aspects of university students’ social life, ideas and behaviour. To netizen students, the Internet provides a virtual school, virtual library, virtual mall, and virtual everything. The heavy reliance on the Internet as the platform for socio-economic activities by netizen students have been facilitated by the availability of affordable smart phones and bundles for Internet connectivity. Similarly, information technology skills amongst netizen students have advanced due to the emergence of enhanced user-friendly interfaces on hardware and software of most technologies. Given that they have had access to the Internet, computers and smart phones from an early age, they are familiar with the multimedia environment, and prefer figuring out things by themselves. Netizen students have very little regard for manual and traditional ways of doing research such as consulting the library catalogue. The world-wide web is their information universe. They are dependent on search engines such as Google and rely on audios to incorporate their work and graphic cues to interpret relevant pages.

The netizens’ knowledge universe revolves around the Internet and not libraries or information centres (Kwanya *et al.*, 2014). This information behaviour has emerged from the fact that they were raised in the era of ready access to information through networked technologies. These net-savvy students are assertive information seekers and have a preference for immediacy, immediate gratification, answers and information. They do not find the resources provided in the library intuitive and prefer to use search engines such as Google and Yahoo! instead. They are more competent with technology and find their peers as more credible information sources than authority figures and books. Due to the prevalence of plagiarism, netizen students are seen as the “cut and paste” generation. They think that everything is found on the web. They have access to the Internet and smart phones but lack the requisite knowledge to use digital information in ways appropriate to academics. Therefore, they cannot develop effective search strategies and end up wasting so much time on the Internet leaving very little time for evaluating information for authority and accuracy. The web offers them several search hits, making it difficult for them to assess the relevance of the materials presented. This results to them printing off pages with no more than a desultory glance at them.

Static information does not work for them; as they prefer interactive systems, viewing interactive media such as PowerPoint slides which enable them to get feedback instantly. The Internet is becoming a dominant infrastructure for knowledge and having grown up in the digital waves and cyber technologies, they have very high expectations of

information technologies. They prefer visual information such as video links over text.

### **3 Rationale of study**

As pointed out earlier, most of the undergraduate university students are netizens who are intensive users of emerging technologies to create, collect or share information. They wallow in vast volumes of information yet hardly benefit from the information due to the consequences of infobesity. In spite of this challenge, very little research has been done on the consequences of infobesity on the information seeking behaviour of young people. Williams and Rowlands (2007) asserted that research into how young people become competent in using the Internet and associated technologies as information systems is patchy.

A search on Google Scholar through Harzing's "Publish or Perish" software using "infobesity" and "Kenya" as keywords yielded five articles. After analysis, three of them were found to have just mentioned infobesity and Kenya in passing. The other two had relatively substantial consideration of infobesity. The first article by Muruli (2016) advocated for the use of call centres as a means of helping information users to cope with the consequences of infobesity, among other challenges. However, this study did not delve into the causes, symptoms or the consequences of infobesity. Furthermore, the study did not pay attention to the condition of undergraduate library users in the context of infobesity. The second study by Ogendi (2017) proposes the use of effective knowledge management strategies by librarians as a means of coping with infobesity. This study does not assess the prevalence of infobesity or its impact on library information usage.

It is evident from the foregoing that no meaningful study has been conducted to explore infobesity amongst undergraduate university students in Kenya. Recognising that infobesity is real among undergraduate students, as netizens, their capacity to make the best use of information services for their personal and academic endeavours is likely to be curtailed if the consequences of infobesity amongst them are not addressed. One of the best ways of addressing this challenge is by determining the nature of infobesity they exhibit as well as its impact on their information needs and seeking behaviour. This chapter investigates the characteristics and prevalence of infobesity amongst university students in Tangaza University College as well as its impact on their information seeking behaviour.

### **4 Methodology**

The study leading to this chapter was conducted using a cross-sectional survey design. According to Levin (2006), a cross-sectional study is conducted to ascertain the status of a phenomenon at a specific point in time. She adds that such a study can help find out the prevalence of an outcome of interest, for the population or subgroups within the population at a given point in time. A cross-sectional survey design was found suitable because it caters for issues that vary with time.

The population of the study comprised of 200 undergraduate students in session during the May-August 2018 trimester at Tangaza University College in Nairobi, Kenya. According to Gall *et al.* (2003) at least 30% of the total population is considered representative of a population. Thus, 30% of the accessible population is adequate to represent the perceptions of the population. Using this approach, the authors determined the sample size at 60 respondents. Data was collected using self-administered online questionnaires hosted on Google Forms. The specific respondents were selected through simple random sampling using their email addresses with the help of the university ICT office. The link to the questionnaire was sent to the email addresses of the selected respondents. The collected data was analysed and presented using descriptive statistics.

### **5 Findings and Discussions**

Of the 60 potential respondents identified, 46(76.7%) filled the questionnaires. The response shows that 22 (48%) of the respondents were female, while 24(52%) were male. This gender distribution of the respondents was statistically insignificant. The majority 21(46%) of the respondents were between 22 and 26 years of age. There were 10(22%) respondents aged between 27 and 31 years old, while a similar number was aged above 31 years. Also, 5(11%) of the respondents were aged between 17 and 21 years. This age distribution indicates that the majority of undergraduate students in Kenya are between 22 and 26 years. Those above this age bracket may have progressed through a diploma before joining undergraduate programmes. It is also possible that they are "fresh" students but did not join university immediately after completing their secondary school education.

Regarding the year of study, the majority 19(41%) of the respondents were fourth year students. They were followed by third years 10(22%), first years 8(17%) and second years 6(13%). Three respondents declined to indicate their year of study. The high response rate by fourth and third year students may be attributed to their maturity and interest in research. The low response rate by second years may be explained by the perception that students at this level are carefree and do not take issues seriously as they concretise their place in the university after completing their first year of study. Data analysed revealed that the majority (43) of the respondents were pursuing courses in education. There

was one response each for Computer and Biology, Leadership and Management, and Theology. This is not surprising because the majority of the students at Tangaza University College are pursuing programmes in Education.

### 5.1 Information universe

Most 16(35%) of the respondents described their information universe as being characterised by vast amounts of information as well as diverse formats of content. This was followed by interlinked information sources and resources at 11(24%). The other characteristics identified by the respondents were fast speed of information flow, prosumption (production and consumption of content), and unclear veracity (true and untrue context mixed together). These findings confirm that library users currently operate in an information universe of abundance. The situation is created through prosumption in which users produce and consume vast amounts of information. Hartzer (2018) estimates that in one minute, 973,000 people log into Facebook; 18 million text messages are sent; 4.3 million videos are viewed on YouTube; 375,000 apps are downloaded on the Google Play Store and the App Store; 174,000 people are scrolling through Instagram; while 481,000 tweets are sent. He also estimates that in one Internet-minute, 1.1 million swipes occur on Tinder; 187 million emails are sent; 936,073 views on Twitch; 67 voice-activated devices are shipped; 38 million voice mail messages are left; 25,000 GIFs are sent via Facebook Messenger; 2.4 Million Snaps are created on Snapchat; \$862,823 US dollars are spent online; 266,000 hours are watched on Netflix; and 3.7 million search queries are performed on Google. Although the veracity of these estimates is not confirmed, they paint an overall picture of an information universe which is dominated by vast amounts of interlinked information which is largely created, consumed and shared fast by the users through myriad communication channels facilitated by the Internet.

Most 18(39%) are excited about the information universe. 9(19%), however, are overwhelmed. The others are confused 6(13%), anxious 6(13%), fascinated 3(7%), fatigued 1(2%), fearful 1(2%), disappointed 1(2%), and frustrated 1(2%). The findings indicate that the majority 28(61%) of the respondents are generally unhappy or stressed about the prevailing information universe. The findings imply that most of the undergraduate library users are not in a position to make the best use of information resources and sources in the prevailing information universe. This calls for an intervention by librarians to devise ways of helping the library users to gain control over their information universe.

### 5.2 Prevalence of infobesity

The majority of the respondents, 29(63%) described themselves as experiencing infobesity. Some explained their experience as reported verbatim hereunder:

*"I source for a lot of material that I eventually get confused with which information is relevant for me."*

*"In the process of reading different sources of information, I sometimes get confused to know who is right and wrong since the same thing is explained differently by different people."*

*"There is too much information which is different therefore I do not know which to believe or accept."*

*"It takes me long when I have to sit and write on something, I have so much information that I do not know which is appropriate especially online."*

*"Too much information gets you confused and of course it affects the person's wellbeing."*

*"Over excitement sometimes leads me into a lot of complications that's difficult to handle."*

*"I get myself glued to the Internet in search of information and content given seems to be interesting so I can't tell which is which within the limited time I have."*

Therefore, most of the library users are largely overwhelmed by the volume of information available to the extent that they are not able to make the best use of it. Some also get lost in the sophisticated web of information sources not knowing what is right or wrong. Similarly, some get hooked by the easily available information that they keep accessing thereby wasting valuable time doing more searching than actual use.

The respondents who said they do not experience infobesity had the following to say:

*"I am particular about the sources of information; I confine myself to peer-reviewed scientific material."*

*"Before I make a decision, I make sure I have researched enough and sought enough guidance from professionals if need be."*

*"I do not complicate life; I use simple information...I do not need boring information...to make a decision."*

*"I tend to get information on what I only read and what I only require at that point in time."*

*"I only look for information I need for knowledge's sake."*

The responses above suggest that students seem to imply that they are aware that there is a lot of information out there. They also seem aware of the dangers of immersing oneself into this vast information. Therefore, they exercise caution, for instance, by getting support from professional librarians or mapping their information search beforehand. These comments imply that they are aware of infobesity and risks therein. Consequently, they have taken steps to avoid

it. These responses further demonstrate that although it is seemingly easy to succumb to infobesity, it is possible to overcome it. Library users are not entirely helpless before the allure of infobesity. Therefore, it can be concluded that infobesity is avoidable.

### 5.3 Information seeking behaviour

The majority (40.4%) of the respondents use the information they seek for academic purposes while 21.2 per cent use it for career and professional development. The other uses the students apply information to include general purposes (19.2%), social networking (9.6%), entertainment (3.8%), political participation (3.8%), and religious purposes (1.9%). Given the respondents were undergraduate students, it is pretty obvious why the majority (61.6%) of them sought information for academic as well as career and professional development.

The majority (62.8%) of the respondents began their information searching for the information they needed on the Internet. Only 16.3 per cent stated that they began their information searching from the library. The other respondents identified their first point of information searching as mass media (14%), family (4.7%), as well as peers and friends (2.3%). These findings confirm that libraries are no longer the first source of information especially for youngsters. The findings also reveal the prominence of the Internet in the current academic information universe. Modern academic library users believe that the information they need is on the Internet. They only turn to the library when they fail to get what they are looking for on the Internet or mass media.

Regarding information resources used, the majority (27.1%) stated that they preferred online databases while 25.4 per cent preferred electronic books and journals. The other information resources used by the respondents include print books and journals (23.7%), audio-visual materials (8.5%), reference materials (6.7%), grey literature (5.1%), and information repository (3.4%). Given that the majority of the respondents indicated that they used the Internet, it is not surprising that the majority (52.6%) of them preferred electronic and online resources. It is also evident from the findings that print books and journals as well as reference materials are still important for undergraduate students. The Table 2 below presents the statements which summarise the information seeking behaviour of the respondents:

Table 2: Information seeking behaviour

Information seeking behaviour	%
I wish to apply the least effort searching for information	6.8
I can use information whose authenticity I am not sure of as long as it is easy to access	5.5
I prefer information digital formats	9.6
I use multiple information sources at the same time	34.2
I do not read complete sources; I only use the relevant sections	11.0
I do not save or own the information sources I use; I only download them when I need them	4.1
I prefer synthesised or summarised information	6.8
I am willing to pay (money, time) for relevant information	12.3
I do not necessarily plan my information seeking in advance; I just use what I find	0.0
I am disappointed when I cannot get the information I am seeking promptly	9.6

The findings indicate that most of the respondents use multiple information sources at the same time; do not read complete sources, only the sections which are relevant for specific tasks at hand; are willing to spend money and time to get relevant information; and prefer information in digital formats.

### 5.4 Impact of infobesity

Most (27%) of the respondents reported that infobesity has caused them to procrastinate. This is because they encounter a lot of information which they spend a lot of time filtering. This way, they are unable to take actions expected of them promptly. They keep postponing actions as they spend more time on the Internet and other information sources. Almost one quarter (22.2%) of the respondents reported that they are infocinated. They have more information than they need. Table 3 presents the other responses regarding the impact of infobesity on undergraduate students in Kenya.

Table 3: Impact of infobesity

Impact	%
Procrastination	27.0
Infocination (being intoxicated with information)	22.2
Poor time management	15.9
Attention deficit (poor concentration)	11.1
Poor decision making	12.7
Social isolation	11.1

The respondents were asked to suggest ways undergraduate students can avoid or cope with the consequences of

infobesity. Some of their responses are reported verbatim hereunder:

*“Use one source at a time, proper time management; use credible sources to acquire information.”*

*“Know what material is needed and relevant sources for the material hence manage available material.”*

*“They should focus on the valid and reliable sources; one can make rational decisions as long as it is helpful.”*

*“People should only consume that information that is important and necessary and leave out the rest.”*

*“I suggest a balanced information absorption and synthesis and general social life.”*

*“Focus on one thing and finish up with it before getting to another duty.”*

*“Be focused and decided on what to search for; maintain concentration and do not divert to social media like WhatsApp and Facebook during research; visit the library to get hard copies to use when not able to access online materials.”*

It is evident from the foregoing that the respondents are of the view that undergraduate students can avoid or generally mitigate infobesity by being selective in their information searching and use. They also recommend heightened focus and discourage multi-tasking which they posit can lead to confusion and poor use of time.

## 6 Conclusion

The findings of this study confirm the fact that infobesity is real amongst undergraduate students in Kenyan universities and colleges. It is evident that infobesity is a consequence of vast amounts of information they are exposed to and the ease with which they are able to create, use or share information. The information universe around undergraduate students in Kenya is characterised by huge volumes of information in diverse formats from interlinked sources; fast flow of ideas and information; and presumption. Thus, current students operate in an environment of information abundance to the extent that they are overwhelmed, fearful, frustrated, fatigued and anxious. They are infocinated and are unable to make the best use of the information for academics, career development, and general information. Academic libraries need to put in place strategies to build the capacity of undergraduate students to avoid or mitigate the consequences of infobesity.

## 7 Recommendations

The authors propose the following actions to reduce the prevalence and impact of infobesity on undergraduate students in Kenya:

1. Librarians should develop and roll out comprehensive information literacy programmes which build the capacity of the students to understand their information needs and conceptualise a searching strategy that meets these needs effectively. The students should also be trained on how to assess the veracity of information especially from less conventional sources.
2. The students should be encouraged to go on a data diet through which they will identify and consume useful information only. They should be encouraged to understand that it is not the quantity but quality of information which matters.
3. Academic librarians should make available credible information sources and resources. This way, the less credible sources will be eliminated through natural selection. Many students use less credible largely because they do not have adequate credible sources. As the librarians do this, they should pay attention to the information formats and types that undergraduate students prefer as a means of increasing appreciation and use.
4. Academic librarians should reengineer library services by customising them to the information needs and seeking behaviour of the users. A hint of the services which are likely to be appreciated by current undergraduate students is given by the information sources and services they prefer. Taking Google as an example, academic librarians should make library services convenient and easy to use to attract fleeing undergraduate students.



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# The Impact of Media Digitisation on Local Video Production: A Case of Nairobi City County, Kenya

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## Abstract

*This chapter assessed the impact of media digitisation on local video production. Local screen production scene has been awash with regional and foreign soaps like Afrosinema and telenovela productions for a long time. Consequently, local video productions do not receive favourable airtime despite the rising demand for local good quality productions among the Kenyan viewers. The Government of Kenya enforced the 40% local content rule in July, 2016 in its efforts to develop the local content industry. However, the local industry is yet to compete favourably at the regional and international levels. The objectives of this study were to assess the impact of media digitisation on the diversity of content generation of local video production and the extent to which digitisation has attracted audience to local video production. The study adopted a mixed research approach. The participants of the study included; 38 key informants among them: content producers, TV production managers, key informants, creative directors, filmmakers, video editors and content distributors and 220 active local TV drama and movie consumers who have access to and consume local video productions using offline and online digital platforms. Qualitative data collected from the key informants was analysed using content analysis and presented in narrative prose format while Quantitative data collected from the consumers was analysed using Statistical Package for Social Sciences (SPSS version 20). The main findings show that media digitisation has made local video productions easier to generate. On the other hand, Kenyan viewers consume local video productions more on the catch-up services and video on demand (VOD) than on the mainstream TV channels. The local video industry is, however, yet to be fully established and self-sustaining.*

**Keywords:** *Digitisation, Local Content, Riverwood, Video on Demand, Disruptive Innovation.*

## 1 Introduction and Background of the Study

Local video production is a fast-growing industry in Kenya in the wake of advancing digital age. It has developed from the use of bulky analogue equipment to the use of sophisticated digital equipment. Local video production is a source of content to local free-to-air (FTA) television channels, pay television channels, online and offline video on demand (VoD) platforms and content aggregators.

In the mid-1970s, Kenya Broadcasting Corporation (KBC) announced that it would stop subscribing to programmes from British Broadcasting Corporation (BBC) and start producing its own programmes (Bougalt, 1995). KBC used to import American detective and spy programmes such as *Dallas*, *the Jeffersons*, *Roots*, *Flintstones*, *Follies* and *Little Rascals* as well as children and entertainment programmes sourced from the Great Britain and West Germany. In 1983, the percentage of programme imports reduced to 59% at the same time 35% of programme was in *Swahili* (Bougalt, 1995).

The digital migration experienced in Kenya in 2015 was revolutionary in the local video industry. Apart from the proliferation of new FTA TV channels, Kenyan subscribers can also access local content through pay TV channels like Viusasa, ZUKU, regional TVs like DSTV and Showmax as well as international firms like Netflix, all striving to establish market niches among the Kenyan viewers. Improving broadband internet infrastructure has aided the digitisation in Kenya. Unlike in the past, independent video producers no longer have to worry about taking their productions to the local mainstream broadcasters because there are now alternative broadcast outlets (Githinji, 2014). Wilson Muirania, the actor and producer of *Jaymo Ule Msee* TV series, has utilised digitisation by shooting and uploading comical skits on the Internet. The success of local video industry (Riverwood) can be attributed to digitisation and a business model that adopts a mass-market production for maximum profit.

Kenya has played host to international video films and TV drama series production that dates back to the 1970s. More recently, Netflix has premiered a TV series (*Sense8*) partly shot in Nairobi with eight Kenyan actors.

## 2 Rationale of the Study

The local entertainment scene has for a long time been awash with foreign soaps, *telenovelas* and regional *Afrosinema* programmes. This creates an impression that local TV drama series and movies are inferior to foreign drama series and movies despite the seemingly high demand for local good quality production among the Kenyan viewers. The fact that most mainstream local broadcasters purposely schedule local video production to run between 7:35pm and 8:00pm during the prime time is indicative that local TV drama series and movies are popular among the Kenyan viewers.

According to Nyutho (2015), Ragbir Singh, the producer of Kenya's first Swahili film *Mlevi*, well-produced local content is a feasible business endeavour.

Recently, the Government of Kenya made it mandatory for local broadcasters to air 40% local content in a move to regulate the media following the sprouting up of many new channels that have emerged during the digital migration process. Broadcasters opposed the ruling as they faced an uphill task of providing local content for their TV programme (Mzungu, 2013).

Although local video production industry is utilising digitisation, the industry is yet to compete with regional powerhouses like Nigeria (*Nollywood*), Tanzania (*Bongowood*) and South Africa despite Kenya boasting a rich cultural heritage and spectacular locations (Kihang'ah, 2008). Furthermore, there exists insufficient literature on media digitisation on local video production. There was a need, therefore, to find out the impact of media digitisation on local video production. The study on which this chapter is based contributes towards addressing the lacuna that exists in the knowledge of media's impact on local video production.

The specific objectives of the study were to:

- 1) Investigate the impact of media digitisation on diversity in content generation of local video production,
- 2) Assess the extent to which digitisation attracts audience to local video production;
- 3) Examine ways in which digitisation has created job opportunities in the local video production industry
- 4) Investigate the impact of media regulations on media digitisation on local video productions.

The literature on media digitisation on local video production is relatively scarce therefore; this study seeks to add knowledge to the existing literature in this area. The significance of this study is to influence policy decision by the relevant authorities and stakeholders on how to develop a self-sustaining local video production industry that has the potential to employ thousands of young producers, actors, scriptwriters, storytellers, casting crew, videographers and editors as well as being a foreign exchange earner.

### 3 Research Methodology

The study adopted a descriptive research design. The study used both qualitative and quantitative methods to collect data. This allowed triangulation of the data. Primary data was collected using a questionnaire, as well as face-to-face and telephone interviews. The questionnaire was used to collect data from 220 active media consumers who had watched local video productions (TV drama or movies) in their either homes, workplaces and learning institutions using digital technologies such as FTA and pay TVs, smart phones, laptops and Personal Computers (PCs) and VODs in the past seven days. The questionnaire was structured, having both open and close-ended questions. Face-to-face and telephone interviews were utilised to collect data from 38 participants, namely, 11 independent content producers, 13 TV production managers, four key informants from Communication Authority of Kenya (CAK), Kenya Film and Classification Board (KFCB), Kenya Film and Television Professionals Association (KFTPA), Ministry of Sports Culture and Art (MoSCA), four creative directors, two filmmakers, two scriptwriters, one video editor and one local content distributor.

Local content comprises drama, movies, music, children and people living with disabilities (PLWDs). However, this study focused on local TV drama and movies. The study also sampled local TV drama and movie consumers in Lang'ata Sub County considering financial income, time and financial constraints as the criteria for selection.

The target population for the study was 38 respondents for qualitative research and 220 respondents for quantitative research. Purposive sampling was used to select qualitative research participants. The sample size for this study was 294 (256 TV drama and movies consumers from the five wards in Lang'ata Sub County and 38 interviewees). Two hundred and twenty (220) questionnaires were successfully filled and together with the 38 participants, the response rate was 258. According to Fales (1971), to estimate sample size some apriori decisions are made such as the degree of accuracy which is standard at  $PE^{\circ}$  (0.05) and an estimate of a number that can give accurate results. The general recommendation is that a figure which is 50% (0.5) or any percentage which is above 50% is accurate. In this study, the researcher used an accuracy of 80% (0.8) which is denoted by (pt). The formula for determining the sample size therefore is:

$$S.S = \frac{2^2 (pt)(1 - pt)}{PE^2}$$

$$256 = \frac{4(0.8)(1 - 0.8)}{0.05^2}$$

Table 1: Target population of the study

Lang'ata SubCounty	Target population	Sample Size
Karen ward	24,507	36
Nairobi West ward	33,377	48
Mugumoini ward	47,037	68
Nyayo Highrise ward	24,191	35
South C ward	47,202	69
<b>Total</b>	<b>176,314</b>	<b>256</b>
Qualitative research participants	100	38
<b>Total</b>	<b>176,414</b>	<b>294</b>

Source: Research Data

The qualitative data for this study was analysed using the qualitative content analysis and presented using the narrative prose format. The quantitative data was coded and analysed using Statistical Package for the Social Sciences (SPSS) and presented as simple percentages in bar graphs and pie charts.

## 4 Findings

### 4.1 Impact of media digitisation on diversity of content generation

The first objective was to investigate the impact of media digitisation on diversity in content generation of local video production.

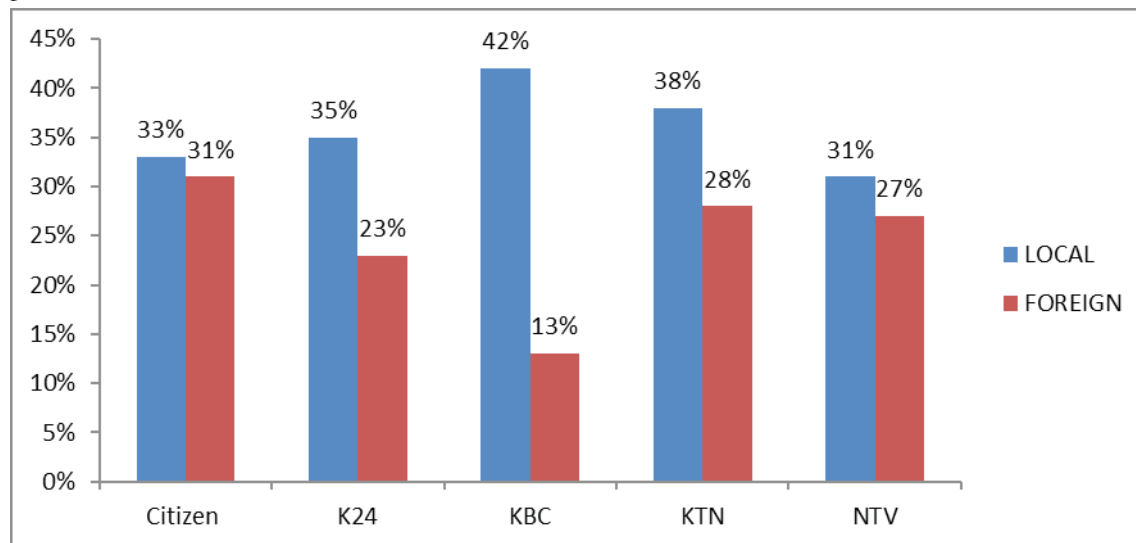


Figure 1: Diversity of content by local TV stations

Source: CAK (2016)

Figure 1 shows that KBC Channel 1 satisfied the CAK's 40% requirement by airing 42% local content and 13% foreign content. KTN aired 38% local and 28% foreign; Citizen TV aired 33% local content, 31% foreign; K24 35% local and 23% foreign, and lastly, NTV 31% local and 27% foreign.

After the government enforced the 40% local content rule, there has been a heightened effort by broadcasters to acquire diverse local video productions. An independent content producer stated:

*"Five years ago there was dictatorship in the type of content we produced, but right now we have the opportunity to satisfy the market demands of the audiences which are changing daily." (IP 03, interviewed 21 November 2016)*

Before the impact of media digitisation, broadcasters used to predetermine the type of content the independent producers create thus limiting diversity. In the words of an independent content producer:

*"The TV stations who are my target market dictate storylines of what I can produce and who they believe is their target audience. This means I do not have the liberty to incorporate the different themes in my drama productions." (IP 01, interviewed 14 September 2016)*

Due to media digitisation, new niche markets have emerged and viewership seems to be shifting from traditional broadcasters to VOD platforms as new audience niches created every day. A renowned content producer John Karanja (interviewed on 16 September 2016) stated that:

*"China has over 15 million Swahili speakers who are in demand of Swahili content. France too also wants as much of the Kenyan content dubbed or subtitled for their channels."*

Mr. Karanja went on to say that Riverwood produces for the low end and high end depending on the budget. Thus, the production sold to regional and international markets are produced using the best quality cameras that utilise the 4K technology such that it can be downgraded to the preferred resolution of the viewers. Another renowned producer Kimani Iceberg (interviewed on 21 November 2016) stated that:

*“New audiences’ markets are being created daily as a result of digitisation. French TV channels have a demand for Kenyan video productions dubbed or transtexted into French.”*

The demand for local video productions is increasing across the digital divide as a content aggregator from Riverwood stated that:

*“Kenyan TV drama and movies are gradually being demanded by regional content aggregators like COTEQUEST of South Africa and international markets like MTN, BET and FOX who have created dedicated channels for African content.” (CA 01, interviewed 11 January 2017)*

The findings show that the proliferation of digital FTA and pay TV channels after the digital migration has created a demand for more local content. In the words of a key respondent from the Communications Authority of Kenya:

*“We are going to 60 licensed FTA TV channels but the operational channels are currently at 46 because we want to have diverse content for children, PLWDs, Farmers, mother to child excluding news and talk shows” (KR 01, interviewed 29 August 2016)*

For the broadcast houses that still rely on in-house production for their programme, an independent producer stated that:

*“Broadcast stations are struggling to survive because they have not changed with changing digital times. They are now approaching the independent producers to produce TV drama and movies for a particular audience” (IP 04, Interviewed 17 September 2016)*

A production must meet the broadcast standards of a particular TV station for it to air. Besides quality, broadcasters consider other commercial factors. A TV producer stated that:

*“Before acquiring productions, we consider viewership possibilities and commercial sponsorship potential of a particular TV programme we acquire” (TVP 02, interviewed 1 September 2016)*

The findings show that broadcasters are commercial entities and target audience and advertisers determine the type of content they acquire. Another TV producer stated that:

*“The show, be it Mexican soaps or local drama, should be of good broadcast quality. It should also appeal to the needs of our target audiences whose tastes and preferences differ” (TVP 03 interviewed 26 August 2016)*

#### 4.2 Digital media use by audiences

The second objective of the study was to investigate the extent to which digital signal attracts audiences to local video productions.

To survive in a highly competitive media environment, TV stations have designed innovative strategies. Besides slotting in TV dramas and movies in TV programme line-ups, broadcasters are also embedding the same entertainment programmes in their respective websites, YouTube channels and Facebook pages. TV stations are no longer the final destination of independent producers to market their TV drama and movies since new digital platforms for example, Buni TV, Ronga TV, Viusasa and Showmax have emerged.

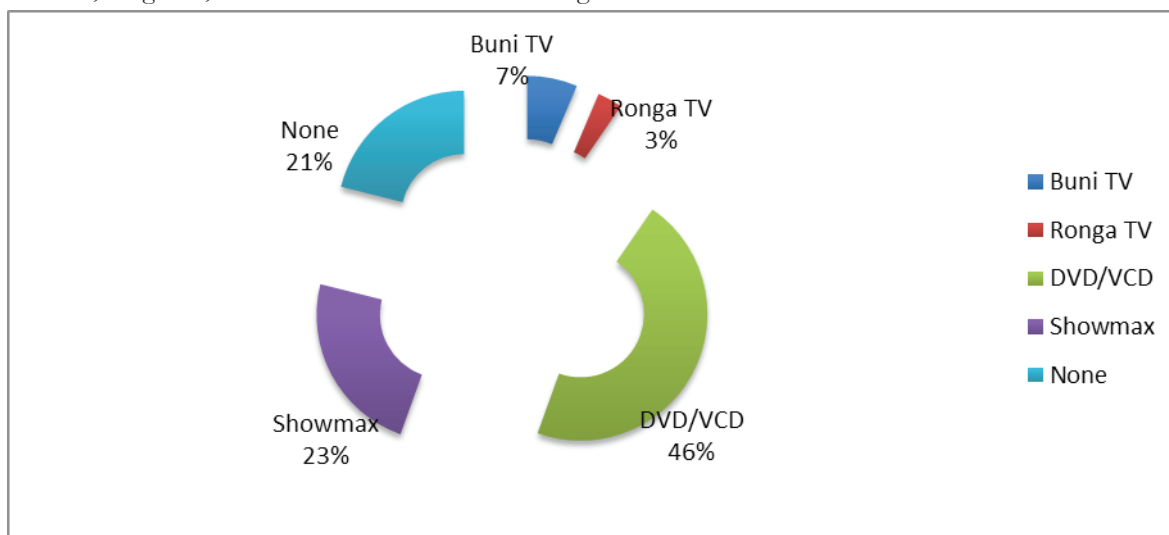


Figure 2: Preferred VOD Digital Platform

Source: Research Data

From the Figure 2, 46% of the respondents preferred to watch local TV drama and movie consumers using DVDs. Showmax, a new digital platform, allows viewers to select their local favourite programmes at their most convenient time is gradually gaining popularity at 23%. Other VoD platforms include *Buni TV* and *Ronga TV* constitute 7% and 3% respectively. These platforms enable the viewers to set reminders of their favourite programmes on their personal video recorders (PVRs) for later viewing at a time of their convenience. The emergence of these digital platforms is likely a consequence of digitisation.

Table 2: Factors that motivate viewers to watch Kenyan TV Dramas and Movies

Factors	Yes	No
Quality	58.7	41.3
Originality	57.3	42.7
Popular Cast	34.9	65.1
Twists and turns	41.7	58.3
Suspense	27.1	72.9
Value addition	23.4	76.6
Year of production	6.4	93.6
Availability on digital platform	64.2	35.8
Indigenous culture theme	12.4	87.6
Urban culture theme	34.4	65.6
Norms and values theme	32.6	67.4

Source: Research Data

From the research findings in the Table 2, 64.2% of local TV drama and movie consumers view local content because of its availability on digital platforms 58.7% indicated that they are motivated by the quality of production.

The use of advanced camera equipment and editing software has made production easier and better in quality. It is possible to create several TV drama series and movies on virtual sets within a short time and distribute them. In the words of a video editor:

*“In the past, it would have taken a week or so to edit a single production. Nowadays, it is more instantaneous; I can shoot in the morning and edit in the afternoon easily using all-inclusive software like Black Magic DaVinci Resolve which helps me to edit, catalogue shots and colour grade in one sitting.” (VE 01, interviewed 21 January 2017)*

For a long time, Riverwood productions were perceived as being inferior in quality as they are only produced for low budgets. However, Riverwood Ensemble now produces high-end products depending on the budget. Riverwood producers now own expensive and good quality cameras such as DSLR. A leading independent content producer stated that:

*“We are now purchasing 5D Mark III Full HD camera which is integrated with 4K capabilities; local broadcasters do not even deliver in 4K but they downgrade to a lower standard than what we shoot in.” (IP 07, interviewed 21 February 2017)*

Despite the notion that Riverwood films are of inferior quality, most of the independent producers shoot in 4K but they downgrade their video productions to SD in order to fit the current broadcast signal quality in Kenya.

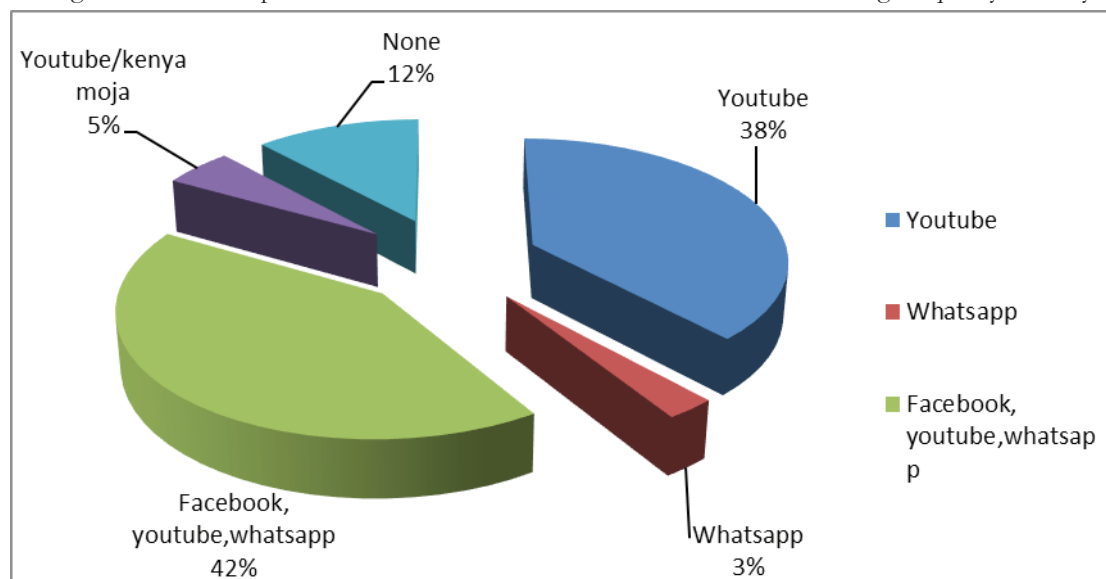


Figure 3: Preferred online digital platform to access and consume local TV drama and movies

Source: Research Data

From the findings shown in Figure 3, 42% of local TV drama and movie consumers chose Facebook pages, Youtube and WhatsApp platforms as the preferred channels of watching local video productions apart from TV channels.

*“People are spending more time on their devices than they are spending on watching TV. Smartphones is the next big thing in terms of entertainment and this is where producers will make more money.” (IP 08, interviewed 21 September 2016)*

Given the increasing rate of Internet penetration in Kenya, smartphones and tablets are the next frontiers in this industry because viewers are easily accessing and consuming local video productions through the Internet.

#### 4.3 Media digitisation and job creation

The third objective was to examine the ways in which digitisation has created job opportunities in the local video production industry. The findings show that digitisation has created more job opportunities in the local video industry. A renowned independent content producer John Karanja stated that:

*“There are over 500,000 copies of content DVDs that are mass-dubbed daily for local and international distribution. We also distribute regionally and to African TV channels abroad.”*

According to Okande (2015), Riverwood industry is worth between Ksh 900,000 and 1.2 million monthly. A content aggregator from Riverwood stated that:

*“In a year, at least 12 movies are produced at Riverwood. Each movie sells at 50Kshs; 1,000,000 copies are duplicated making a whooping profit of Ksh 600,000,000 annually.” (CA 01, interviewed 11 January 2017)*

Media digitisation has created opportunities for upcoming producers to showcase their talents in the emerging digital platforms other than the traditional Kenyan television stations. In the words of a content aggregator:

*“Our Riverwood TV channel (RWTV) on YouTube started with 500 subscribers watching 20 movies that we uploaded at first. By the end of one year we had 2,000 subscribers.” (CA 01, interviewed 11 January 2017)*

The demand for local video productions is high and growing.

Media digitisation has also led to reduction in revenue streams for broadcasters leading to job losses in this industry. A mainstream TV producer stated that:

*“The surge in revenues from adverts has contributed to push and pull between broadcasters and content producers. It takes a lot of time for broadcasters to agree to the terms of a contract.” (TVP 03, interviewed 26 August 2016)*

Advertisers are cautious in their spending as broadcasters face competition from offline and online digital platforms. In the words of a TV producer:

*“Advertising revenue is split in so many ways making it difficult to keep buying shows from content providers. That is why we still insist on having our own internal productions in order to cut costs.” (TVP 04, interviewed 7 September 2016)*

The reorganisation and transformation of major Kenyan TVs to cope with the first digital business models have seen the laying off of staff including those in the production department (Daily Nation, 2016).

#### 4.4 Media digitisation and media regulations

The fourth objective was to establish the impact of media regulations on local video production. While high-end producers cried foul over the negative impact piracy has on their businesses, most producers especially from Riverwood believe piracy builds up the popularity of the lesser known actors and producers. Producers-cum actors like *Kibenjo* and *Machangi* shot into limelight partly due to piracy of their work.

The enforcement of the 40% local content rule on broadcasters by the CAK is a major boost to independent video producers and failure to adhere to this rule will attract a penalty. A key respondent from the CAK stated that:

*“The CAK will impose a 2% penalty on gross revenue of any broadcaster who fails to adhere to the 40% local content rule which is now in full enforcement.” (KR 01, interviewed 29 August 2016)*

This therefore means that aspiring and established TV stations have a big void to fill in terms of airtime.

It should be noted that despite the benefits that the legislation has brought, entry into the media production industry still remains an expensive undertaking because of requirements to pay licences fees.



Table 3: License Fees Levied on Local Productions

Government Agency	Particulars	Total Cost (Ksh)
DFS license fees	15,000 + (1,000 per day for 20 days)	35,000
KFCB license fees	100 per 90 minutes	9,000
KECOBO	Copyright fees	2,000
KFCB stickers	Ksh10 per DVD for 10,000 DVDs	100,000
Others	Ksh 48 per DVD for 10,000 copies	480,000
Total		<b>626,000</b>

Source: Research Data

The findings in Table 3 also show that high cost of license fees on local video production hinder the steady growth of the industry. In the words of Muchiri Mentor (interviewed on 20 January 2017):

*“Producing 10,000 copies of a 90 minutes’ movie takes approximately 20 days to shoot and each day costs a thousand bob plus other costs of production which amounts to estimate Ksh 626,000.”*

## 5 Conclusion

It is evident that media digitisation has made it easier for local video productions to be generated and consumed. At the same time, Kenyan viewers seem to be customising their TV viewership of local video productions by opting for more convenient catch-up services and VODs as their preferred media of consuming local video productions. Kenyan TV drama and movie consumers are being actively exposed to alternative broadcast outlets such as online and offline digital platforms, and local content.

Media digitisation has offered viewers better audio-visual quality experience that is more interactive than before. Riverwood productions, for instance, hitherto thought to be of inferior quality, has gradually been recognised by the mainstream TVs. Technology is gradually advancing and independent local producers are already acquiring best quality cameras which shoot in 4K. Local video industry is a major employer in that Riverwood for instance, makes an annual net profit of Ksh.300 Million. A single production has a team of an estimated 20 people; video producers, directors, scriptwriters, video editors and casting crews. Local video production industry is a profit-making venture as more and more young Kenyans are joining the industry and employing themselves.

The cost of producing local shows varies depending on the budget and the needs of the audience. For instance, to break even, a local producer needs to charge approximately Ksh 250,000 per 30-minute episode. This compares less favourably with the cost of procuring a full series of a foreign *telenovela*, which according to *Globetrack International Report* for the CAK in 2016, would cost Ksh 60,000. The report put the cost of producing a local show at Ksh 600,000 most of which is due to high costs of license fees charged by the Department of Film Services (DFS), KFCB and KECOBO before coming up with a full production.

The enforcement of the 40% local content rule on broadcasters by the CAK is a major boost to independent video producers and failure to adhere to this rule will attract a penalty. Therefore, this means that aspiring and established TV stations have a big void to fill in the digital space. The CAK and KFCB must ensure the industry flourishes and competes favourably with the rest of productions across the world.

## 6 Recommendations

Local video production can flourish even further if the TV broadcasters, independent producers and the government work together towards a win-win goal. To avoid compromising the quality of local content production, television broadcasters should continue improving the quality of their productions by investing in equipment, training and hiring talented content producers. Independent producers and broadcasters can collaborate together to generate local drama and movies at affordable costs where producers can be offered a better pay for their products.

The tax waiver on film equipment that the Government of Kenya offered was commendable although the hefty license fees charged by KFCB before making and classifying a production negate this noble cause. This body should therefore reconsider the payment of these fees.

To build a self-sustaining local video industry, local productions need to be recognized through award schemes. Local celebrity culture in Kenya needs to be built around pioneer actors like Oscar award winner Lupita Nyong’o, Hollywood actor Edi Gathegi, Lwanda Jawar (Sense8) and Nick Mutuma (Shuga) among others upcoming actors.

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# Block Chain Application in Securing, Sharing and Validating Certificates in the Education System in Kenya

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## Abstract

*This chapter looks at the application of Blockchain technology in the education sector in Kenya with particular reference to securing, sharing and validating academic credentials. The specific objectives of the study were to identify the use and test cases of Blockchain technology in certification management; describe the platforms required to host and manage the Blockchain credentials management system; illustrate the workflow process to be applied in the management of certificates using Blockchain. This study is based on qualitative research method using literature review, and case studies to generate evidence. The study revealed that the application of Blockchain in the management of certificates is possible through the adoption of the Blockcert platform developed by MIT Media Lab. Though still at an infancy stage, it has proven to be a success with MIT Media Lab having issued certificates through it. The system is open source which would enable each institution to import the source code and develop the dependencies and framework as they see fit. Utilising Blockchain in the management of certificates offers an immutable, verifiable, permanent and distributed store of certification, with each block building upon the last. When a certificate is issued, the data is compressed into a hash and recorded on the Blockchain. This generates a “receipt” that can always be checked at a later date. The verification service validates the signature of the issuer and the certificate data and also ensures that the certificate status has not been revoked.*

**Keywords:** Blockchain, Blockcerts, Education, Certification, Kenya.

## 1 Background Information

Information communication technologies (ICTs) have disrupted service industries in Africa at unprecedented levels. The education sector, being a service-based provider has not been majorly impacted by the disruptions offered by ICTs in the same way as other sectors such as banking and telecommunication have been. However, there is a potential of technologies such as e-Learning and open learning creating significant shifts on how education and training will be delivered in the near future. Blockchain serves as a foundational technology that could greatly impact on how service industries operate.

Blockchain is an innovative technology with the ability to disrupt existing business models. Its development is preceded by the groundwork laid by distributed computer networking technology - Transmission Control Protocol/Internet Protocol (TCP/IP). As an emerging technology, its impact has majorly been felt in developed countries. However, the opportunities offered by Blockchain are enormous particularly for developing countries such as Kenya.

Blockchain technology is a result of Bitcoin technology that resulted from an act of defiance. Peck (2017) explains Bitcoin as follows:

*“Unleashed in the wake of the Great Recession, the cryptocurrency was touted by its early champions as an antidote to the inequities and corruption of the traditional financial system. They cherished the belief that as this parallel currency took off, it would compete with and ultimately dismantle the institutions that had brought about the crisis. Bitcoin’s unofficial catchphrase, “In cryptography we trust,” left no doubt about who was to blame: It was the middlemen, the bankers, the “trusted” third parties who actually couldn’t be trusted. These humans simply got in the way of other humans, skimming profits and complicating transactions. Bitcoin sought to replace the services provided by these intermediaries with cryptography and code.”*

Yli-Huumo, Ko, Choi, Park and Smolander (2016) have added the aspect of document management of Blockchain by defining it as a decentralised transaction and data management technology developed first for Bitcoin cryptocurrency.

The early works on Blockchain and individual records makes recurrent references to ‘self-sovereignty’, and an individual’s ability to be in charge of his or her own identity online (Lilic, 2015; Allen, 2016; Smolenski, 2016). According to Au (2017) and Lewis (2017). Public blockchains facilitate self-sovereignty by giving individuals the ability to be the final arbiter of who can access and use their data and personal information. Within an educational context, the term is on its way to becoming synonymous with the empowerment of individual learners to own, manage and share details of their credentials, without the need to call upon another institutions as a trusted intermediary.

## 2 Statement of the Problem

Certificates are indicators of accomplishment or proof of association. Some, like academic certifications, may enable an individual to secure employment. The system which most institutions (like universities) rely on to certify or manage these certificates is slow, unreliable and in some cases fraught with fraud (Ezzell & Bear, 2005). Some of the means devised to solve this problem, for example, Use of Portable Document Formats (PDFs), and the application of digital signatures, does not guarantee the security of documents. Depending on the hashing algorithm applied, these security features can be undermined by altering the date/time stamp, or even the entire document. A Blockchain-backed certification system can enhance the management of certificates; not only by the issuer of the certificate, but by having the recipient being part of its management. The process would also be more open and verifiable.

## 3 Research Objectives

1. To identify the application of Blockchain in certification management;
2. To describe the platform required to manage the Blockchain certification management system; and
3. To illustrate the workflow process to be applied in the management of certificates using Blockchain.

## 4 Research Questions

1. What are the existing applications of Blockchain in certification?
2. What platform is required to manage Blockchain certification?
3. What workflow process can be applied in the management of certificates using Blockchain?

## 5 Literature Review

Lemieux (2016) argues that a lot of current and proposed applications of Blockchain technology aim to enhance record keeping through offering novel forms of generation, usage, storage and/or control of records. She states that, “The Blockchain aims to change the way that the authenticity of records is established from reliance on a trusted third party to a system-based mode of establishing authenticity”. This enhances the ability of securing individual and institutional integrity through offering a fool proof, immutable, uninterrupted and incorruptible solution to information verification. Fazzio (2018) echoes the same by stating how information governance and records management are a natural fit for Blockchain technology because these fields value data based on its authenticity, integrity, and reliability.

Wahab, Barlas and Mahmood (2018) point out that there are a number of problems with the paper-based records. These are:

1. The probability of fraudulence is very high as numerous certificates are issued by several different institutions. These certificates are always at risk of being challenged for their authenticity as counterfeits of physical documents are easily produced.
2. Paper based certificates are difficult to preserve and use in later stages of life. There is a high risk of losing the original documents during the attestation process. Thus, the process is modelled in such a way that each attestation has to go through the same set of activities.
3. The regulators do not maintain any database on their own and always rely on the issuing institute itself for the verification of the documents. Hence, there is a lack of ownership by a central authority.

## 6 Methodology

This study which yielded this chapter was based on exploratory research method, using literature review, and case studies to generate evidence. For an emerging technology such as Blockchain, with almost daily industry announcements, iterations and media posts, the use of qualitative methods is a rational means to look at a phenomenon that is continuously evolving. The literature review was based literature on tertiary institutions that have pioneered the application of Blockchain systems.

## 7 Findings

The findings of the study are presented hereunder according to the objectives of the study.

### 7.1 Existing application of blockchain technologies in certification

The University of Nicosia pioneered the use of Blockchain in the storage of academic certificates on the Bitcoin Blockchain. The innovative digital technology supports the creation, issuing, viewing and verification of Blockchain certificates that are registered in a public Blockchain and cryptographically signed. This generates a tamper-proof

certificate and at the same time provides a verifiable proof of training that is immediately useful when applying for employment, further studies or immigration (“Blockcerts to be developed in Malta,” 2017).

The MIT Media Lab Learning Initiative and Learning Machine jointly developed Blockcerts, as an open source ecosystem for creating, sharing, and verifying Blockchain-based academic certificates. The academic certificates hold basic information such as the name of the recipient, the name of the issuer and an issue date, among other details. (Schmidt, Nazare, McConachie, Zyskind and Sethi, n.d.)

Academic certificates are registered on the Bitcoin Blockchain, cryptographically signed, and are tamper-proof. Blockcerts makes it possible to verify issuance of certificates, (identify who issued the certificate and whom it was issued to), and validate the content of the certificate itself (Schmidt et. al, n.d.). Based on Blockcerts, a pilot for academic and professional certifications was pioneered by the Federation of State Medical Boards (FSMB). FSMB will be issuing and verifying official documents with Blockcerts, (Daniell, 2017).

In July 2017, SAP (a German-based multinational software company) introduced TrueRec, a secure and trusted digital wallet for storing professional and academic credentials based on Ethereum. TrueRec was made available to people enrolled in the online course “Touch IoT course for SAP Leonardo” offered by openSAP, an online learning platform and provider of massive open online courses (MOOCs). Over 4500 students received and are able to manage their certificate through TrueRec (Boeser, 2017).

### 7.2 Blockchain platform

There are three elements of computing namely: storage, computing, and communications. Mainframes, PCs, mobile, cloud and Blockchain all manifest these elements in their own unique ways. Specialised building blocks emerge to reconcile trade-offs within a given element. McConaghy (2017) describes the building blocks of Blockchain as illustrated in the Figure 1.

Storage within Blockchain can be actualised through token storage. This comprises of the assets and their value. The file system indicates the organisation of file hierarchy (database) that stores structured metadata, that is, tables in relational form or documents in JSON and a data market to enable the sharing of data. Processing refers particularly to how the computing is done either on the client side through fat client stack or through high performance computing. Communications within Blockchain is actualised through sending data containing particular value that cannot be replicated and is immutable in state.

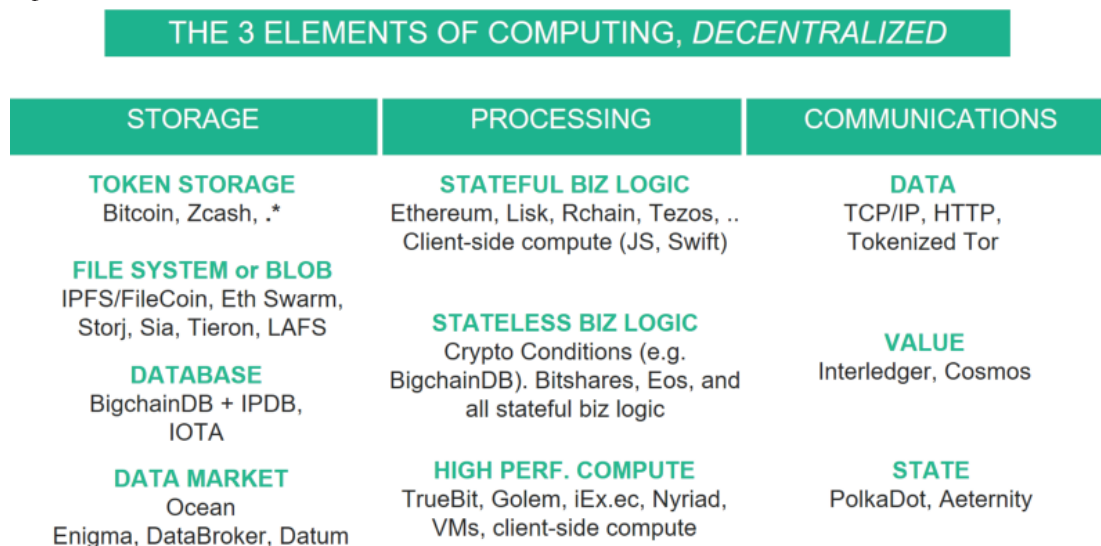


Figure 1: The Elements of computing

The parties that are involved in the use and management of certificates are the recipient (student), the issuer (the institution) and verifier in this instance an employer seeking to determine the authenticity of a certificate. In this regard, MIT Media Lab has developed a platform that utilises the following components to enable the management of Blockchain-issued certificates.

1. **Issuer**- a university creates a digital academic certificate and register it on the bitcoin Blockchain.
2. **Certificate**- Certificates are open badges-compliant, which is important, because there is an entire community of open badges issuers (academic institutions that issue certifications to an individual will need support, and because open badges is becoming an Integrated Management System standard)
3. **Verifier**-Anyone can, without having to rely on the issuer, verify that (a) a certificate has not been tampered with;

(b) it was issued by a particular institution; and (c) issued to a specific user.

4. **Wallet**-To enable individuals to safeguard their certificates and share them with others, for example, an employer. The iOS wallet is available already, as well as in the Android ecosystem.

### 7.3 Workflow process

The standard that is preferred in the management of credentials is to be based on *Blockcerts* (Open standard for Blockchain credentials) from MIT Media Lab. The benefit of choosing *Blockcert* is its independence from any particular platform. It can be used both within Blockchain and Ethereum, as within public and private chains as well (Schmidt et. al, n.d.). The workflow is as follows:

1. The student applies to the school for a credential or is invited upon the creation of a certificate, and the certifiers check the students' information and merge the credential with a Bitcoin transaction once it is approved.
2. Then the majority of the academic committee members sign it with their private keys. This is to ensure that rogue employees are not singularly responsible for signing certificates.
3. The system then broadcasts the transaction which contains the Merkle root for all the certificates.
4. Student receives a Javascript Object Notation (JSON) based certificate once the transaction is confirmed by the miners.
5. The student provides the JSON-based certificate to the employer, when applying for a job.
6. The company verifies the certificate via access to the Blockchain and checks the authentication code.

## 8 Discussion of Findings

The process of Blockchain application in management of certificates is possible. However, the following issues have to be taken under consideration:

1. Application of blockchain use a lot of energy because of the high processing power required during the verification process that is basically done through data mining.
2. The credentials or certificates that are handled through the system are in most instances confidential. Institutions choosing to apply blockchain systems are advised to adopt private ledger that would operate in conjunction with the receiver (student) and other subsequent users rather than using public ledgers that would comprise the confidentiality of the credentials.
3. The main premise of managing certificates within Blockchain is for digital certificates. This presumes that the certificates being issued by institutions are not paper-based. Blockchain technology would therefore be best suited in the certification and verification of Massive Open Online Courses (MOOC). It can however still be applied in verification of paper based certificates.

## 9 Conclusion

The adoption and implementation of Blockchain technology in the Education sector is a revolutionary idea that will enable the user (student/graduate) to be able to manage their credentials effectively as has been proven by (Schmidt et. al, n.d.). Institutions of higher learning in the developed world have embraced the use of Blockchain and there exists successful test cases. Blockcerts is an open source platform to available to institutions that may wish to adopt blockchain technology in their certification processes. The workflow process of issuing, managing and verifying the certification process between Academic institution(s) and the student/graduate exists. Institutions of Higher learning are advised to adopt private ledgers to ensure the security, confidentiality and privacy of the credential systems is maintained.

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# An Overview of the Status, Challenges and Opportunities of ICT for Knowledge Management in University libraries in Nigeria

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## Abstract

*This chapter discusses the status, challenges and opportunities of ICT for Knowledge Management (KM) in university libraries in Nigeria. There are 163 established and maintained university libraries in Nigeria. The University of Ibadan that was established in 1948 possibly being the oldest university library in the country. The authors used qualitative content analysis, largely by literature review, to contextualise how ICTs are used for knowledge management in the university libraries in the country. The review revealed that the availability and accessibility of ICTs for knowledge management has not been uniform across all university libraries. Issues like under funding of university libraries, irregular power supply, limited personal computers, expensive nature of ICTs and non-existent telecommunications in some university libraries in Nigeria have made it difficult to apply ICTs to library operations. However, irrespective of the challenges faced, libraries have devised strategies such as alternative power supply of generator and external funding bodies, among others, for coping and rendering services. More government support is required in order for the university libraries to continue to render their services.*

**Keywords:** ICT for KM, Libraries, Knowledge Management, University libraries, Nigeria.

## 1 Introduction and conceptual background

Rosenberg made an observation about libraries in Africa more than two decades ago. She stated that: “libraries are poorly funded, with budgets that are either non-existent, declining or rarely honoured; collection development is often either minimal or non-existent; there is too much expenditure on staff (some libraries are overstaffed) at the expense of acquisitions; there is overdependence on [foreign] external funding, which is estimated to be as high as 90-100% in some libraries; ICTs aren’t sufficiently utilised and networks suffer poor connectivity; and resource sharing is not a common practice”(Rosenberg in Ocholla, 2009:22).

These observations by Rosenberg (1997) provide a basis for contextualisation and discussion on the current state of university libraries in Nigeria. This chapter used qualitative content analysis of literature and documents, to contextualise the status of university libraries in Nigeria.

## 2 Overview of University Libraries in Nigeria

Presently, there are 163 established and maintained university libraries in Nigeria (NUC, 2018). The first university library was established at the University of Ibadan in 1948 (Agboola, 2000). The University of Nigeria library, Nsukka later followed in 1960 and several more were situated in different states of the country. The 163 university libraries in Nigeria are categorised into federal (41), states (47) and private (75). The libraries are situated across the thirty-six states and the federal capital territory, Abuja in Nigeria (NUC, 2018). The number of accredited university libraries in Nigeria has increased from 128 in 2013 (Okojie, 2013:6) to 152 in 2017 and 163 in 2018 (NUC, 2018). This increase originated from the establishment of a new breed of universities (public and private) in the country (Okojie, 2013). The libraries in Nigeria have experienced significant expansion in the diversity of users and information resources, staff strength, and methods of service delivery.

University libraries in Nigeria have experienced significant growth with regard to quality and quantity of information resources (print and electronic formats), and the number and level of trained information professionals. These factors are believed to be the driving force behind the present university library organisation and operations which strive to ensure that the set goals of the institution and the needs of the staff and users are met.

The university libraries in Nigeria are strategically positioned at the heart of universities to support their institutions’ mission of teaching, learning and research within the academic community (Ifidon, 1996). However, the libraries cannot function without adequate staff, funding, collections and services to meet the requirements of National University Commission (NUC) for quality assurance of the information products and services offered in Nigerian universities (NUC, 2014). To ensure quality assurance in terms of service delivery in university libraries, NUC set up mechanisms that would regulate and enhance accountability and demonstrate growth in the professionalism of staff and coordination of collection development in university libraries (Obadara and Alaka, 2013). However, a study by Utulu (2010) found



that the effect of adequate and continuous funding has not been felt in collection development, re-skilling of staff, and coordination of work operations in some libraries. Utulu notes the need to re-position Nigerian university libraries in order to meet diverse and increased users' and information requirements.

The Association of Colleges and Research Libraries (ACRL, 2011:5) is often referred to for proper standards and guidelines for benchmarking academic libraries. The ACRL standards focus on vision, mission, and objectives; information resources; ICT resources; organisation of and access to information resources; and library services. The NUC likewise has its own standards and guidelines for the development and running of university libraries in Nigeria which seem to have been benchmarked to those provided by ACRL.

### 2.1 University Library Policy

University library policies are fundamental in determining the status and opportunities associated with ICT for KM in university libraries. Policies are used to guide and regulate every operation that takes place in university libraries (Enakrire, 2016). In reviewing the NUC (2014) policy, the establishment and maintenance of university libraries in Nigeria require an equal ratio of the availability of the following:

1. Adequate staff to support students.
2. Information resources of both print and electronic.
3. Information services and their relevance to current trends.
4. Available infrastructure such as buildings, reading capacity.
5. Policy in relation to library services, training, funding and budgeting.
6. Students to academic staff must be balanced for effective information services.

In support of the listed items above, the National Information Communication Technology Policy (NICTP, 2012) concurs that, policies are crucial in strengthening management operations in university libraries. For example, when specific principles, practices, training and evaluations are made, policy helps to support library operations and services in university libraries. Scheeder (2005) explains that policies in a library raises awareness of, and promotes the institution's mission, thus making the library an access point to knowledge. Policies do not only provide a framework that coordinates and governs the organisation, but also inform organisations on the procurement, use, management and maintenance of ICTs, as major information management tools in academic and research libraries (Oni, 2004:2). Practical experience shows that some Nigerian university libraries (such as the University of Ibadan, Federal University of Technology, Akure, Delta State University and Federal University of Petroleum Resources) have flourished because of ICT policies. Policies aligned with the set objectives of the operations are embraced by the university libraries in question.

Regarding the accreditation requirements for university libraries, the NUC policy document emphasises the need for good governance, ensuring external supervision through adherence to standards of library resources, and costs of supplies by vendors (NUC, 2014). The adoption of new technologies (ICT facilities) in academic libraries has changed librarians' work environment over the past decades. Presently, university libraries and librarians now use different mediums and ICT tools such as computers, mobile phones, the Internet and social media to gain quick access to electronic information resources and services (Okite-Amughoro, Makgahlela and Bopape, 2014). The transformation in the work environment is also noted by Mohammed, Garba and Umar (2014:1)

### 2.2 Library and information services

Library and Information Services (LIS) are key elements in assessing the status of university libraries. LIS has become a critical success factor in the growth of academic libraries. The extent to which information needs of users are met depends on the quality of service delivery offered by librarians. The quality services focus largely on qualified and competent librarians, coupled with better provision of tools to work within the organisation. University library services in most developed countries have flourished due to the use of web-based electronic documents and the use of Web 3.0 technologies (Gbaje and Kotso, 2014). The use of web-based electronic documents has led to increased user expectations, increased information needs; more opportunities for users to collaborate and contribute towards the development of information; and access to and retrieval of many volumes of information resources within a short period (Bhardwaj and Walia, 2012). University libraries are compelled to consider human, social, technological, and economic capital as requirements in rendering ICT-driven library systems and services to users (Utulu, 2010:282).

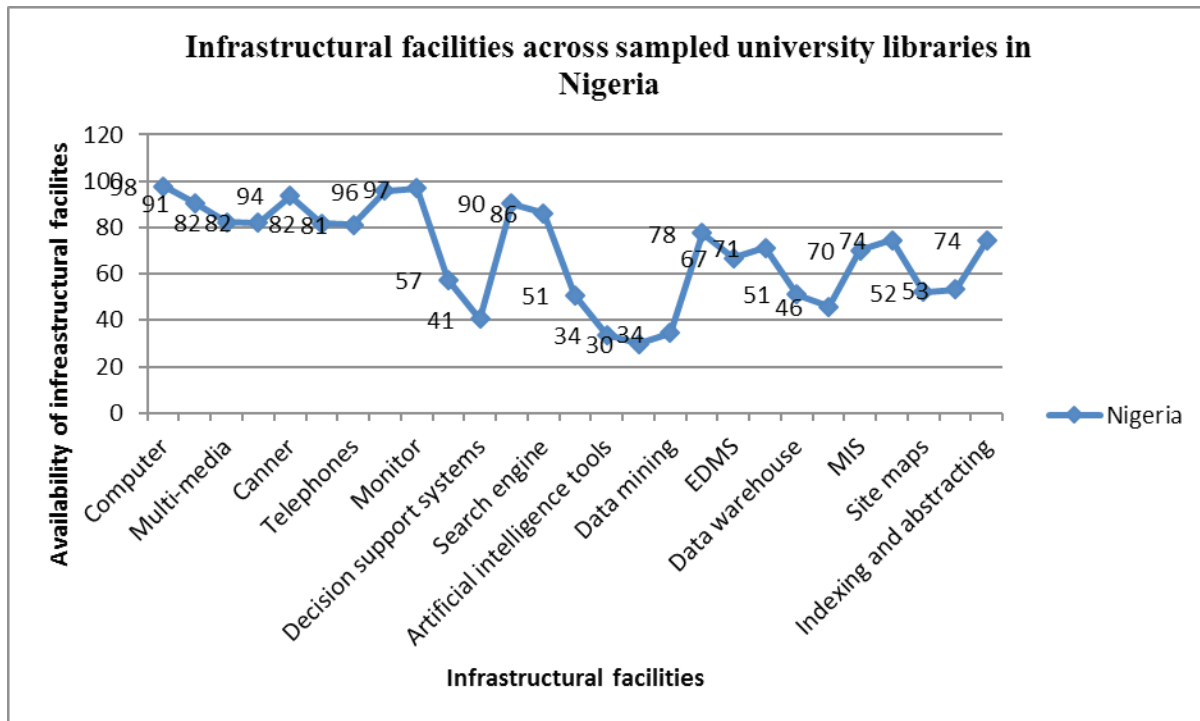
### 2.3 Infrastructure/Resources

The status of university libraries is arbitrated by the adequacy of infrastructural facilities and resources, which the library possesses, as no libraries can exist without facilities. A study conducted by Enakrire (2016) identifies the following essential infrastructure for academic libraries in Figure 1. The rationale behind the representation of the infrastructural facilities, and resources, extracted from Enakrire (2016), PhD Thesis, as presented in Figure 1, is that, recent

infrastructural facilities of artificial intelligence tools, data mining, data warehouse, decision support system, electronic data management system, among others, are currently used more by libraries in developed countries, compared to the conventional physical tools of computer, scanner and multi-media.

The infrastructural facilities are used for specific and general library operations in the university libraries. They enable acquisition, processing, storage, retrieval and dissemination of information to users. Importantly, most of the information resources in database/institutional repository in university libraries are managed by these facilities (Enakrire, 2016). They strengthen, and continue to support librarians in service delivery in university libraries (Enakrire, 2016).

NUC policies affirm the use of these infrastructural facilities and resources, in order to improve functional university libraries (NUC 2018). However, very few university libraries are able to possess these infrastructural facilities and resources, due to inadequate and misappropriation of budgetary allocation of funds to university libraries in Nigeria.



**Figure 1: Infrastructural facilities**

Source: Enakrire, 2016:162

From the data in figure 1 is obvious that computer and telephone accessories are dominant. Surprisingly, many of the tools do not have much effect on service delivery in the libraries visited, considering the percentage attributed to them by respondents. However, some of the tools are used to perform general and specific work operations.

#### 2.4 Staffing

Staffing is a key factor in every organisation, especially in the actualisation of service delivery (Enakrire, 2016). According to Utulu (2010:291), universities in Nigeria with user populations of 18,600 or more, are expected to employ 33 librarians, 8 para-professional staff members, 3 senior administrative staff members, 6 secretaries, and 161 junior staff. The NUC (2014) states the requirements for university libraries concerning personnel as follows:

1. One librarian for every 400 users, up to a maximum of 20 librarians for every 8000 users.
2. One librarian for every 800 users after the first 8000 users, up to a maximum of 30 librarians for 16000 users.
3. One librarian for every additional 1000 users after the first 16000 users.
4. One para-professional staff member for every four librarians.
5. One senior administrative staff for every 10 librarians.
6. One secretary for each university librarian, deputy university librarian, and dean of division or department.
7. Five junior staff for each librarian.

As the population of users increases, staff numbers/capacity and levels of expertise are equally expected to increase. The educational programmes offered at various institutions depend largely on the adequacy of library resources and the staff capacity to enable information access and services.

Presently, the number of librarians in university libraries in Nigeria with diverse professional qualifications and achievement of doctor of philosophy (PhD) in library and information science/studies and allied disciplines (eg archives and records management) is increasing. Nigerian universities have now made it mandatory that a PhD degree, and a specific number of research publications be requirements for librarians as they are categorised as academic staff (Enakrire, 2016). This resonates with previous studies on the status of academic librarians in universities (Ocholla, Ocholla and Onyancha 2013, 2012). For example, they suggest, "The promotion of university librarians to senior library positions should be tied to research output and publications, as librarians serve a vibrant academic community, whose research requirements and services can be best achieved by people who not only conduct research, but also disseminate research results through scholarly publications. Such librarians would fully understand the complexities of scholarly research publications, such as the preparation of a manuscript, information retrieval, peer-review, referencing, plagiarism, contractual agreements between author and publisher, open access (OA), conference presentation requirements, etc, and effectively support the author" (Ocholla, Ocholla and Onyancha 2013:18). Ultimately, with such involvement they can conveniently claim academic status within a university.

### 2.5 Funding

Funding has been a major issue in the development of libraries in Nigeria. Issues with the funding of university libraries have been noted in several related studies (Osagie and Orheruta, 2013:195; Enyia, 2013; Ani and Edem, 2010; Utulu, 2010:292). Approximately 10% of the main institutional budget in Nigeria is used to accommodate the needs of libraries as part of the NUC's provision for the funding of university libraries. A major contributor to university funding in the country has been the Education Trust Fund (ETF), instituted, according to the Tax Act No. 7 of 1993, and later amended by Act No. 40 of 1998. The federal government mandates companies in Nigeria to pay 2% out of their profit as tax to the ETF, so that the development of projects and libraries at various universities in Nigeria can be attained or sustained (Akindojutimi, Adewale and Omotayo, 2011). Aside from the basic 10% from the institutional budget, the ETF is regarded as a secondary source of funding that is allocated to libraries and information-based institutions (Akindojutimi, Adewale and Omotayo, 2011). The funding of university libraries, as specified by the NUC, is as follows:

1. Capital grants are based on the year of the university's establishment.
2. Ratio of personnel cost to overheads is 60% to 40%.
3. Libraries stand at 10%; research costs 5%, and capacity building 1% of the total recurrent-minimum.
4. The academic to non-academic funding ratio is 60%:40%.
5. Internally generated revenue is 10%.
6. Expenditure on central administration is 25% maximum.

Adequate provision of funds to university libraries through the implementation of the NUC requirements enhances and fosters the acquisition of information materials and facilities (office space and readership services), and the recruitment of qualified staff (Utulu, 2010:292). Unfortunately, libraries in Nigeria still suffer same challenges of poor and irregular annual budgetary allocation due to poor funding (Akerele, 2018). This is as a results of misappropriation of funds by government officials.

Another factor worth noting in Nigerian university libraries is that they also serve to support library organisations and the quality of the services rendered to users include: increased staff strength and evaluation of staff performance/productivity (Ikem and Ajala, 2000); management of library operations (Olorunsola, 2000); and preference for e-resources and institutional repositories by users (Abubakar 2011).

### 3 Challenges of ICT for Knowledge Management (KM) in University Libraries in Nigeria

Challenges of ICT for KM are not peculiar to university libraries alone. Verma and Singh (2016) assert that, the road map that some university libraries have taken in their decision-making has not helped the improvement of organisational performance of staff. Therefore, there is need to review and evaluate indicators and suggestions made towards enhancing the development of the organisations on regular basis. The challenges facing university libraries concerning the application of ICT for KM are multifarious. Suggestions made by respondents (Enakrire, 2016), make it possible to categorise them into ICT infrastructure/facilities, personnel, funding, power supply, and the cost of equipment. The acquisition of new knowledge and skills by librarians would not be feasible without a laid down ICT policy in university libraries.

The challenges include:

1. limited personal computers among librarians and desktop/ICT infrastructural facilities in libraries (Okere, 2015; Anuforo and Olayinka, 2010);
2. inadequate ICT staff and literacy (Okiy, 2003);

3. poor funding and expensive nature of ICTs and non-existent telecommunications (Chisenga, 2000) (the cost of equipment in Nigeria, with its battered economy and devalued currency, has contributed significantly to some of the problems in Nigerian university libraries); and
4. unreliable power supply (Anuforo and Olayinka, 2010). The problem of power supply has affected all sectors that require electricity for survival. Many academic libraries now have backup plans for electricity (generators) so that the ICTs can be functional at all times.

Figure 2 provides a summary of the challenges faced by university libraries in Nigeria.

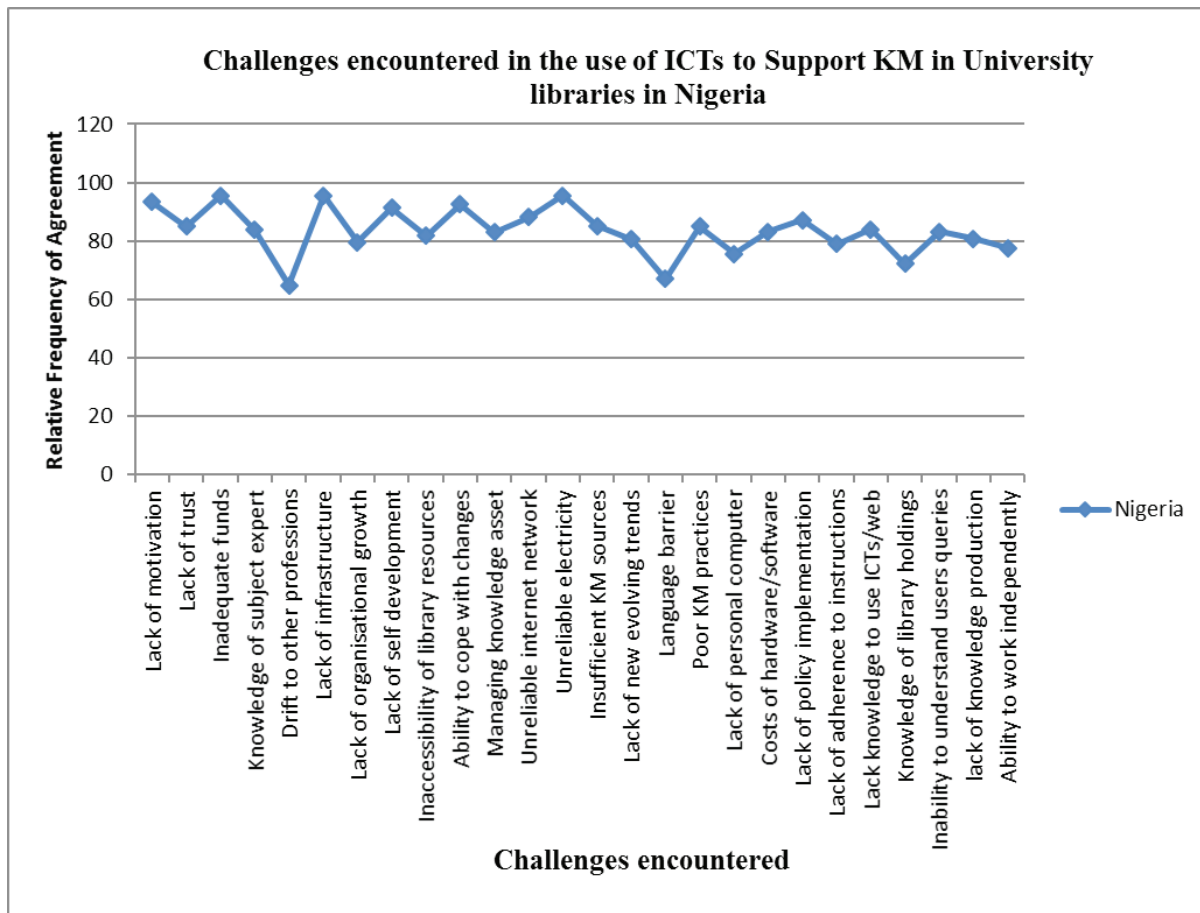


Figure 2: Challenges in the use of ICT in Nigerian university libraries

Source: Enakriri (2016:206)

#### 4 Opportunities of ICT for KM in University Libraries in Nigeria

Studies by Elayadom and Thirunavukkarasu (2018); Rushmansab and Bhaskar (2015); and Sharma (2015) alluded to several opportunities that exist in the application of ICT for KM in present day university libraries across the globe. These include strong research support activities in the university, databases with many volumes of digital collections of thesis and dissertations in institutional repository, availability of, and accessibility to e-resources, accessibility and maintenance of university websites, and intranet connectivity among staff members. Other areas where opportunities are noticed in the use of ICTs for KM in university libraries are:

1. Increased use of electronic resources as reported by Bhardwaj and Walia (2012). Presently, library users now have the opportunity to download volumes of electronic resources from the university library repository/websites without much delay due to the enabled ICTs and Internet connectivity. Librarians have managed their work performance on daily basis through research publications constantly searched on databases in university libraries. This opportunity can only be available if there is strong Internet and bandwidth connectivity.
2. Increased speed and accessibility of information (European Commission, 2012:3). The reason behind the speed of operations and easy accessibility to print and electronic resources utilised by both users and librarians in most university libraries in Nigeria today was the provision of funds by external bodies and the alternate power supply. The provision of funds for the libraries resulted in the acquisition of the available ICT and strong Internet and bandwidth connectivity.

3. Processing and retrieval of large volumes of information (Anunobi, Anyanwu, Oga and Benard, 2011). The processing and retrieval of information is also dependent on the availability and accessibility of ICT facilities, as well as proven tacit knowledge and skills of information professional in discharging responsibility. Best practices in university libraries have shown continual practices and engagement with external body to learn and unlearn ways of improving work performance.
4. Open access and distance education/training (Anunobi, Anyanwu, Oga and Benard, 2011). Open access and distance education/training has become fundamental to university libraries today. It has also affected the changing roles of librarians and users' diverse needs. Open access enables the publication of multifarious research papers, which librarians and libraries could benefit from. University libraries serve as enablers of education and training. The information resources in libraries are used to transform nature and changes in human being. The present generations of library users and information seekers now require information/knowledge in open access. This requires that university libraries and librarians adopt and adapt strategies that encourage open access in service delivery. The more librarians engage in continuous education and training, using different interfaces, the more they would assist in the drive to achieve university library goals.
5. Proper housekeeping mechanisms (Anunobi, Anyanwu, Oga and Benard, 2011). Proper housekeeping mechanism is vital in present day university libraries. The era where users spent lots of time searching for information is past. Therefore, libraries that have not embraced and developed institutional repositories and databases should quickly do so. The management operations can be better organised if proper housekeeping mechanisms are in place. This requires adequate planning, organising, coordinating and evaluating all library operations on a regular basis, in order to address new key roles of the five laws of library science as stipulated by Gorman (1995).

## 5 Discussion and Conclusions

Fundamentally, university library development in Nigeria, like other libraries in the world, has become increasingly technology-driven in terms of information access and services. However, even within Nigeria, the development of academic libraries has not been uniform despite being guided by the university library policy produced by the NUC. While there has been an increase in the number of better and more qualified librarians who could improve library services, infrastructural support has been minimal. Technological support has suffered because of weak infrastructure.

The literature revealed that there have been hardly any new library resource acquisitions, and access to e-resources has been minimal as Internet connectivity is highly affected by poor power supply. This observation supports Rosenberg's comments of more than two decades ago. University libraries in Nigeria have to make effective use of library policies, and embrace technology and staff development to influence and transform university libraries in Nigeria.

In concurrence with related studies by Ani and Edem (2010), who addressed the framework for the effective development of an ICT policy in university libraries in Nigeria; Anunobi, Anyanwu, Oga and Benard (2011), who dealt with the adoption of ICT for library and information services and Abubakar (2011), who emphasised on academic libraries in the 21<sup>st</sup> Century in Nigeria. We are particularly mindful of the observation made by Enakrire and Ocholla (2017:7), published in SAJIM, that,

*"The availability and accessibility of ICTs for KM among the sampled university libraries were not uniform. Infrastructural support has largely affected some of the university libraries. The irregular electricity supply in Nigeria made it difficult to believe that ICTs were functional. The knowledge and skills for using ICT for KM were largely adequate, but varied within the libraries and librarians as well. The need for re-skilling of librarians becomes significant as it would help to bridge the gap and reduce knowledge loss in the library organisation."*

The study concludes that, while not unusual, most African university libraries are poorly resourced and funded. It further observes that, "The challenges facing the libraries are numerous, with inadequate professional staff topping the list. However, irrespective of the challenges they face, libraries have devised strategies to cope and render services" (Enakrire and Ocholla, 2017). The authors suggest that re-skilling of librarians through continuous education is feasible with institutional support, formulation of functional policies, and the provision of fund by the government. These, they posit, will enable a better integration of ICT with KM in the libraries.

This study contributes to the review and re-evaluation of university library development and services in Nigeria that would facilitate the turning of challenges to opportunities, strategic planning and policy making, and research development in present day universities. More support for academic libraries at government and institutional levels is highly recommended. Additionally, benchmarking the libraries with good practice locally and internationally be employed as a tool to help determine the nature and level of support required.

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# Provision of Information Services to the Visually Impaired Persons Using Assistive Technologies at the Kenya National Library Services

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## Abstract

*The chapter assesses the provision of information services to the visually impaired persons at the Kenya National Library Service (KNLS) using assistive technologies. Various suitable assistive technologies obtainable in the market are examined. Similarly, the challenges public libraries face while offering services through assistive technologies are also examined. The study leading to this chapter was conducted at the Nairobi Area Library. The target population comprised of visually impaired library users and library staff selected purposefully based on expert sampling. The sample consisted of one librarian heading the Nairobi Area Library; one head of Visually Impaired Persons (VIPs) unit; two visually impaired library staff serving in the department; two sighted staff working in the section; and five visually-impaired users of the library. Data was collected through interviews and analysed qualitatively. The findings show that there were assorted assistive technologies in the market suitable for use with visually-impaired persons. It was also evident that efforts had been made by KNLS to acquire Job Access with Speech (JAWS) and braille embossers. However, the library lacks sufficient funding to acquire adequate assistive technologies and train the staff to use them effectively. These inadequacies hampered the effective provision of services to the visually-impaired users.*

**Keywords:** *Visually impaired persons, Assistive technologies, Public libraries, Kenya.*

## 1 Introduction

People living with partial and full loss of eyesight have been given less attention by public libraries in Africa. Due to their immobility and accessibility limitations, opportunities available to other citizens are out of reach for them (Todaro, 2005; Koulikourdi, 2008). Assistive Technologies (ATs) are contrivances for increasingly supporting, or improving functional potentials of individuals with disabilities. They entail the use of any tool, equipment or system to facilitate an individual to do chores that are impossible to do without the assistance (Oyelude, 2017). A multiplicity of ATs exists for utilisation in libraries. The choice of which ones to use depends on the financial and functional capabilities of the institution. In this chapter, ATs are considered as the assortment of electronic devices (both hardware and software) that enable persons with visual disability and impeded by physical deficiency, such as blindness or limited dexterity, to access information.

The Kenya National Library Service (KNLS) was founded by an Act of Parliament, Cap 225 of the Laws of Kenya in April 1965 to advance, foster, create and furnish libraries in Kenya. The KNLS plays a double role of both a public library and a national library. The role of a public library was emphasised by the IFLA/UNESCO Public Library Manifesto of 1994 still applicable today (IFLA/UNESCO, 2016). The manifesto provides directives on how to offer information services to all persons notwithstanding their age, race, gender, religion, nationality, language, social status or impairments. KNLS has over 300 registered visually-impaired users in their 57 public libraries strewn all over the country. In their quest to provide information services to all, KNLS has embraced the use of ATs, such as audio navigators, screen magnifiers, and daisy readers for the conveyance of knowledge to visually-impaired persons.

## 2 Statement of the Problem

People living with disabilities in Kenyan libraries have equal rights to access information just like those without. Several legal frameworks and policies in Kenya promote individual dispensations of persons with disabilities and encourage the adoption and employment of ATs. The Bill of Rights in the Constitution of Kenya (2010) states that every person has the right to freedom of expression, which includes the freedom to seek, receive or impart information or ideas. It further states that every person shall enjoy the rights and fundamental freedoms to the greatest extent consistent with the nature of right or fundamental freedom as stated in the constitution of Kenya (National Council of Law Reporting, 2019). In addition, the Persons with Disabilities (Amendment) Bill (2015) states that persons with disabilities are entitled to a barrier-free and disability-friendly environment to enable them to have access to buildings, roads and other social amenities, and assistive devices and other equipment to promote their mobility. These legal frameworks advocate the right to information access by people with disability.

The KNLS has been providing access to print braille materials to the visually impaired persons. However, due to the



changing information demands brought about by the changes in the information environment and technology, this attempt is insignificant considering the spread and range of visually-impaired persons. Many information services exist in alternative media more favourable to their information needs than print resources. Despite several policies and legal framework espoused to endow information services to visually-impaired persons using assistive technologies, effective information access is negligible. Limited books can be accessed using ATs, namely braille, but these are limited in copies and format. This lack of inclusivity has discouraged many visually-impaired persons from coming to the library to access information. Providing equal access to library services is an ever-ending practice that must be evaluated periodically as new technologies emerge and impact the access and exploitation of information resources (Carter, 2004).

This chapter examines the provision of information services to the visually-impaired persons using ATs at the Kenya National Library Service. Specifically, the chapter identifies the ATs existing in the market that is used by KNLS to proffer information services to the visually-impaired persons; elaborates the factors guiding KNLS in selecting assistive technologies; and explores the challenges that librarians and library users encounter while using ATs at KNLS.

### **3 Research Methodology**

The study anchoring this chapter espoused a qualitative case study design. The site of the study was the Kenya National Library Service, Nairobi Area Library. The Nairobi Area Library which is located in Upper Hill, was identified based on its size, history and readership that include physically challenged users. The population of the study constituted 65 visually-impaired registered users served by the library and 6 librarians working in the visually-impaired department. From the 65 registered visually-impaired users, five (5) were selected purposefully based on the regularity of their visits to the library. In addition, a census of all the six librarians directly working with visually-impaired users was done. These comprised of the head of the Nairobi Area Library (1), head of visually-impaired department (1), two visually-impaired library staff serving in the department, and two sighted staff working in the section. Data was collected using interviews and analysed qualitatively using content analysis.

### **4 Findings of the Study**

This section highlights the findings of the case study on the provision of information services to the visually-impaired users through assistive technologies at the Kenya National Library Service.

#### **4.1 Assistive technologies for Visually-Impaired Persons (VIPs)**

The study sought to identify the ATs obtainable in the Kenyan market. The focus was especially on those that KNLS was utilising to provide services. The reason was to understand the types of assistive technologies the library was using, the available ATs, and the adequacy of the services rendered through the ATs.

The findings indicate the availability of ATs such as JAWS, braille embossers, magnifying glasses used by public libraries in the Kenyan market. The study further confirmed that KNLS was already using ATs such as Job Access with Speech (JAWS), Braille embossers, Duxbury Braille Translator (DBT) and audio dictionaries. The study affirmed that there were numerous ATs obtainable in the market as attested by The National Council for Persons with Disabilities (2019) that include, computer software like JAWS, motorcar to aid mobility and sign language translation. The study found that the use of ATs was low. The low use of ATs by KNLS was attributable to lack of technical knowhow, compatibility challenges and inadequate funding and mobility issues. This affected the delivery of services to the visually-impaired users as affirmed by all the respondents who acknowledged that the ATs were few and inadequate. For instance, the JAWS screen reader software in use was outdated (version 16, yet the current one is version 22) by five years. The research also revealed that visually-impaired library users and staff used ATs for a variety of purposes. These included reading, accessing information, and retrieving Internet contents. The users also required assistance in the use of ATs. Below is a listing of existing ATs in the library.

##### **4.1.1 Reading assistance software devices**

These consist of screen magnification and readers. These assist the visually-impaired users in reading digital content. Computer screen magnifier is purchased to fit one's computer screen. They include JAWS and magnifying glass.

The JAWS is a screen reader software designed for computer users with vision loss that inhibits them from seeing the screen content or navigating with a mouse. This provides the user with distinctive, intelligent tools for steering the Web pages and screen content. It provides speech and Braille output for computer applications on personal computers. The JAWS software is designed to operate with Microsoft Office, Google Docs, Chrome, Internet Explorer, Firefox, Edge and espousals Windows® 10, Windows 8.1, and Windows 7, in addition to touch screens and gestures. By reading aloud the contents on the PC screen, JAWS provides the user with a unique set of smart tools to circumnavigate and access Web pages. At the time of the study, KNLS was using an older model (Version 16) of JAWS yet the current version in the market is Version 22. This is attributed to lack of funds to acquire new models. Efforts were being made to acquire

latest versions. Magnifying glasses on the other hand aid low vision impaired persons. The study established that the library owned two magnifying glasses used by clients.

#### 4.1.2 Braille technology

This technology is used by the blind or visually-impaired users to access and create braille. These included:

*Braille Embosser* – Braille embosser is a contact machine that creates tactile dots on heavy paper, making written documents accessible to sightless individuals. They differ in purpose, cost and quality of paper used.

*Duxbury Braille Translator (DBT)* – They are used to ensure that the file sent to braille embosser is transcribed and proofread well. Professional translation software is used. The study noted that KNLS uses Duxbury Braille Translator (DBT) to translate and format content by automating the conversion from regular braille to print (and vice versa). In addition, it provides word-processing facilities working directly in the braille and the print.

*Braille transcribers* – It transliterates information from a print textbook into a braille version and then transcribes it into braille to enable a person who is blind or has low vision to acquire similar message as those using regular books.

*Scanners* – These are Optical Character Recognition (OCR) systems used by the sightless to scan printed text and then have it spoken in artificial speech or saved to a computer file. This technology assists in scanning, recognition, and reading text.

#### 4.1.3 Auditory access devices

These assist sightless or visually-impaired users to access print and information. They include talking books and machines explicitly intended for users with audio books. They constitute the following;

*Audio Dictionary*: The study attested that audio dictionaries were in use. They are electronic dictionaries with speech that may be used by a scholar who cannot access a print dictionary. The hand held dictionary has an inbuilt thesaurus, battery operated and a standard (QWERTY) keyboard. Words are generated in both a vocalized and large print format.

*Speech Recognition Software*: Dragon Naturally Speaking-Speech recognition software changes spoken words in writing and can make computer work easier and faster by interactions and control of PC to perform tasks such as creating documents, spreadsheets, presentations, send email, and search the Web through voice commands. This device existed at KNLS, but is only used by the library staff.

Audio navigator currently exists in the library to guide visually-impaired users to navigate through audio book chapter by chapter and page by page. It has a sound feature that reads the book loudly.

#### 4.1.4 Mobility aids

These devices enable the user to steer their way inside the library. The study confirmed that these were mainly owned by the patrons. Patrons with low vision used them for mobility within and inside the library. Those used included walking sticks, walking frames, and white canes.

## 4.2 Factors considered in selecting Assistive Technologies (ATs)

The study explored factors that KNLS considered to select ATs currently being used. The respondents gave the criteria that were applied at the point of consideration to acquire as follows:

### 1.1.1 Needs of the visually-impaired users

This was reported as a factor considered by the staff in acquiring ATs as quoted by the head of department.

*“We go by what our VIP requires. Different VIPs have different needs but we tend to concentrate on the majority since we have financial limitations”.*

### 1.1.2 Compatibility

For the assistive technologies utilising PCs or smart phones, the study ascertained that the librarians first check for compatible software or hardware that is available in the library in line with the device to be acquired. For instance, JAWS is well-suited for Microsoft Office, Google Docs, Chrome, Internet Explorer, Firefox and Edge. To upgrade the current JAWS, the library must consider the compatibility of the systems in place.

### 1.1.3 Affordability

The study confirmed that the library lacked adequate ATs due to financial resources. Affordability is one factor which determines what is to be acquired as attested by the head librarian.

*“The library considered buying DAISY READERS worth over USD 350 each but considering the number of KNLS branches this would be very expensive”.*

#### 1.1.4 Availability

The library considers ATs only if they exist in the local market. Where the device is not locally available the idea is dropped and alternatives sought.

#### 1.1.5 Usability

Considering that KNLS caters for many physically challenged users, for instance, the level of visual disability differs from one to another. In addition, visually-impaired persons have different disabilities. These facts have to be considered as attested by the respondents.

*"We consider the use the device will be put into".*

#### 1.1.6 Appropriateness

This entails considering whether the device is appropriate for use in the library. For instance, Dragon Naturally Speaking-Speech recognition software requires Internet to operate since conversion is done in the clouds. It is inappropriate where the Internet is unavailable.

#### 1.1.7 Ease of use

The library also considers how simple and trouble-free the use of ATs is to the user especially in retrieving and using the information.

### **4.3 Challenges encountered by the library Staff and Users Using Assistive Technologies**

The study established that KNLS was utilising several ATs in delivering information services to visually-impaired persons. However, their use was not far-reaching due to several challenges explained below:

#### 1.1.1 Usability of ATs

Visually-impaired library users had challenges in exploiting the ATs such as adjusting a computer screen magnifier or activating the JAWS software. This was attributed to users not having frequent interactions with these ATs. The visually-impaired users also depended on friends with good sight to assist them when using these ATs.

#### 1.1.2 Availability of ATs

The study contended that the library had challenges with the availability of the ATs. For instance, scanners and braille devices are only imported through specific dealers and non-governmental agencies and is, therefore, not easy to obtain in the local market. This makes acquisition a big challenge for the library. Users had to make do with the limited devices available. The study concluded that the available AT devices were not sufficient.

#### 1.1.3 Cost of ATs

Findings attested that most ATs were expensive since they were imported through specific dealers. The financial state of most visually-impaired users makes the ATs out of their reach. Moreover, the library depends entirely on government funding, which is limited. Some ATs such as braille transcriber, JAWS software, screen magnifier software, audio devices are costly. For instance, the study found that one audio navigator was priced at USD 300 while a DAISY Reader cost USD 349. This is on a higher side for an ordinary Kenyan to afford.

#### 1.1.4 Inadequate training

The study ascertained that users experienced difficulties in activating the JAWS software. Moreover, the study affirmed that available staff in the department lacked skills in the application of ATs. Braille transcriber and braille embossers require training to use. The visually-impaired library staff lacked sufficient skills to operate ATs and depended on their sighted colleagues to take them through the process. This contributed to information delays to users.

#### 1.1.5 Mobility challenges

The library floor arrangement was not suitable for the mobility of the visually-impaired persons. Only personal ATs existed. This study concluded that visually-impaired persons were not factored in during the design of the library. The researcher further affirmed that even where the visually-impaired users were assigned occupancy, books and boxes littered the floor. In addition, the section was situated in the far corner of the library making manoeuvring to the section backbreaking for the visually-impaired users. This is corroborated by Bhardwaj and Kumar (2017) who found that many visually-impaired students in Indian colleges could not access the college notice board or existing facilities and resources in libraries since the designer of the workplace failed to conform to the accessibility standards developed for visually impaired students.

### 1.1.6 Technological challenges

The study established that although KNLS had a wealth of information in digital format, the visually-impaired users were forced to travel to the physical library to access resources. This is attributed to lack of appropriate ATs online for accessing information remotely. The use of information resources was confined to the physical library or virtually but within the vicinity of library surrounding.

### 1.1.7 Lack of technical knowhow

The findings revealed that the staff and users lacked skills in the use of current ICT-related ATs in the marketplace. They tend to use those that were simple and non-technical in operation. Koulikourdi (2008) corroborates the findings that Greek libraries tend to adopt more traditional products and services such as wheelchairs and ramps because of ignorance of the state of the art technologies.

### 1.1.8 Compatibility issues

The study established that the majority of the ATs were old and outdated and could not be used with the most of the current PCs.

## 5 Conclusion

Provision of information services to visually-impaired persons is a mandate of the public library considering that they have rights to access information as enshrined in the constitution. The KNLS endeavours to deliver information services to visually-impaired users but the organisation is handicapped owing to numerous challenges such as limited funding and lack of staff with technical skills to offer assistance to the visually impaired. There are ATs such as JAWS and braille technology existing in the market that can be acquired using different buying options that public libraries can explore to reduce costs. Assistive technologies, such as speech recognition software, come with a number of challenges which can be resolved to enhance access to information by the visually-impaired.

## 6 Recommendations

Based on the findings of the study, the researcher proposes the following:

1. Extend online information services to be accessed off the library premises. To address mobility challenges for the visually-impaired persons, KNLS should enable online access using their own assistive technology. The study recommends that the public library management should consider extending electronic remote off-Library access to increase information access coverage. Additional aspects such as authentication requirements can be introduced to ward off unauthorised users.
2. Acquire more ATs – This will help to cater for the ever-increasing information needs and the number of visually-impaired users as revealed by the study. The researchers recommend the acquisition of more computers for the visually-impaired users installed with the newest editions of AT software and hardware.
3. Market the AT services. Very few visually-impaired users visited the library, a concern attributed to information asymmetry on the existence of services to visually-impaired users.
4. Training visually-impaired users and staff on ATs. The study discovered that staff and visually-impaired users who handle the existing ATs were not efficient and sufficiently skilled in the AT devices.
5. Public libraries in Kenya are struggling to get sufficient funding to support their services. Considering ATs are quite expensive, alternative methods of acquiring the same ought to be explored by the management so that they become affordable. These may include using open source software or entering into a consortium of libraries to share costs of acquiring and utilising the ATs.
6. Technical assistance should be accorded to the staff and users who are not familiar with the ATs existing in the market. The study suggests hiring the services of professionals to provide practical guidance on the suitability, application and maintenance of ATs. This will help reduce wastage and add variety of cost effective devices.

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# Methods Used by Visually and Hearing Impaired Students in Accessing Information Resources at the University of Nairobi Libraries

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## Abstract

*This chapter explores the methods used by the visually and hearing impaired students to access information resources at the University of Nairobi (UoN) libraries. The objectives of the study on which this chapter is based were to identify the type of information searched for by the visually and hearing impaired students in the UoN libraries; determine the accessibility of the information sources in the UoN libraries; examine the types of assistive technology used by the visually and hearing impaired students in the UoN libraries; analyse the usability of the methods applied to access information resources by the visually and hearing impaired students in the UoN libraries; determine the challenges; and suggest solutions on how to enhance the access of information resources by the visually and hearing impaired students in the UoN libraries. The sample population comprised of 13 visual impaired students, 7 hearing impaired students, 9 UoN library staff, the DVC-Academics, and Dean of Students. The study employed both qualitative and quantitative research techniques which collected data using questionnaires. Snowballing sampling technique was used to connect with the respondents. Data was analysed using a combination of qualitative and quantitative methods. The study concluded that the major information sources that were consulted are textbooks, journals, and electronic media. The study revealed that the UoN libraries have inadequate assistive technology facilities; the librarians offering user services have insufficient knowledge of assistive technology; there is no room dedicated to students with impairment; as well as visually and hearing impaired students are not aware of the library services and the way to access them.*

**Keywords:** *Visually Impaired Persons, Hearing Impaired Persons, Information Services, University of Nairobi, Kenya*

## 1 Introduction and Background

Information needs is defined as the inadequacy of appropriate information that library users consider to better their present status (Wu, He and Luo 2012). These needs encompass the physical, physiological, social-cultural, economic and general perspectives of life. Considering a user's ability to access, retrieve and use the library resources, a number of factors should be met to achieve maximum satisfaction. Impairment of any kind is, therefore, a factor that hinders the access, retrieval and use of library resources without assistive technologies (Krug *et al.*, 2016). Singh and Rani (2013) states that, basic skills should be imparted to both abled and disabled students to facilitate effective accessibility, retrieval and use of library and its resources. A visually-impaired Student is one who has been determined by the ophthalmologist to have a visual loss or no vision while a hearing impaired student is one whose hearing ability has been lost partly or completely (Krug *et al.*, 2016).

The United Nations Organisation (UNO) postulated that, for people with visual and hearing impairment to live independently and have a full participation in all aspects of life, state parties should ensure appropriate measures are taken to facilitate people with disability access, equal with others, to the transportation, information and communication, physical environment, organisations and systems, and other services provided to the public (UNO, 2014). The UoN libraries have to facilitate accessibility and use of information materials by its percentage. They must ensure that the visually impaired students and hearing impaired students are not disadvantaged.

## 2 Rationale and Objectives of the Study

Case (2012) explains that hearing impaired students are expected to use the library information resources the same way as their hearing counterparts. The UoN libraries have both abled and disabled students that compete for resources and services. Some of the studies done in line with the study include: an assessment of library services for blind and visually impaired people (Bernardi, 2004); Improving access to services to physically impaired students, (Ekwelem, 2013); review of library and information services for the visually impaired (Rayini, 2017); and an investigation of challenges faced by the visually impaired in accessing the library resources (Kiambati, 2015).

A number of studies have been conducted but none has zeroed in to the role of librarians in the meeting the information needs of the visually impaired and hearing impaired students. Rayini (2017) argues that the responsibility of planning, operating, monitoring and implementing library services should be designated to a senior member of staff. He further states that the staff should be trained on disability awareness and practical skills through an in-service programme. The

study was motivated by a previous study conducted by Kiambati (2015) who recommended that research on visually impaired students has been inadequately conducted in Kenya and therefore a study should be done on how the visually impaired students access the library. In addition to that, there is a communication breakdown at the UoN library whenever visually and hearing impaired students access, retrieve and use the library. Therefore, the study on the methods used by the visually and hearing impaired students to access information resources at the University of Nairobi libraries was necessary. The study explored the methods used by the visually and hearing impaired students to access information resources at the University of Nairobi libraries. The study presumed that the UoN visually and hearing impaired students using UoN libraries have information needs that are to be met by the librarians. The study contributes to knowledge creation about the methods used by the visually and hearing impaired students to access information resources whereas other researchers will use the study as a basis for their research development. The study may also improve services in the UoN library if the management will implement its recommendations.

### 3 Literature Review

Soar (2013) states that a number of students with disability seek the assistance of library staff in accessing, retrieving and using the library materials. The World Health Organization (WHO); estimated that by March 15<sup>th</sup> 2018 285 million are visually impaired, 39 million are blind and 246 million having low vision; 65 % of people visually impaired and 82% of all blind are 50 years and older, 432 million adults and 34 million children have hearing impairment (WHO, 2011).

Higgins (2013) opines that libraries are organisations which are set up to offer services to both abled and disabled users without any discrimination. Kumar and Sanaman (2013), explain that great opportunities have been provided for people with disability through the development of assistive technology. This is made possible through the acquisition and training on assistive technology facilities which ultimately revamp their lives in an efficient, productive and results oriented way. Shonn (1999) cited in Eskay and Chima (2012) asserted that visually impaired students have a large scale of special needs because of their sensory limitations. This is brought by person's abilities, learning styles, attitudes and motivation.

Communication and sight is the centre point of library services provided to the visually and hearing impaired students. This concept requires extra endeavour, endurance, information and technological assistance between the library resources and library users. Kiambati (2015) confirms that information needs of the visually impaired students are met through a thorough preparation of the librarians offering user services. Due to sight limitation, they often do not use the library.

Moore (2000) states that the library and the hearing impaired students rarely know one another. This is because of the challenges they meet whenever they visit the library to satisfy their information needs. Subramaniam *et al* (2013) posited that, students with special needs have preferred formats of resources. Access, retrieval and use of information resources in the library by disabled people would be made possible by the assistive technology. Moore (2000) opines that the degree of impairment of the library user would dictate the type of assistive technology to be used.

Moore (2000) explains further that the hearing impaired students would use the Text Telephone (TTY) available in the library for calling the librarian for reference services or any other unique general information. The accessible Internet would facilitate effective accessibility, retrieval and use of information resources. Audio and visual feedback should be enabled through the audio tracks by the open-captioned audio files in their downloadable transcript files.

Wang and Yu (2017) report research studies done on computers and Internet as a method of accessing information by visually impaired and hearing impaired students. They explained that persons living with disabilities use this method to write and receive mails, instant messaging and chatting, playing computer games, and online community projects. Moore (2000) explains that hearing impaired students use assisted real-time captioning and computer-assisted note taking in their studies through running a text of information when it is being shared. Sign language and oral interpreters in the library would achieve much if included in the library orientations, information literacy training and bibliographic instructions.

During emergency and announcements, Moore (2000) explains, the library should install both audio and visible systems to alert both the visual and hearing impaired students during fire and other security alarms. He further recommends that there is need for a separate well-furnished room located away from the larger library, but within and integrated into the library collection, for the visually and hearing impaired students. This is because the sounds produced by the assistive technology facilities they use may irritate other library users or distract them.

Wang and Yu (2017) explain that visually impaired students access, retrieve, and use information through interpersonal channels. These include friends, family, medical practitioners, and neighbours whom they talk to. Through self-help groups, newly-diagnosed individuals get encouraged and helped to meet their informational needs. He further stated that, the visually impaired students commonly use mass media for problem-solving. Libraries also provide formal organisational resources to the visually and hearing impaired student (Wang & Yu 2017).

Bernardi (2004) suggested that targeted methods such as access to specific catalogues, digital texts, Digital Talking Books (DTB) and special formats inter-library loaning should be used in meeting the information needs of visually and hearing impaired students. Adetoro (2015) suggests that, visually impaired people living in Nigeria would utilise the library materials better than they are doing now through transcribing into alternative or adaptive formats. Bodaghi and Zainab (2013) reports that, visually impaired students at the University of Malay have designated space and carrels which make them feel a sense of belonging, comfortable, safe, easy and accepted since they can interact with peers, sighted students and volunteer readers within the library facility.

Mansa (2007) states that through the programmes available in the current information age, visually and hearing impaired students can manipulate available electronic resources in meeting their information needs. The staff working in the library offering user services would ensure that computers installed with talking computer software (such as NVDA or Jaws) are in good condition and connected to enable access, retrieval and use. Voice recognition software is used to feed data into a computer by voice. Shonn (1999) defines Braille information materials as a system of reading where raised dots are used to represent letters that are read through touching commonly used by both visual and hearing impaired persons. Scanning of information resources is a method commonly used by visually impaired students to access and use course work, lecture notes and printed information resources.

The visually impaired students that suffer from partial sightedness can use the screen reading software that interprets and translates text and graphics into auditory output. They can also use the large prints which Shonn (1999) defines as information materials in large font size. This is to be availed by the librarians. Kumar and Sanaman (2013) explain that students with visual and hearing impairment not only need infrastructure and assistive technology facilities but also information materials in accessible formats depending on the degree of their impairment. He further records that the most preferred format amongst the visual impaired students is the 'Doc' type because it is completely compatible to screen readers in today's market. It is also easy for users to make changes on the information. Daisy player is a portable device that visual impaired students could use in reading the digital documents. Wang and Yu (2017) argue that screen magnifying software that facilitates the enlargement of texts and graphics on a wide range of scales can be so friendly to use by the visual impaired students.

#### 4 Methodology

The study used a mixed research methodology to gather both qualitative and quantitative data using Google forms. Respondents were selected through purposive sampling technique. The researchers contacted the identified respondents for their email addresses to facilitate distribution and return of the questionnaires. The questionnaires had both closed-ended and open-ended questions. Microsoft Excel was used to analyse and represent quantitative data in tables and figures while qualitative data was analysed systematically as per the objectives. Out of a total population of 19 visually impaired students 13 responded; 7 hearing impaired students 5 responded; all the 9 librarians responded; and all the 2 UoN administrators responded.

#### 5 Findings and Discussions

The total population of the study comprised of 37 respondents and all the concerned made the sample size. Table 1 displayed the response rate. There was a relatively high rate of (91.89%) that responded. This is because the researcher personally called the respondents before administering the questionnaires and constantly reminded them to fill and send them back.

Table 1: Response rate of Respondents

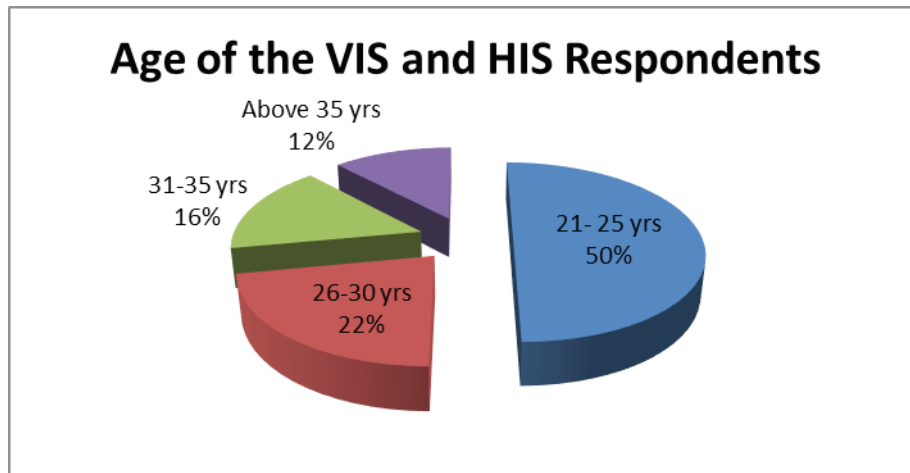
Group of respondents	Distributed	Returned	Percentage %
Visually Impaired Students	19	13	94.74
Hearing Impaired Students	7	5	71.43
Library staff	9	9	100
UoN Administrators	2	2	100
<b>TOTAL</b>	<b>37</b>	<b>34</b>	<b>91.89%</b>

#### 6.1 Demographic Information

##### *Age*

Figure 1 shows that the majority 9-(50-%) of the visually and hearing impaired student's respondents are aged between 21-25 years and the rest of the respondents fall in the bracket of 4 (22 %), aged 26-30 and 3 (16 %) aged 31-35 years and above 35 were 2 (12%). This is a normal age bracket for undergraduate university students since they have just finished the secondary education and are in their rightful ages of 2<sup>nd</sup> and 4<sup>th</sup> year of their education. Therefore, the young age bracket of library users requires effective preparations done by the library staff for their immediate digital need.





**Figure 1: Age of the respondents**

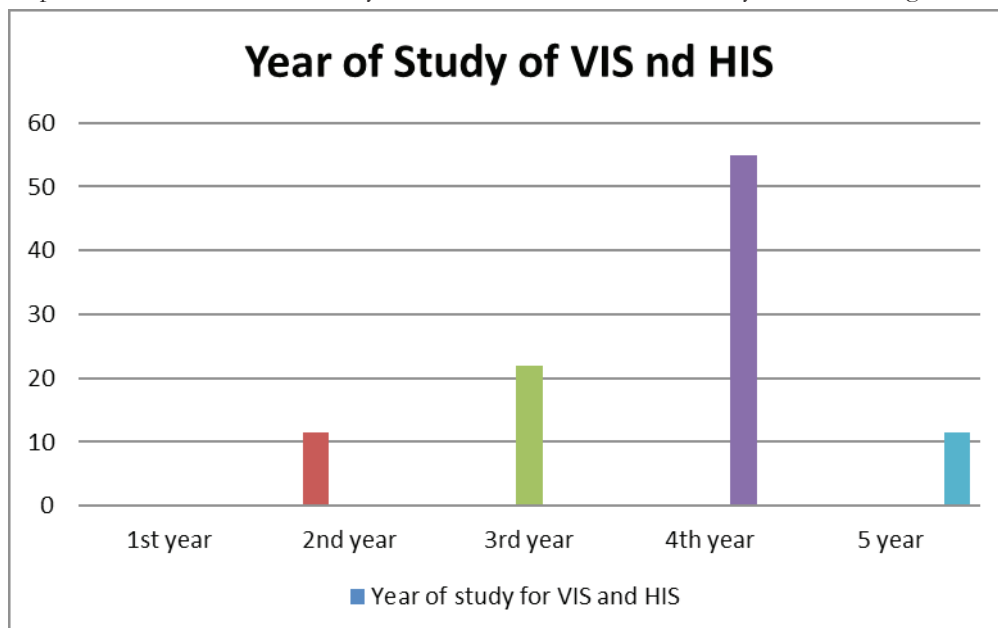
Source: Research Data

*Gender*

The findings show that most 14(78%) of the visually and hearing impaired students' respondents are male and only 4(22%) are female. This study corresponds with a research done by Kiambati (2015) and Ekwelem (2013) that at Kenyatta University, the percentage of the male visually impaired students is higher than the female visually impaired students who responded in her research while the same was recorded at Enugu State University of Technology were majority of the respondents with disability were male. It is not surprising, therefore, to find the same trend in the University of Nairobi.

*Year of study*

Figure 2 shows that the majority 10(55%) of the visually and hearing impaired students are in year 4 while the rest of the respondents are in year 3 4(22%), 2(11.50%) year 2, 2(11.50%) in year 5 and none was in year 1. The findings reveal that a large percentage of the respondents are in their final year. This concurs with Kiambati (2015) that most of the respondents of that level of study have accessed and used the library thus knowledgeable of the study.



**Figure 2: Year of study of VIS and HIS**

Source: Research Data

**6.2 Type of information resources searched**

Figure 3 shows that most respondents 12(66.7%) searched for text books followed by 11(61.1%) reference work, 10(55.6%) journals, 10(55.6%) electronic media, 7(38.9%) information in the Internet, 6(33.3%) newspapers, 5(27.8%) emails, 5(27.8%) audio visual, 4(22.2%) reports, 4(22.2%) dissertations and thesis, 3(16.7%) government publications

while 2(33.3%) searched for monographs. This is attributed to the fact that the visually and hearing impaired persons mostly visit the library to meet their educational needs. This agrees with Atabor (2015) that text books were the most frequent sources of information.

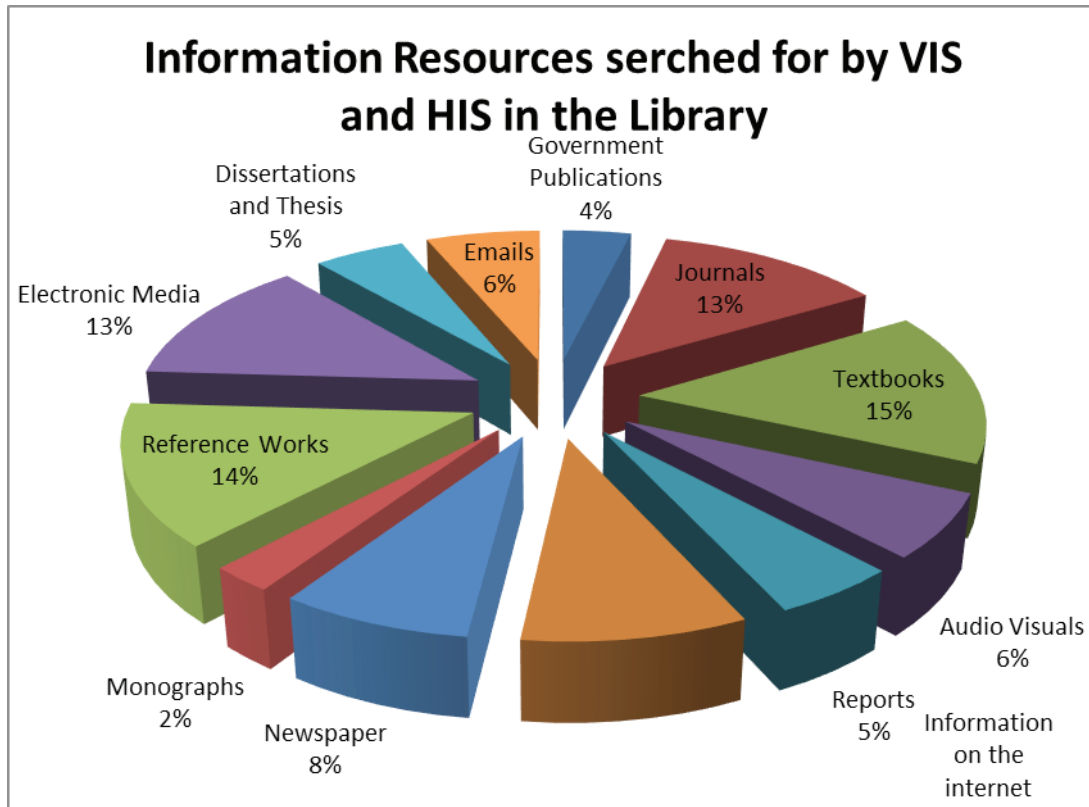


Figure 3: Type of Information Resources Searched

Source: Research Data

### 6.3 Accessibility and use of information resources

The findings show that 14(78%) of the respondents were able to access library resources without any assistance while 4(22%) of the respondents needed help from the library staff. This can be attributed to the fact that individual information literacy skills are imparted to them way before they visit the library. Ayiah (2007) and Soar (2013) argued that the library staff play a vital role in the access and use of information resources in the library. The support enables them to complete school assignments on time unless they are aware that the service is not in the library.

The majority of the respondents 12(66.67%) used library resources by themselves while 6(33.33%) required assistance in-order to use the library materials. This is contrarily to the finding of Kiambati (2015) that visually impaired students at Kenyatta University experienced a challenge in using the library resources. Dermody (2011) revealed that visually impaired students used information resources comfortably without help since they depended on new audio visual technology which is well-matched with the assistive technology for reading.

### 6.4 Type of assistive technology by visual impaired and hearing impaired

Table 2 shows that 7(53.85%) of the respondents used JAWS for Windows in accessing information materials and large prints respectively while 2(15.38%) used Braille books. For the hearing impaired students, 4(80%) of the respondents used hearing aid assistive technology to access the information resources while the other 1(20%) of the respondents used Cochlear implant. The results of this study are not unusual from a study conducted by Stephanie *et al.* (2014) who found that assistive technology are costly and most institutions may not afford them. Coetzee (2016) and Agboke (2015) found that the method used to access and use information resources in the library is dependent to the nature of impairment. In addition to that, there is need for more assistive technology in the library to support learning and research in the library. The study reveals that caption resources and audio visual resources translated from print resources and vice versa should be made available for use.

Table 2: Type of Assistive Technology by Visual Impaired and Hearing Impaired

Type of Assistive Technology	No. of Frequency	Percentage
Jaws for windows	7	53.85%
Braille books	2	15.38%
Large Prints	7	53.85%
Cochlear implant	1	20%
Hearing Aid	4	80%

### 6.5 Challenges

The respondents were asked to list the challenges that they face in meeting their information needs. They listed the obstacles below:

1. Small font size used on the mark the spines of books on the shelves and the shelves labelling.
2. Shelves in the library are far away from the reading area making picking books a challenge.
3. The library staffs have inadequate knowledge and skills in assistive technology thus limiting their capacity to offer services.
4. The library lacks Braille text books.
5. Insufficient number of computers with installed assistive technology facilities.
6. Lack of a designated room for visually and hearing impaired students in the library.
7. The visually and hearing impaired students have inadequate information on library services and how to access them.

### 7 Conclusion

The study has revealed that the majority (82%; n=9) of the visually and hearing impaired students respondents are male; the visually and hearing impaired students respondents have a preferred type of information source that they search for in the library; most of the visually and hearing impaired students respondents get help form the librarians in meeting their information needs; and the method used to access information was determined by the type of disability and availability of the various Assistive technology facility. The primary problem for the visually and hearing impaired students is the involvedness of obtaining the relevant information. The level of satisfaction achieved from the librarian service was moderate. The most important concern identified by the visually and hearing impaired students were insufficient assistive technology, low awareness of library services, lack of competent library staff that offer user services, low budgetary allocation for specialised services, and lack of training on the assistive technology and its usage.

### 8 Recommendations

The authors recommend that there is need for adequate assistive technologies provided for visually and hearing impaired students to use in accessing information resources; better and detailed hands-on information literacy training should be done to improve competencies in using assistive technology; set aside a separate room for use by the visually and hearing impaired students to facilitate better use of assistive technology since the privacy and confidence of the students is compromised when they are mixed with other library users; the library staff should be equipped with special skills attitudes to offer better services; and a bigger budget allocation is required to support the requirements needed for improved services.

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SECTION 7:  

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MANAGEMENT  
OF ELECTRONIC  
RECORDS  

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## Accessibility and Utilisation of Multimedia Records in Mass Media Organisations in Kano State, Nigeria

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### Abstract

*Effective records management is a major element of the governance of any organisation. Despite the crucial role played by records management in organisations, there is a consensus amongst researchers that many organisations, both public and private, pay little attention to the management of records. The study underpinning this chapter was designed to assess the accessibility and utilisation of multimedia records in mass media organisations in Kano State in Nigeria. The objectives were to identify the extent to which these records are accessible for use; the purposes for their utilisation; and the obstacles to their effective accessibility and utilisation in those organisations. Cross-sectional survey research design was employed in conducting the research. A questionnaire was administered to respondents comprising of records managers, administrative officers, journalists, editors, and newscasters. A total of 181 questionnaires were distributed to respondents in the 14 mass media organisations in Kano State. Of these, 165 were returned and deemed usable. Descriptive statistics applying frequency and percentages was used for data analysis with the help of SPSS 16.0 version. The results of the study revealed that despite the indispensable value of records, several obstacles including poor retrieval tools, insufficient funding, poor facilities and storage equipment were some of the factors affecting the effective access and use of multimedia records in these mass media organisations. These factors make the access, retrieval and use difficult for the users. The author recommends the use of records standards and policies to enhance accessibility and utilisation of multimedia records.*

**Keywords:** *Accessibility, Utilisation, Multimedia Records, Media Organisations, Nigeria.*

### 1 Introduction and Background Information

The success of any organisation depends, to a reasonable extent, on how best various forms and formats of records are managed in it. Penn, Pennix and Coulson (1994) as cited in Makhura (2005) indicated that most organisational transactions depend on the proper creation and maintenance of recorded information. The medium on which the recording of information could be done may be paper, microfilm, audiotapes, videotapes, photographs, slides, or any computer-readable medium, such as computer tapes or disks, compact disks and optical disks. Gold (1995), described an organisation's management of its records as the "corporate ... secret weapon" and "the winning strategy" that gives the organisation a competitive edge. In spite of this crucial role records play, few organisations, including mass media institutions, pay attention to the management of this corporate resource. Despite the fact that information organisations (such as mass media) are continually being called upon to function in a business-like manner so as to be self-sustaining and to remain competitive, they overlook the enormous advantages that proper records management practices could contribute to the achievement of their objectives (Mnjama, 2002).

Records as carriers of information are increasingly being used as a corporate resource to improve productivity, efficiency and effectiveness. Mass media organisations generate and/or receive such records on variety of physical and electronic media. The growing sophistication in administration practices and the increasing complexity of organisations, together with the enormous expansion of the quality of records produced, has made it necessary to introduce conscious management strategies for effective handling of records and archival resources in mass media organisations. The primary concern of any records management programme is to have efficient, effective, and economical management of records and information. Proper records management ensures that information is available when and where it is needed, in an organised and efficient manner. While the importance of records management might not be obvious to everyone, its impact on the ability of a mass media organisation to function effectively is indisputable. In support of this, Shepherd and Yeo (2003) stated that it is only through the operation of a well-run records management programme that an organisation retains control of its corporate memory, which enables it to conduct business.

In the last five decades or so, the media and its influence on the society, has grown exponentially with the advancement of technology. There are many types of mass media in Nigeria and the world in general. Each type plays an important role in the society. Hassam (2011) explained that mass media is a broad term which includes everything or anything that conveys a message to the masses. From newspapers to books, from radio to television, from the mobile phones to iPods and to the Internet, all are included in the category of mass media. Though the term was coined in the 1920s when the radio and the television were revolutionising the world, the concept of mass media is as old as the human civilisation itself. The only difference is that in the past, the lives people did not depend on the mass media like it is today.

Kano is one of the largest cities in Nigeria with a population estimated in 2007 to be 9,848,885 people. The principal inhabitants of the city are the Hausa and Fulani people. Kano is an important Islamic city of the West African Savannah for centuries. It has long been the economic centre of northern Nigeria and centre for the production and export of groundnuts. Kano houses Bayero University, colleges, polytechnics and other higher institutions of learning. The state is well known for its culture, traditions and hospitality due to its diverse populace. It's growing consciousness on education and knowing the vitality of information motivated the establishment of both private and government media organisations in the state.

In Kano today there are many types of mass media organisations which provide information through radio, television and newspapers. They contribute greatly by bringing about political, social and cultural awareness and understanding among the people in the state and Nigeria at large. Additionally, mass media contributes to the industrial sector by providing avenues for advertisement. These important roles played by media houses inspired this study on how their records are accessed and used by their staff for the benefit of the public.

## **2 Purpose of research**

The importance of records in any organisation cannot be overemphasised. However, in many organisations, including mass media institutions, records are not regarded as important resources that may influence the effectiveness of the institutions. Although legislation regulating the management of records exists, there is some level of ignorance that could have adverse effects on the performance of the organisations particularly the mass media organisations whose ultimate role is to provide accessibility and utilisation of information (Norris, 2002). For records to be effectively accessed, retrieved and efficiently utilised, they must be properly selected, organised and preserved. Ideally, therefore, mass media organisations are expected to manage the records they generate and/or receive for easy retrieval of information. Accessibility of records in mass media organisations is paramount to the success of the organisations. Employees need information in order to carry out their official duties and responsibilities efficiently and effectively. Records are major sources of information and are almost the only reliable and legally verifiable source of data that can serve as evidence of decisions, actions and transactions in an organisation (Wamukoya, 2000).

Access to broadcast content is extremely difficult, because of its availability in proprietary formats like film and broadcast-standard videotape, which need special players, certainly unavailable to the general public and often unavailable even to other national institutions. Most of the content cannot be allowed to circulate in general. The major objective of the digital preservation of the broadcast records is the preservation for access (Singh, 2009). The typical problem of request for copies of tapes is another challenge, particularly when they come from broadcast companies. Also, when retrieving records, the time spent on searching for missing or misfiled records is non-productive. It has been estimated that staff spend as much as 10% of their time at work searching for information, a situation which could be improved upon through the timely removal of duplicate and unnecessary records, standardisation of filing systems and the application of meaningful descriptions of information resources, often referred to as metadata (Egbuji, 1999; Gill, 1993).

In addition, a number of studies (Makhura, 2005; Mnjama, 2004; Noonan, 2004) point to the fact that lack of effective records management in organisations can lead to poor accessibility, retrieval and utilisation of the information content of records. These complex situations of poor accessibility to records can in turn affect the attainment of organisational objectives. Despite this fact, empirical evidence is lacking in regard to the management of multimedia records in mass media organisations in Kano State.

Multimedia records in mass media organisations are expensive. Records managers need to manage these records cost-effectively as a means of promoting their use. The study upon which this chapter is based sought to identify impediments to the effective use of multimedia records and find ways of improving their management. The specific objectives of the study were to examine the extent to which multimedia records are accessible for use; assess the extent to which they are utilised; and identify the obstacles to effective accessibility and utilisation of records in mass media organisations.

## **3 Literature Review**

There is sometimes a lack of clarity about what is meant by 'record' in relation to the more general term 'information'. According to Agere, Lemieux and Mazikana (1999), a record is any medium in or on which information is recorded. Medium includes paper, magnetic tape and disc, microfilm, audio-tape, film, slide and photograph. Furthermore, Cox (2001) defines records as an extension of human memory, purposefully created to record information, document transactions, communicate thoughts, substantiate claims, advance explanations, offer justifications and provide lasting evidence of events. According to Dearstyne (1985), records are created for some purpose and can have either a short term or enduring (archival) value. The value can be administrative, fiscal, legal or informational. Records with an enduring value should be preserved because they provide a framework for an understanding of the past.

Multimedia is defined in many ways. Most of the definitions agree on the characteristic that multimedia contains texts,

graphics, animations, video and sound in a unified way and that the content can be structured and presented differently. "Multimedia is the exciting combination of computer hardware and software that allows you to integrate video, animation, audio, graphics, and text resources to develop effective presentations on an affordable desktop computer" (Fenrich, 1997). "Multimedia records are characterised by the presence of text, pictures, sound, animation and video; some or all of which are organised into some coherent program" (Phillips, 1997). Multimedia records are dynamic and can be recorded, played, displayed, interacted with or accessed by information or record processing devices, such as computerised and electronic devices.

Mass media in its most generic form is used to denote a section of the media specifically envisioned and designed to reach masses, such as the population of a country. The concept became prevalent during the 1920s with the rise of nationwide radio networks, mass-circulation newspapers and magazines. The mass media include newspapers, television and radio broadcasting. The new addition to the concept of mass media is Internet media. These Internet media can include personal webpage, podcasts and blogs (Wright, 2009). He further describes the context in which the media is used as being pointed toward the well-organised means and ways of conveying or disseminating the news, public opinions, various kinds and forms of entertainment, and all other information relevant to citizens, through newspapers, magazines, advertising, feature films, radio, television, World Wide Web, books, CDs, DVDs and any form of publishing. Concisely, the term mass media simply translates to the modern means of giving news, opinion, education, entertainment and agenda-setting to large numbers of people, especially through radio, television, newspapers, magazines and films. According to Dominick (2009), a medium is the channel through which a message travels from the source to the receiver.

Mass media are the channels used for mass communication. The definition of mass media will not only include the mechanical devices that transmit and sometimes store the message (television cameras, radio microphones, printing presses) but also the institutions that use these machines to transmit messages. According to Moggi and Tessier (2001) a media vehicle is a single component of the mass media, such as a newspaper, radio station, television network, or magazine. In addition, Quinn (2007) stated that mass media is a deceptively simple term consisting of a countless array of institutions and individuals who differ in purpose, scope, method, and cultural context including all forms of information communicated to large groups of people, from a handmade sign to an international news network. There is no standard for how large the audience needs to be before communication becomes "mass" communication. There are also no constraints on the type of information being presented.

Head and Sydney (2004) stated that mass media organisation generally has to do with all agencies whose aims and objectives are primarily the making available of information, whether in print or electronic, for the best use of audiences. They are preoccupied with collecting, organising, presenting and disseminating information. As it is, instances of such agencies could be in the form of electrically operated medium like radio, television and the print medium where printed information materials like the newspapers, magazines, periodicals, journals and books in or outside libraries are found and used for information retrieval purposes. As Elaturot (1977) succinctly puts it, the term "media" are basically and physically carriers of information which could include books, periodicals, newspapers pamphlets and ephemeral audio materials, radio-visual materials, film materials and graphics.

Records in their various forms must be viewed as valuable organisational assets. They play a vital role in the management and operations of the organisation, document past events, and serve as the basis for future actions. Norris (2002) opined that an effective record management programme should have in place systems, manual or automated, that can locate and retrieve records in a reliable and timely fashion to meet the needs of users. Accessibility of records, therefore, is the means by which users can have easy and convenient access and consultation of available records. Access is permission and opportunity to use a record. Access is also related to whether or not users have permission or authority to use archives. In this era of modern technology, the World Wide Web has redefined physical access to records repositories and making many of their records available online. Thus, users can access finding aids and records from their personal computers.

Retrieval, on the other hand, is defined by Read & Ginn (2011) as the process of locating and removing a record or file from storage. It is also the action of recovering information on a given subject from stored records. Retrieval could be any process of locating a record and taking it to the place where it is used. A record, or information from it, may be retrieved in three ways: manually, mechanically or electronically. The exploration of information from records is termed as use of records. The modes of utilisation of records vary according to the organisation. Misau (2006) observed, while quoting Nwosu, who stressed that, "... Records are utilised for decision making, reference, legal requirement, documentation or response". Utilisation of records usually takes place at different stages of records life cycles by its users. In this regard, users include researchers, students, and policy makers, among others. Thus, Misau (2006) stressed that good management of records is only a means to an end, the ultimate goal of which is their proper and effective use by policy makers/managers, top bureaucrats and even middle and lower cadre personnel as well as others such as students, scholars and researchers.



## 4 Methodology

Cross-sectional survey design was adopted in the study. This choice was because it involves a systematic and comprehensive collection of information about the opinions, attitudes, feelings, beliefs, and behaviours of people. The 336 population for the study comprised staff in mass media organisations in Kano, Nigeria. They included administrative/record managers/officers and categories of staff in some departments. They were chosen because by convention and regulations, they are custodians, preservers and users of records in their institutions. A sample of 181 respondents was drawn from different categories of staff utilising the records in accordance with Kreycie and Morgan's (1971) scale of sampling. A set of questionnaires were designed and used for data collection. They were designed based on the objectives of this study. Collected Quantitative data was coded and entered into the SPSS computer package for analysis. The analysis of quantitative data included running descriptive statistics and the analysis of the statistical relationships between dependent and independent variables in the study.

## 5 Results and Discussions

Out of 181 questionnaires administered, 165 were completed and returned, thus representing 91.2% response rate. Data was presented for analysis using the descriptive statistics which include frequency count, percentages and tables.

### 5.1 Accessibility of records in mass media organisations

Access to the records in mass media organisations in Kano State was as shown in Table 1.

Table 1: Access to Records

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Yes	165	100.0	100.0	100.0

Table 1 clearly indicates that all users had access to records in their various mass media organisations in Kano. This showed that no staff was deprived the right to have access to records. This corresponded with the testimony given by Norris (2002), where he opines that records in their various forms must be viewed as a valuable organisational asset. This is because records play a vital role in the management and operations of organisations by documenting past events, and serving as the basis for future actions. In this regard, mass media organisations not only created, retained, and preserved records but also made it readily accessible as indicated in Table 1 so that they could be used. Table 2 shows the level of accessibility of multimedia records in mass media organisations in Kano State.

Table 2: Level of accessibility of records

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Poorly accessible	45	27.3	27.3	27.3
	Fairly accessible	50	30.3	30.3	57.6
	Accessible	35	21.2	21.2	78.8
	Moderately accessible	20	12.1	12.1	90.9
	Highly accessible	15	9.1	9.1	100.0
	Total	165	100.0	100.0	

Table 2 shows the extent to which users had access to records. The term access has been defined as the availability of records for consultation as a result of both legal authorisation and the existence of finding aids (Abioye, 2002). In the same vein, Harrod (1977) stated that the extent of accessing records is the means by which users can have ease and convenient of access and consultation of available records. Table 2 clearly reveals the contrary which showed the higher percentage indicating poor and fair access to records, justifying difficulties and inconveniences in accessing records. The data collected reveals that 45 (27.3%) respondents indicated poor accessibility of records; 50 (30.3%) respondents had fair access; 20 (12.1%) and 15 (9.1%) respondents indicated that records were moderately accessible and highly accessible respectively. 35 (21.7%) out of 165 respondents also indicated the records were accessible. The terms and conditions of access to records were to a large extent influenced by the access policy.

Access is also concerned with making proper arrangements to ease access of records whether from within the organisations or from without. This is particularly important in the light of the current trends of multimedia and electronic records. The results show that most of the respondents could not access records by the media houses. The respondents were all unanimous that accessibility to records through cyber cafés was not possible, and hardly could they access records from their homes and offices. Access to records was best facilitated by personal visit to the records offices to which 104 (63%) respondents consented to. This was followed by accessing records through application to which 95 (57.6%) respondents consented to. This finding failed to correspond with the assertion of Reese (2000) that organisations need the ability to access records by multiple indexing parameters such as subject matter (content and context), record creator, intended recipient, and date. Well-indexed records ensure easy access and reduced time and financial cost. Poor indexing methods

will result in additional fees and more labour expended. Access to records is faced with some problems. Public access to records is often hindered by lack of public awareness of the existence of such vital records and the role the records can play in the life of the general public. This implies that the public do not know much about the existence of such records and how to come about having them at hand for use (Maidabino, 2003). However, it is evident that while provision for internal access to records was satisfactory, provision for external access was poor. These results imply that the mass media organisations were especially ill-prepared to deal with external access requirements.

### 5.2 Retrieval of records in mass media organisations

The records of an organisation can only be useful to the organisation if they are accessible to the members of the organisation who need to use them. This implies making sure that they are readily retrievable when required. When asked to indicate the tools of retrieval in place to facilitate access to records, the findings reveal the type of retrieval/finding aids available in mass media organisations in Kano State. This shows that date of creation/receive 155 (93.9%), location register 141 (85.5%), index books 141 (85.5%), summary guides/list 115 (69.7%), class and items list 93 (56.4%), catalogues 84 (50.9%) were used as retrieval finding tools in the various mass media in Kano State. Manuscripts group lists 125(75.8%), calendars 121 (73.3%), inventories 97 (58.8%) were not uniformly employed as record finding aids in the investigated media organisations.

The findings indicate that the major mode of retrieving records in all the mass media organisations in Kano was manual 165 (100%), with fewer percentages showing the presence of retrieving records both mechanically 33 (20.0%) and electronically 21 (12.7%). Read and Ginn (2011) stated that records or information from it may be retrieved in three ways, that is, manually, mechanically and electronically. The reasons for the above result were perhaps connected to the lack of available mechanical and electronic retrieving tools in the various mass media organisations under study. As such records managers preferred going to a storage container and removing by hand a record that a user had requested or made a note of the information someone had requested from it.

### 5.3 Purposes for utilisation of the records in mass media organisations

The findings show that most of the respondents were using records for information purpose 163 (98.8%), administrative/official purpose 152 (92.1%), reference purpose 147 (89.1%), research purpose 126 (76.4%), news 118 (71.5%), and historical purpose 114 (69.1%). In accordance with these findings, Misau (2006) also identified the purpose of using records to include research and administration. Access to information is a fundamental right and an essential condition for democratic governance, accountability, the development of participatory democracy and economic development. Access to information is essential for protection of other human rights and contributes to social stability and security (Manchester Declaration on Access to Information, 2006).

Table 3: Frequency of utilisation of records by the staff in the mass media organisations in Kano State.

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid				
Daily	39	23.6	23.6	23.6
Weekly	63	38.2	38.2	61.8
Monthly	39	23.6	23.6	85.5
Occasionally	24	14.5	14.5	100.0
Total	165	100.0	100.0	

Table 3 shows the extent of utilisation of records by the staff in the mass media organisations in Kano State. It was observed that 63 (38.2%) which is the highest percentage revealed users prefer utilising records on a weekly basis while only 24 (14.5%) used records occasionally. This can be linked to the poor retrieval finding tools and certain difficulties in accessing the records at appropriate time. In justifying this finding, Akussah (2006) asserts that utilisation depends on the access to the available records through authorisation and the help of finding aids. As such lack of proper finding aids or user education can be a problem in proper utilisation of records.

### 5.4 Obstacles to effective accessibility and utilisation of records in mass media organisations

From the findings, it emerged that challenges to access of records in mass media organisations include: lack of clearly stated title of the record 120 (72.7%); difficulty in comprehending the subject matter of the records 88 (53.3%); difficulty in identifying the original filing code of the record 100 (60.6%); lack of or inadequate trained manpower to intellectually and physically organise the records 144 (87.3%); insufficient funding to purchase furniture, accessioning materials 146 (88.5%); non-automation of the record office 152 (92.1%); inadequate staff in terms of number and quality 128 (77.6%); and natural atmospheric factors, such as humidity, wind, rain etc. 89 (53.9%). As shown in the results, the respondents were unanimous in their responses to the obstacles encountered on management of records in their various mass media organisations in Kano State. However, respondents confirmed that they had no difficulty

in identifying the date of creation of a record. The results presented to a large extent confirm the assertions made by Jimerson (2003) emphasised that the essential purpose of organising records is to know what the organisation has so that staff can find it when they need it.

## 6 Conclusion

Several studies have revealed that records management play a vital role in various aspects such as; strategic planning, performance improvement, efficient service delivery, promoting good governance, supporting democratic accountability, fulfilling legal requirements, combating corruption, promoting and protecting human rights and ensuring sound financial management. Nonetheless, based on the empirical survey findings, it can be concluded that records management is not receiving the attention it deserves in the mass media organisations in Kano State. The results of the survey showed that the mass media organisations fell below requirements when it came to maintaining multimedia records. The study also demonstrated that the mechanisms in place for the management of records were inadequate to provide an environment in which records management objectives could be achieved. The findings showed that in the absence of guidelines records management, practices and procedures were developed through individual initiative. Knowledge of appropriate requirements relating to retrieval, access and use to record was also limited.

## 7 Recommendations

The following recommendations are made based on the findings of this study as well as within the context of the empirical surveys:

1. Records management manuals should be developed to provide a reference point for practices and procedures while also helping to standardise records management activities in the mass media organisations.
2. The mass media organisations should also pay serious attention to their electronic and multi-media records management environment. It is also recommended that the mass media organisations should allow records centres and archives to assume their rightful role in the management of records throughout their life cycle.
3. The records office should be automated to enable speedy retrieval, use and safe keeping of records. Moreover, adequate budget and necessary equipment such as photocopiers, microfilming machines, should be provided to supplement the automation and digitisation activities.
4. Training is identified as one of the crucial elements in ensuring sound records management. The mass media organisations should facilitate continuous training in records management, particularly in the face of current changes in the information field.

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# Records Digitisation Technologies and Systems in the Banking Sector in Kenya

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## Abstract

*Whereas some studies on digitisation in the banking sector in Kenya have been conducted, none has investigated the technologies and systems used as well as their suitability for the purpose. By using a fit-viability analysis, this chapter investigates the digital technologies and systems used by banks in Kenya to digitise their records; assesses their fit to the needs of the banks; examines their viability for the Kenyan banking environment; and proposes strategies to enhance the fit and viability of digitisation technologies and systems to the Kenyan context as a means of enhancing the benefits of digitisation for banks in the country. The study from which the chapter is extracted was an exploratory survey. Primary data was collected using key informant interviews from records managers of various banks selected through information-oriented purposive sampling. The data was analysed using conversation analysis. The results of the study reveal that banks in Kenya use diverse systems to digitise records. These systems fit the requirements of the banks and are viable in their economic, infrastructural and organisational contexts.*

**Keywords:** *Banks, Digitisation, Digital Records, Fit-Viability Analysis, Kenya*

## 1 Introduction

Kenya's financial system comprises of numerous commercial banks, non-bank financial institutions, a range of insurance companies and a stock exchange. Similarly, there has been a phenomenal growth of non-bank financial intermediaries. The insurance industry has also experienced a rapid expansion, both in terms of firms and customer numbers and range of services offered. To this extent, the Kenyan financial system is by far the largest in Sub-Saharan- African countries by total assets although largely dominated by the banking sector (Cihák & Podpiera, 2005). Over the last thirty years, a significant growth in the number of commercial banks has taken place in Kenya. This has largely been contributed to by the fact that financial services are one of the key sectors factored within the economic pillar of Kenya's Vision 2030.

According to the Central Bank of Kenya's Financial Stability Report (2016), the country's financial system has grown significantly, becoming more complex and highly integrated. The report further explains that so far, the banking industry is comprised of 42 banks, one mortgage finance company, 13 microfinance banks and 8 representative offices of foreign banks. In addition, there are 76 foreign exchange bureaus, 17 money remittance providers and three credit reference bureaus. As such, there are five main actors regulating the financial sector activities. The sectors include banking, insurance, capital markets, SACCO and pensions. The actors are regulated by the Central Bank of Kenya (CBK), Insurance Regulatory Authority (IRA), Capital Markets Authority (CMA), Sacco Societies Regulatory Authority (SASRA) and Retirement Benefits Authority (RBA) respectively.

Cytonn Investment, in their December 2017 "Kenya Banking Sector Report" indicated that in Kenya, there are a total of 39 commercial banks, with Chase Bank and Imperial Bank under receivership, 1 mortgage finance company, 12 microfinance banks, 8 representative offices of foreign banks, 86 foreign exchange bureaus, 14 money remittance providers and 3 credit reference bureaus. Financial inclusion in Kenya has continued to rise, with the percentage of the population living within 3 kilometres of a financial services access point rising to 77.0% in 2016 from 59.0% in 2013. The report further explains that of all the listed banks, 7 are in Tier I, 4 in Tier II while the rest fall under tier III of the CBK's rankings. The banks' tier ranking is done by Central Bank of Kenya and is based on the bank's market share, and asset base customer deposits among other parameters.

However, Redford (2017) notes that despite growth, the sector has its unique challenges. These challenges range from the recent development in terms of interest rate caps that is expected to constrain the access to finance for small and medium enterprises (SMEs) in the coming years to non-compliance issues that has led to the CBK placing two banks under statutory management in the past year. However, opportunities are still there in the sector to enable it to tap into the economic environment thereby filling in the gaps brought about by threats of these challenges. One of the opportunities lies in the adoption of records digitisation as a means of enhancing evidence-based decision making thereby streamlining operations and improving productivity.

## 2 Digitisation of Records

Now, more than ever, organisations have realised the need to utilise technology in streamlining business processes in order to gain competitive advantage and keep up with the forces of the external business environment (Ryan & Frater, 2002). The financial and banking sector, in particular, is not an exception to this scenario. As such this sector has embraced electronic document records management technologies to eliminate or reduce inefficiencies and drawbacks of paper-based transactions in its operations.

It is worth noting that the nature of banking operations leads to the generation of large volumes of paper from back office operations, account opening processes, loan application processes, banking hall operations, transmission slips, administrative communiqués, legal documentation, securities, credit and risk documents and so much more. In the 2015 World Economic Report, it is estimated that in a banking institution every 100 employees will generate over two million pages of documents in a year. These physical documents come with their own sets of challenges. Therefore, digitisation technology serves to increase operational efficiencies by breaking down the inefficiencies associated with the use of physical paper documents.

Market experience has shown that a number of digitisation technologies have been used by both financial and non-financial institutions to enhance record keeping. Over the years technologies such as the Optical Character Recognition (OCR) technology has been used to automatically capture data from papers (forms). This technology comes in both structured and semi-structured forms. The structured forms come in a standardised format. In such forms, fields to be captured are located in a specific area. A good example of these is the account opening forms. The semi-structured forms are documents which have the same fields but different layouts. Examples include invoices, purchase orders, and receipts, among others.

Another digitisation technology is the Barcode Recognition. This is the use of barcodes to capture records. The barcode technology has the ability to name, batch, split, file and route a document, making the process of digitisation more efficient.

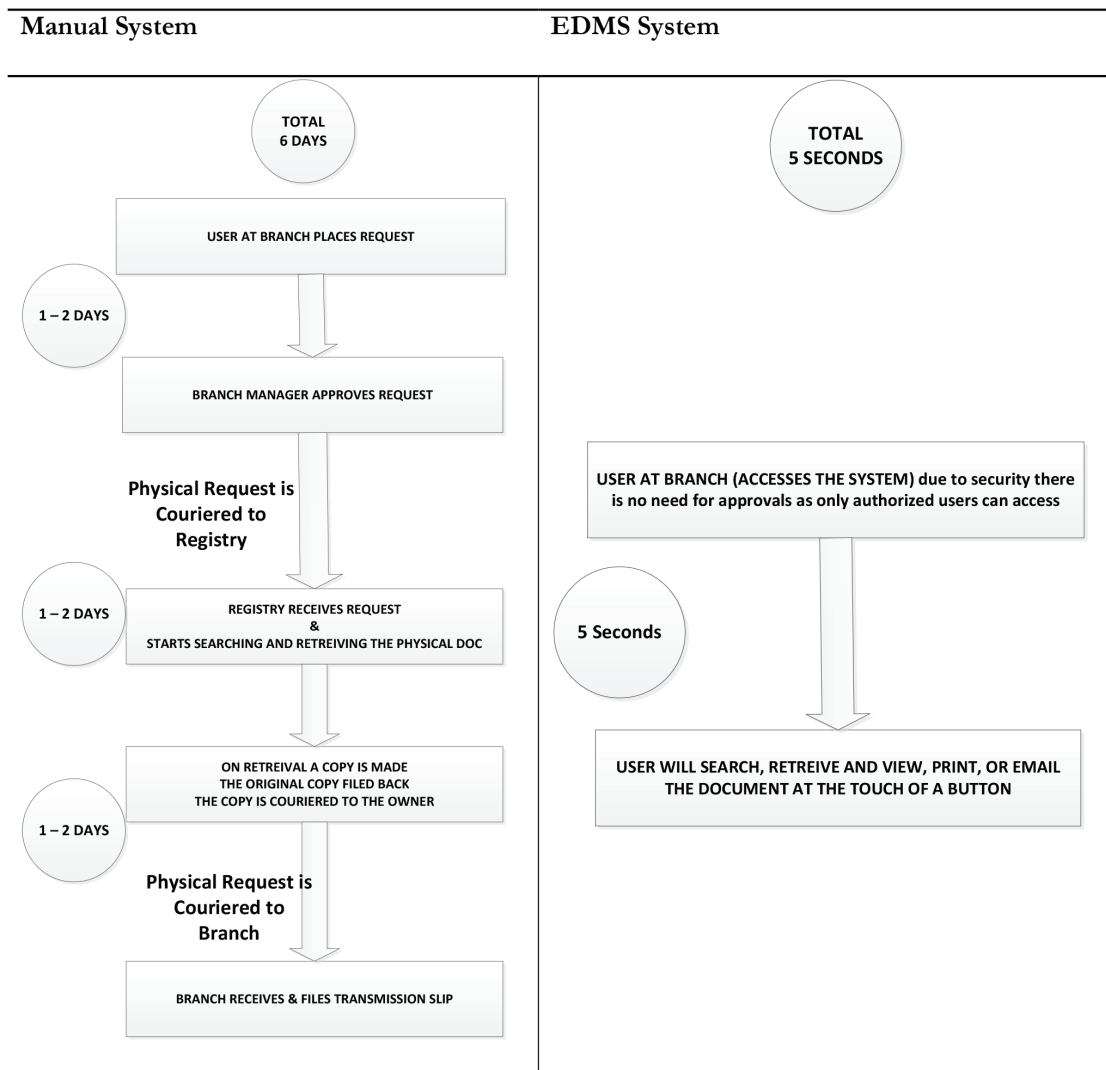
Another form of records digitisation technology is the image clean-up and enhancement software. This software is used for editing and making poorly-stored and worn out documents more legible. This software usually has features such as skewing (straightening the document), de-sparkling (removing dust and specks from scanned documents) and orientation detection of a document which involves automatic rotation of a document to the desired angle. Bates stamping is another records digitisation technology. This is where a document is digitally stamped by a document scanner.

In addition to the technologies, a number of systems are also used in the financial institutions for digitisation. The systems include Digital Imaging Systems. These are software applications that give organisations the ability to capture, store and distribute an enormous number of records over electronic networks. Also used is the Business Process Management Systems, a software application that uses various methods to discover, model, analyse, measure, improve, optimise, and automate business processes. In use also are the scanning systems that are used in converting analogue documents such as printed or handwritten documents into electronic formats. The Document Management System is also used to create, find and share information. It usually takes the form of business software and facilitates the organisation and dissemination of the organisational knowledge base.

## 3 Practical Application of Digitisation

The banking sector in Kenya is growing at a fast rate and needs to re-engineer existing processes to deal with the ever increasing workloads. Take, for example, a loan approval and disbursement process which would normally take two or more days to complete using the manual processes in which various departments would require to access one file. Thus, some parties would be delayed. The approval is dependent on the physical presence of specific approvers. Therefore, there is great risk of documents being mishandled and misplaced hence putting the integrity of the processes in doubt.

The above problems can be solved using an electronic workflow, like credit quest, where loan documents once received at the branch from the client would be scanned into the EDMS. Once scanned in the EDMS, the loan application would be routed to a central processing centre at the headquarters where all processes are centralised for approval and processing through an electronic workflow. This process is independent of geographical barriers. The workers need only to access a computer terminal to process work while the approvers can approve and disburse payment at the comfort of their iPad and smart phones thereby allowing banks to process loans faster and meet client demands. This can be replicated to other processes such as account opening, product launch, administrative duties, human resource unit, and others functions. This is just a tip of what the systems can offer. Digitisation systems are evolving into more dynamic solutions that provide organisations with a competitive edge over the competition allowing banks and other financial institutions to save cost and enrich the customer experience.



**Figure 1: Flow Chart**

Source: Adapted from Xie, Zou and Liu (2015)

Xie, Zou and Liu (2015) demonstrate how various branches will generate numerous records of bank slips which are then shipped to the banks archive on a daily basis. Occasionally, there will be requests to access the archived documents. This process will normally take a day or two to be processed and will require a dedicated records management team to execute the request (search for the physical record, retrieve, make a copy and transmit via courier). On the other hand, if these documents were captured within an Electronic Document Management System, retrieval would be done directly by the authorised users at the branch without requiring the intervention of the records team. The user at the branch would simply search and retrieve the record at the touch of a button. In cases where an external party requires the document, the user can simply print or email the document. The flow chart in Figure 1 demonstrates the manual and EDMS systems' processes as explained by Xie, Zou and Liu.

#### 4 Benefits of Records Digitisation Technologies and Systems

According to the International Records Management Trust, a United Kingdom based consultancy company, other benefits of records digitisation technologies and systems include:

1. **Control of records creation and growth:** An effective records digitisation technology and system addresses both creation control (that is, it limits the generation of records or copies not required) and records retention (a system

for destroying useless records or retiring inactive records), thus stabilising the growth of records in all formats.

2. **Improvement of efficiency and productivity:** Time spent searching for missing or misfiled records is non-productive. A good records digitisation technology and system can help any organisation to upgrade its recordkeeping systems so that information retrieval is enhanced, with corresponding improvements in office efficiency and productivity.
3. **Ensuring regulatory compliance:** The only way an organisation can be reasonably sure that it is in full compliance with laws and regulations, is by operating a good records digitisation technology and system which takes responsibility for regulatory compliance.
4. **Cost reduction:** Professional records digitisation helps organisations to save on the costs of space and equipment, which are engaged to manage records that would otherwise have been disposed of.
5. **Risk mitigation:** Adequate records management protects organisations from risks resulting from insufficient or inadequate information such as weak management decision-making, a negative corporate image and the loss of client confidence. Proper records management reduces instances of leakages of confidential information to unauthorised persons reducing the chances of litigation on confidentiality.
6. **Assimilation of new records management technologies:** A good records digitisation technology and system provides an organisation with the capability to assimilate new technologies and take advantage of their many benefits. It is easier for an institution to introduce and test a new system if it already has one without interfering with the existing records and also not having to undergo training costs of personnel.
7. **Knowledge sharing:** A key perspective of organisational performance management is knowledge sharing. Proper records management ensures that critical knowledge is captured and preserved for sharing across the organisation to sustain competitive advantage and ensure continuity in service and product delivery. Through knowledge sharing, turnaround time is reduced in service delivery and corporate image is also enhanced since it gives the perception that all employees are hands on about happenings in the institution.

## 5 Literature Review

The International Organisation on Standardisation (ISO) 15489-1:2016 defines a record as information created, received and maintained as evidence and information by an organisation or person in pursuance of legal obligations or in the transaction of business. This definition is also shared by a number of authors, who contend that a record can be in many forms of media including the electronic media (Ngulube, 2001; Shepherd & Yeo, 2006).

Records digitisation is rapidly becoming one of the standard forms of preservation for libraries, archives and information centres as well as analogue materials in the banking sector. This approach is enabling the institutions to ensure information contained within fragile, organic materials will still be viewable by future generations. However, as technology changes, there are concerns that the methods used today to preserve these records are not going to be sufficient or even viable in the future. Software and document formats change very quickly, and could be obsolete in a relatively short time period. This applies both to hard copy records that are converted into digital copies as well as born-digital items (those created as digital). For this reason, digitisation is not strictly a preservation activity as the new records will require preservation as well. It is important to understand what digital preservation is and how it can be effectively used to preserve collective knowledge for future generations. There is little information on this topic in the literature today, and finding relevant articles and sources is difficult. There are different schools of thought on digital preservation. The old school of thought sees it as the most important advancement in the topic of preservation, while the modern school opines that it is not the only or even the best solution to keeping information safely. While there are opposing views on some aspects of digitisation and digital preservation, there are also areas where most authors like Conway (2010) and Smith (2016) seem to agree. Budgetary issues, professional education and increased technological currency are frequently mentioned as challenges in the field, and the need for better and more in-depth education, cost-sharing initiatives, and cooperation are universal suggestions. This is a field where changes happen very fast. What was current at one time becomes out-dated quickly.

Digitisation of records is the conversion of traditional, analogue materials such as log books, title deeds, maps, and other paper items into an electronic, digital copy. This is not to be confused with digital preservation. As Conway (2010:64) notes, it is important to distinguish “digitisation for preservation” from “digital preservation”. Digital preservation is the conservation of all digital materials, whether they were born digital (such as emails, websites, videogames, and other electronic files), or whether they have been digitised from analogue materials (Conway, 2010). Although digitisation is often seen as preservation, this is not always the case. According to Smith (2016), much is gained by digitising, but permanence and authenticity are not among those gains. Digitising may allow greater access to an artefact, but it comes with its own challenges. Digital records have many the same function requirements that paper ones do. In other words,



the work required by professionals to transfer, process, store, and preserve files, which allows a user to retrieve the desired information, applies both to analogue and digital records (Galloway, 2011).

However, once an item has been digitised, that new version requires continuous, on-going maintenance for as long as the record is to be kept. This presents huge cost and time implications for the facility (Sanett, 2013). Additionally, when it comes to digital materials, there is a huge difference between storage and preservation. Storage is simple, as there is enough space in hard drives or in the cloud for as much material as can be created. The difficulty is that even if the stored data is intact, it may not be available or accessible, due to technological changes or human error in naming conventions. Preservation, that is, keeping the information available and usable for future generations, requires much more complex actions (Brand, 1999). Differences in digital preservation needs occur depending on the type of institution involved. Libraries usually have published materials, which mean there is often more than one, and usually many, copies of the same artefact. Preserving the original material is important, but the information contained within is often more important to users (Galloway, 2011). Conversely, archives contain material that is unpublished and one of a kind. In this instance, both the information contained and the original artefacts themselves have intrinsic value. It is important for both libraries and archives to preserve the authenticity of an artefact, as well as the source of the object as a means of answering the questions surrounding where it came from, whom it came from, and in what context it was created (Galloway, 2011).

Galloway (2011) explains that if something is worth preserving digitally, it must be preserved as closely as possible to its original state. This will guarantee the authenticity of the item and preserve it for historical use. It is also best to work with both digital and hard copy mediums to ensure safekeeping of all types of knowledge contained in a material, as digitisation is only possible if works have been preserved in a more traditional format as well. Preservation strategies are more important than the actual formats used, and migration strategies for formats must be decided upon (Tennant, 1997). There are a number of ways professionals can ensure that digitally preserved materials remain usable. It is important not only to preserve the record itself but also the hardware and software it was created on and designed to be used with. Digital materials are very complex, and compression, encryption, and HTTP links that were active in original works make it much more difficult to extract meaning from a preserved artefact. Because it is often not possible to preserve a digital file exactly as it was when it was created or when it was analogue, at the very least the focus must be on preserving the 'essence' of a file (Zorich, 2007). Emulators are computer programs designed to mimic or "emulate" other operating systems, and are one solution to obsolete software or hardware (Galloway, 2011). Using an emulator allows users in the future to see exactly how the material could have looked like. By creating a similar operating environment to the original, emulators help the files to remain interactive. Because it is important to be able to see something in its original form whenever possible, in order to preserve historical authenticity, emulators would need to be created and updated regularly, as older technology becomes obsolete (Jain & Mnjama, 2016).

When working with digital materials, there is the problem of mutability. An example of this is with a video game. Watching the game is a very different experience than playing it, and it is difficult to get the full feel of the material when not using it in its intended context. Because of this, it is important to use the most descriptive metadata possible, in order to give future viewers a better understanding of what they are seeing (Brand, 1999). The format, the naming convention, and the reasons why certain aspects have been chosen will all likely be of interest to future users, just as aspects of old artefacts, such as the binding used in an old book, or what was used for ink, are important to scholars.

Digitisation and therefore digital preservation are no longer emerging tools in the financial sector; they are now the preferred and accepted practice for saving many analogue records. Libraries and archives are in a transitional period and many are moving away from print into a primarily, or, in some cases, entirely, digital format (Jain & Mnjama, 2016). Users expect instant access to materials wherever they are, and the only way this can be achieved is by digitisation of records (Conway, 2010). It is important that current and future users will be able to access the information, be able to tell whether the information is accurate and preserved as it was intended to be, and use it in their intended way (Gladney, 2009).

## **6 Rationale of the Study**

Banks and other financial institutions produce vast volumes and varieties of records on a daily basis. These records include, but are not limited to, customer details, account statements and transactions, as well as corporate documents such as permits, licenses minutes and reports, among others. As the volume of these records continues to grow, banks face myriad challenges such as inadequate storage space; inability to search, locate and retrieve records promptly when needed; and vulnerability to unauthorised access and misuse. Most banks have therefore turned to digitisation as one of the strategies of coping with the aforementioned challenges.

Financial institutions in Kenya, particularly banks, can benefit from an effective use of the records digitisation technologies in their operations. Unfortunately, operational literature on records digitisation technologies is scanty. Perhaps, this is

because of the high costs required for initial system purchase and training that come with the implementation. However, despite the constraints that come with the implementation, there is need for better records as they are the best means for preservation and access (Cox & Cox, 2001).

In their quest for new information technologies, banks are facing risks and adjustments that are common to many other industries and these are easily observable nowadays. Cyber-risks and the transformation of human capital are probably the most important ones that banks deal with. Banks are now investing huge amounts in cyber security.

According to Business Wire consultants, the breach level index, in 2017 alone were 1,765 vulnerabilities detected in information systems that caused data breaches affecting 2,600,968,280 information registries globally. Of these, the breaches that affected the financial institutions were 235,563,765 being 9% of all the breaches affecting all the industries, coming in third after governments 18%, technology 15%. There are 3,407 data breaches every minute. It is important to consider that one of the information advantages attributed to banks in managing credit and market risk is their day-to-day market participation but this only makes the amount of information that banks have to protect larger and larger. The specific objectives of the study anchoring this chapter were to investigate the digital technologies and systems used by banks in Kenya to digitise their records; assess their fit to the needs of the banks; examine their viability for the Kenyan banking environment; and propose strategies to enhance the fit and viability of digitisation technologies and systems to the Kenyan context as a means of enhancing the benefits of digitisation for banks in the country.

## 7 Methodology

The study was designed as an exploratory survey. This is a methodological research approach used to investigate emerging research problems which have not been clearly defined (Stratton *et al.*, 2008). The cardinal purpose of exploratory research is to gain familiarity with a phenomenon or acquire new insight into it without necessarily making conclusions about it (Brown, 2006). Stebbins (2001) argues that exploratory researchers utilise discovery and serendipity to explore and gain valuable insight into the research problems. The authors found this approach appropriate for the current study because the concept of records digitisation technologies and systems is relatively new in Kenya. Similarly, records digitisation and technologies are dynamic to the extent that it may not be appropriate to give a “final word” on matters pertaining to them. The research design was also considered appropriate because of the limited literature on the topic of study.

The population of study consisted of Kenyan banks identified from the Central Bank of Kenya online database. The authors accessed and analysed the banks’ various operations. Data was collected through content analysis of the bank’s operations based on the files from the Kenya Bankers Association’s checklists and guidelines. Additional data was collected through interviews with 510 staff members drawn from the three banks picked through information-oriented purposive sampling. The sample size was arrived at using a calculator proposed by Survey Monkey based on the formula below:

$$Sample\ Size = \frac{z^2 \times p(1-p)}{e^2} \div \left( 1 + \left( \frac{z^2 \times p(1-p)}{e^2 N} \right) \right)$$

Where Population Size =  $N$  | Margin of error =  $e$  |  $z$ -score =  $z$

From the 510 population size, confidence level of 95% and margin of error of 5%, the calculated sample size was 220. Out of the 220 distributed, 197 interviews were successful representing a response rate of 89.54%.

The institutions requested that their identity be concealed for confidentiality purposes. One bank belongs to tier I, while the rest belong to tier II. The selection of the staff to interview was based on their availability and willingness to participate in the study. The collected data was analysed using descriptive statistics because it enabled the authors to summarise, interpret and describe the data within the context of the study.

## 8 Findings

Some of the questions to the interviewees included a response on whether their institutions have you digitised their records or not, name of the digitisation system in use, how the systems fits in the institution’s operations and their general level of training on the use of the systems. Based on the responses, the study findings led to the following findings:

### 8.1 Records digitisation tools

The study revealed that there are various digitisation tools and systems currently used by banks in Kenya. These are identified and discussed hereunder.

One of the systems used was the Straight through Processing (STP). This is a system used by banks to speed up

their transaction processing time mainly in the back office. The software enables banks to have the same information being streamlined through a process across multiple points. This is performed by facilitating information that has been captured electronically to be transferred from one party to another without manually re-entering the same pieces of information repeatedly over the entire sequence of events. The system, therefore, helps in avoiding data capture errors, saves time and enhances confidentiality since information only passes through the hands of intended bank staff.

Another system used by the banks and most financial institutions in Kenya is the Credit Quest (CQ) software. It is a suite of products that provides integrated and easy-to-use solutions that are built for the unique needs around records management. It also reduces turnaround time on applications and boosts productivity by automating routine tasks. As such it increases efficiency via an adaptive workflow, allowing collaboration and common access to an electronic credit file.

The study further revealed that banks in Kenya also use tools such as Kodak Capture Pro for capturing images and Case 360 for processing and sharing account opening forms and related documents and processing daily vouchers. Kodak Capture Pro and Case 360 both have scanning, viewing and sharing capabilities that if optimally employed will greatly enhance workflow within the financial institutions. Other digitisation tools used include Sybrin system which is used for cheques truncation processing. The system allows users to scan and electronically share copies of the cheques across banks, hence, avoiding the physical carrying of cheques and reduces the turnaround time for cheques clearance.

## 8.2 Assessment of the “fit” of the digitisation tools

Technologies have a high potential to generate value to the adopting organisation if they fit the tasks of the organisation. Therefore, the fit of a technology is a measure of the extent to which it performs the tasks the adopting organisation requires it to. According to Liang and Wei (2004), the fit of technological tools measures the extent to which they match the needs of the tasks. In this study, the authors assessed the extent to which the digitisation technologies used by banks in Kenya fit the requirements of the tasks they are being used for.

All the respondents affirmed that the digitisation systems their organisations have deployed best serve the tasks for which they were installed. They explained that the core tasks of digitisation technologies in banks are embodied by the features and functionalities in the systems. These included capture, index, save, share, archive, search, retrieve, view, print, and back up digitised materials. The respondents also explained that digitisation systems have enabled banks to deploy security measures not possible with paper-based records systems. For instance, it is practical to implement “view only” rights on paper-based records. This is possible on digital records systems which enable authorised persons to view files, for instance, to know their status. The respondents also explained that the workflow management feature on digital records systems streamline operations. It is a necessary functionality which digital records systems bring to the banking arena.

It was observed, however, that some banks use different systems for different functions leading to a fragmentation of sorts. This fragmentation of systems still requires high level of human interaction through paper work, diluting the noble intention of digitisation of records and processes. There is need for an integrated system that performs most of the critical activities and only allows minimal human interaction during the processes. The respondents also pointed out that some banks only used a few of the modules available on digitisation systems thereby limiting their benefits.

From the foregoing, the authors conclude that the digitisation systems currently used by banks in Kenya fit the tasks they are put to by the banks. It is expected, however, that new features may be required once in a while as a consequence of new expectations emanating from emerging customer needs and regulatory compliance.

## 8.3 Viability and challenges

Liang and Wei (2004) explain that the viability of technologies is a measure of the readiness of the environment in which they are being adopted to support their effective use. They explain that viability is considered in terms of economic feasibility, technical infrastructure and the social readiness of the adopting organisation.

In this study, the respondents were of the view that the digitisation technologies currently used by the banks in Kenya are viable. They explained that the Government of Kenya through the ICT Authority has invested in developing ICT infrastructure to enable institutions enjoy full benefits of their digitisation efforts. Through regulation of ICT in the public sector, stakeholders in the private sector too enjoy a windfall of benefits such as high-speed Internet connections which is an important element for any digitised process to be successful.

However, banks have also experienced a fair share of challenges that come with the quest to digitise. These challenges include financial constraints on initial installations, inadequate personnel in the projects, poor handling of original documents and material and inadequate resources for sustaining the various technical support contracts. Given that technology is dynamic, the rate of obsolescence for ICT is high. As such, banks have to keep substantial reserves to cater for continuous replacements.

To mitigate the challenges, study findings revealed that various banks in Kenya undertaking digitisation projects have devised strategies which have enabled them to cope with some of the challenges. Some of the workable strategies include documenting standards and best practices to be applied uniformly across projects. Other strategies usually applied include having digital and quality standards and policy enactment before digitisation starts. Furthermore, all staffs are engaged during digitisation to ensure a consistent transition and reduce chances of resistance. Similarly, all digitisation projects should decrease the likelihood of re-digitising in the future by promoting best practices for conversion of materials into digital format and the long-term preservation.

## 9 Conclusion

Banks in Kenya have invested heavily in various technologies and systems all of which are expected to ensure security of records and enhance operational efficiencies within the institutions. The systems fit the tasks to which the banks have committed. Similarly, they are viable in the economic, infrastructural and organisational environment of banks in Kenya. Rapid development of technology has changed the way banks work and interact with their customers. Most of the banks work by using the digital technologies and systems in their various operations and even insisting on their customers to embrace the same. Leveraging on technology through installation of ERP systems to integrate the various systems is therefore inevitable for banks to realise the benefits of digitised operations as demonstrated by the capabilities of the software mentioned in the findings.

There is need for further studies on this subject to reveal the current state of records digitisation technologies and systems used in the banking sector in Kenya and its impact on service delivery. The research on the nexus between records digitisation technologies and systems and service delivery would have a direct impact on risk mitigation because efficient service delivery systems and seamless flow of processes contribute heavily towards risk mitigation.

It is also of importance to note the policy implications associated with records management. Countries all over the world have come with legislations to guide issues relating to management of records. In Kenya for instance the management of records is carried out in compliance with the Public Archives and Documentation Service Act Cap 19 laws of Kenya and other relevant statutes, rules and regulations that may be issued by the Government of Kenya from time to time. International Standard Organization (ISO) 9001 and ISO 15489 also emphasise the global need for standardisation of records management. By so doing, jurisdictions protect their records management systems' patents.

## 10 Recommendations

During the study it was noted that banks have installed various systems whose intention is to increase efficiency in the operations. As such there is need for them to install of ERP systems to integrate the various systems instead of the disjointed systems which are costly in terms of maintenance and staff training.

Banks should also endeavour to build in-house human resource capacities through continuous staff training on the systems and technologies that are in operation in their respective institutions. This will enable them to easily handle issues arising from the systems such as system breakdowns instead of relying on the system developer or service level agreements.

Banks have no choice but to increase their budget allocations and invest more in human capital, if they really want to leverage on records digitisation technologies and systems for their business development growth.

Since this study limited itself to only a few banks in Kenya, a similar study needs to be conducted in all banks in Kenya to reveal the status of records digitisation technologies and systems in all banks. This will be necessary to understand whether the findings of this study are indeed representative of the entire banking sector.

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## The Role of Digitization in the Preservation of Corporate Archives at Kenya Power and Lighting Company

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### Abstract

*This chapter investigates the role of digitisation in the preservation of corporate archives at Kenya Power and Lighting Company (KPLC). The specific objectives of the study leading to the chapter were to determine the accessibility of the digitally preserved archives at KPLC; find out the policies relating to digital preservation of archives at KPLC; analyse security threats related to digital preservation of archives at KPLC; and explore the challenges of digital preservation of archives at KPLC. The research adopted a descriptive research design. A mixed methods approach was used to incorporate both qualitative and quantitative research methodologies which gave a better understanding of the research problem. The target population included 74 study participants. The study employed census sampling technique. Semi structured questionnaires were used to collect data which was analysed using Statistical Package for Social Sciences (SPSS 23). The results of the study indicated that KPLC is open to digital preservation of records hence embracing the various formats for preservation. The KPLC provided three kinds of access to digital archive services: full access, partial access and no access were allowed on some of their digital records. The findings established that KPLC had policies related to Digital Records Management (DRM). Also, the study revealed that KPLC had proper procedures and mechanisms in place to ensure security, long term preservation and accessibility of digital records. The challenges surrounding digital preservation of archives included inadequate funding, obsolete hardware and software, insufficient ICT facilities, fragile storage media, inadequate expertise and shortage of DRM Skills. The study recommends that KPLC should adopt new communication technologies, build capacity by developing a detailed training plan and have a budget for the adoption of ICTs.*

**Keywords:** Digitisation, Preservation, Archives, Corporate archives, Kenya Power and Lighting Company.

### 1 Introduction

Digital records are becoming more influential in organisational operations as many businesses embark on e-commerce strategies (Lichpack and McDonald, 2003). E-commerce refers to the integration of computers and telecommunication facilities for the purpose of communication and information exchange to enable the organisation to deliver services more effectively and efficiently (Heeks, 2002). The use of ICTs in preservation at KPLC has resulted in the creation and use of digital records. This strategy is believed to increase the efficiency of the internal processes such as those supporting financial and human resources management. Because of the speed of technological change, organisations have to consider issues of preservation of their digital archives even while they are still in active use and needed for posterity. Digital records being preserved by the organisation must be accurate and complete to ensure transparency and accountability. Records in whatever form need to be captured, managed and safeguarded in an organised system in order to retain their value as formal corporate records (Harris, 2001).

### 2 Digital Records Management (DRM)

Digital Records Management was developed from the 20<sup>th</sup> Century onwards. Shepherd and Yeo (2003) point out that until recently, almost all records were on paper but due to developments many organisations are increasingly using Information and Communication Technologies (ICTs) to create, receive, and manage their records. Organisations are preserving an ever-increasing number of digital records generated through media such as computers, tape and Digital Video Disks (DVD) recorders in different formats (Ngoepe, 2008). This implies that records are either born-digital items or hard copy materials that are converted into digital copies. For this reason, digitisation is not strictly a preservation activity, as the new files will require preservation as well (Conway, 2010). Thus, the rate at which digital records are created both by conversion or born-digital poses management threats to organisations.

Digitisation is the process of changing written and printed records into electronic format. The substance may be text, image, audio or amalgamation of this (multimedia) (Conway, 2010). Murthy, (2005) noted that there are basically three major phases of digitisation activities. The main activities involved in the first stages relate to the putting together for digitisation and the actual process of conversion of materials. The second stage is concerned with the processing required to a number of editorial and processing activities such as cataloguing, indexing and compression. End-users can utilise the digitised materials when satisfactorily processed. The third stage relates to the preservation and maintenance

of the digitised collection and services (Chowdhury and Chowdhury, 2003). The process of digitisation equally involves enormous cost. In addition to paying for equipment and the digitisation process, there are many other types of costs such as staff salaries and those associated with various related activities before and after digitisation such as movement of physical items, copyright clearance, creation of records and indexes and so on.

Digital preservation is a terminology used to describe both the maintenance and the safe guarding of a digital resource into the foreseeable and the distant future. Digital preservation is the action required to sustain access to digital materials beyond media/technological obsolescence (Ronald and Michael, 2005). Hedstrom (2006) defines preservation as the process of designing, resource allocation, application of preservation strategies and technologies necessary to ensure that digital information remains accessible and usable. On the same note, Ronald and Michael (2005) are of the view that digital preservation is emerging as a trustworthy process, yet there is much on-going debate concerning the viability and even the meaning of this process. Given the nature of electronic storage technologies and the short-lived nature of web pages, many are doubtful that digital preservation will ever become a reality. For state departments and corporate organisations to be able to retrieve information quickly they need to have proper digital records management systems in place (Milner, 2002). In order to ensure archives' authenticity, reliability and accessibility over time, organisations need to take into consideration issues of preservation at the time of creation. This means addressing the issue of preservation at the planning stage of programme or system design even before the records is created (Tafor, 2003).

Records created or maintained digitally are often referred to as digital records. Parrish and Courtney (2007) define digital records as a combination of text, data, graphics, images or audio information that is created, maintained, modified or transmitted in digital form by ICTs. According to Shepherd and Yeo (2003), digital records include all components of an electronic information system namely: electronic media as well as all related items such as input documents, printouts and metadata. The anxiety by organisations to adopt digital records management systems does, however, face limitations especially financial matters. In most cases, funding affects both information manager and the user because of the inadequate ICT facilities to access the services maintained in digital format. This impacts the relationship between the organisation and the users of its services.

Ngulube (2007) noted that government information especially in the Sub Saharan Africa (SSA) is not properly organised as records management systems in many countries lack the necessary equipment, infrastructure and trained records managers hence they are collapsing. According to Ngulube (2004), the advent of ICTs has brought about a paradigm shift in the production of government information. The transition from paper-based records to digital records is happening at a time when many records managers in SSA do not have the necessary skills to deal with digital records. In KPLC, although the management of digital records has not been effectively controlled, the organisation's policy makes provision for the management and access of digital records. The available policies related to DRM provide the legislative and legal framework according to which digital records management practices in organisation is regulated.

### **3 Contextual Information**

Kenya Power & Lighting Company traces its history from 1875 when Seyyied Barghash, the Sultan of Zanzibar, acquired a generator to light his palace and nearby streets. This generator was later acquired in 1908 by Harrali Esmailjee Jeevanjee, a Mombasa-based merchant, leading to the formation of the Mombasa Electric Power and Lighting Company whose mandate was to provide electricity to the island. In the same year Engineer Clement Hertzels was granted the exclusive right to supply Nairobi City with electricity. This led to the formation of the Nairobi Power and Lighting Syndicate. In 1922, the Mombasa Electric Power and Lighting Company and Nairobi Power and Lighting Syndicate merged under a new company known as East African Power and Lighting Company (EAP&L). The EAP&L expanded outside Kenya in 1932 when it acquired a controlling interest in the Tanganyika Electricity Supply Company Limited (now TANESCO) and later obtained generating and distribution licenses for Uganda in 1936 thereby entrenching its presence in the East African region. The EAP&L exited Uganda in 1948 when the Uganda Electricity Board (UEB) was established to take over distribution of electricity in the country.

In February 1954, Kenya Power Company (KPC) was formed and commissioned to construct the transmission line between Nairobi and Tororo in Uganda. This was to transmit power generated at the Owen Falls Dam to Kenya. Kenya Power Company was managed by EAP&L under a management contract. In the same year, EAP&L listed its shares on the Nairobi Securities Exchange. Kenya Power Company demerged from KPLC in 1997 and rebranded to Kenya Electricity Generating Company (KenGen) and in 2008, the electricity transmission infrastructure function was carved out of KPLC and transferred to the newly formed Kenya Electricity Transmission Company (KETRACO). Kenya Power & Lighting Company (KPLC) was rebranded Kenya Power Limited in June 2011. Kenya Power Limited (KP) is a limited liability company which transmits, distributes and retails electricity to customers throughout Kenya. The company is a national electric utility company, managing electric metering, licensing, billing, emergency electricity service and customer relations.

## 4 Research Methodology

The research problem was best studied through the use of descriptive research (case study) to give a picture of the situation as it naturally happens within KPLC. The study adopted a mixed method approach. This is because the study was used to gain in-depth information behind the role of digitisation in the preservation of archives at KPLC. It provided further details into the area being studied and aided in developing hypotheses for the research. Therefore, in this study the researchers adopted descriptive and inferential statistical method to analyse the qualitative and quantitative data because the two methods played a collective role towards proper and effective data analysis and construction of research findings as a complementary means to establish the role of digitisation in the preservation of archives at KPLC.

The population for this study comprised of 74 respondents; 20 staff in the Information and Communication Technology (ICT) who provide technical support such as hardware and software update, virtual private network (VPN); and 54 staff in Records and Archives Department with specialised skills of reformatting of records. The study utilised census sampling method. Census is a sampling method applied when the population is less than 200 respondents. Hence for this study all the 74 respondents formed the sample size for the study.

Data collection is a term used to describe a process of preparing and collecting data (Freeman & Haddow, 2008). A formal data collection process is necessary as it ensures that data gathered is both defined and accurate and that subsequent decisions based on arguments embodied in the findings are valid. The main data collection instrument was a semi structured questionnaire. The questionnaires were used because they allowed the respondents to give their responses in a free environment and helped the researcher to gather the required information. Data from the questionnaires was categorised into themes based on the objectives of the study and coded for ease of analysis using the Statistical Package for Social Sciences (SPSS) version 23. The analysed data was presented using pie charts, tables, graphs, frequencies and percentages.

A pilot study was conducted at KPLC, Electricity House and Stima Plaza, Nairobi in two key divisions of the Company's Secretary Division and Information Communication Division. The pilot study involved three key participants in the study as follows; the General Manager ICT, Company Secretary (Legal Officer) and the Chief Records Officer. In this research, 7 respondents were chosen to contribute and were not included in the sample chosen for the study. Test-retest reliability is obtained by administering the same test repeatedly over a period of time and still produces the same results. During piloting the researcher administered the questionnaire to a different set of respondents who are not part of the group of sampled respondents, but exhibit similar characteristics to those sampled for the study. The piloting process also played the important role of checking the respondents for their suitability, clarity, relevance of information and appropriateness of the language used.

## 5 Results and Discussions

The findings of the study are presented and discussed in this section based on the objectives of the study.

### 5.1 Types of digital records preserved at KPLC

The study sought to establish the types of digitally preserved archives at KPLC. The respondents were asked to state the types of digital records created and preserved at KPLC. The findings of the study revealed that 30.9% of the respondents stated annual reports of the organisation (activities, statistics, finances, high and low moments, achievement); 27.3% declared audited financial records; 18.2% avowed service delivery reports on the number of monthly installations, customer complaints among others; 14.5% affirmed employment records of the organisation (number of staff, management and volunteers) while 9.1% stated company profile.

### 5.2 Formats of digital records held at KPLC

The respondents were requested to indicate the format of the digital records preserved at KPLC. From the findings 72% of the respondents indicated that the files were preserved in databases in their departments; 68% indicated data files; 60% indicated text files; while 56% indicated image files. The findings revealed that KPLC is open to preservation of digital records hence embracing the various formats for preservation. Also, the findings point out the organisation's readiness and ability to preserve the digital materials in new formats

### 5.3 Handling of digital records at KPLC

The respondents were asked to indicate how digital records are handled when they are received at the KPLC repository. From the findings, 80% of the respondents indicated that document were checked for viruses when they are received in the Archives Service; 79% indicated they were copied to different storage media; 70% indicated the files were checked against deposit documentation; 68% indicated they were checked to see if the digital records are readable/can be opened; 61% indicated they were migrated to current versions of file formats; 59% indicated they were checked for



sums generated; while 53% indicated normalisation was done to open formats. The findings revealed that the level of handling of digital records has ensured that there is no data corruption and unauthorised access in which the integrity, reliability and confidentiality of digital records could be compromised.

#### **5.4 Type of access to digital records at KPLC**

The respondents were requested to indicate the type of access they allow on digital records held by their archival services. According to the findings, the majority (60%) of the respondents indicated partial access; 25% indicated full access; while 15% indicated no access. From the findings of the study, it is evident that KPLC has focused on security grading and classification of information and records hence the different levels of access provided by the organisation.

#### **5.5 Level of agreement on statement relating to accessibility of digital archives at KPLC**

The respondents were requested to indicate their level of agreement to statements relating to accessibility of digital archives. The findings were placed on a five Likert scale where 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree. From the findings, the respondents agreed that users are given personalised log in credentials for accountability, integrity and confidentiality (mean=4.11); followed by accessing digital records via internet (mean=3.99); accessing digital records storage digital services like CD and DVDs (mean=3.86); we cannot access sensitive and vital records (mean=3.73); we have full access to all digital records in the organization (mean=3.70); we search digital records via emails (mean=3.66); and that we search digital records via server/storage tapes (mean=3.60).

The study revealed that KPLC has embraced different levels of access depending on the nature of the assignment and portfolio one holds in the records management department. Thus, the users are given personalised log in credentials for accountability, integrity and confidentiality.

#### **5.6 Provision of access to digital records at KPLC**

The respondents were requested to indicate how they provide access to the digital records held by their archives. From the findings, 68% of the respondents indicated that they provide access to the digital records held by their archives via the Internet; 65% used online in the search room from server storage/tape library; 59% indicated on CD or DVD in the search room; while 48% indicated no access is provided to digital records.

### **6 Conclusion**

The study concluded that digitisation plays a significant role in the preservation of corporate archives. The findings of the study confirmed that the respondents were aware of the role digitisation plays in the preservation process. The findings revealed that KPLC is open to preservation of digital records hence embracing the various formats for preservation, thus preservation ensures digital records remain authentic and usable for archival development as a measure of obsolescence. Digitisation continues to offer great advantages for access to the corporate archives by allowing users to locate and retrieve the preserved materials with ease and in an efficient manner. The study revealed that the KPLC appreciates records as key drivers in various business activities hence the diverse access provision. Therefore, with digitisation, the preservation of original copies and format of the records is guaranteed.

The study established that KPLC had policies that enhanced the preservation of digital records and archives. These policies included authorisation policies, staff development policies, disaster recovery plan policy, application of latest technology in preservation of information as well as regulatory compliance policy. Finally, security is of great concern during preservation process. In this regard, the study found out that KPLC had put in place different levels of security measures for digital records. Further, security helped to preserve the records while maintaining its integrity, authenticity and credibility.

### **7 Recommendations**

Based on the findings and conclusions, the following recommendations were made:

1. The study revealed that e-mails, circulars and Intranet were the major mode of communication at KPLC. Thus, it was established that ICTs facilitated effective communication. The study recommends that corporate communication manager puts more emphasis on the social networking sites (Facebook, Twitter and blogs) to raise awareness of the digital preservation related policies.
2. The study established that KPLC's digital preservation policy was absent though the organisation had developed policies related to digital preservation archives such as authorisation policies, application of latest technology and staff development policies. The study recommends that the Chief Records Officer should review existing policies to ensure access level competences and regulatory compliance of the digital records are met. Also, research towards new policies for format of digital records such as security policy which ought to be undertaken both by Legal

Manager and Chief Records Officer since obsolescence and aging storage media put electronic records at risk. Storage media are affected by dual problems of obsolescence and decay thus limited shelf life and obsolete in a few years.

3. The study found out that KPLC had inadequate expertise and shortage of DRM skills. Thus, the study recommends that Chief Manager Human Resource and Administration should develop a detailed training plan revolving around the needs of the department. The board of management must ensure that financial resources are available to support the training needs as well as facilities that could enhance digital records management programme. The study also recommended that Chief Manager Human Resource and Administration should sponsor records management staff to get formal training of digital records management (DRM) skills from institutions of higher learning offering relevant courses such as Moi University, Kenya Methodist University, Technical University and Kenyatta University so as to bridge the gap posed by advancement of the technologies that generate digital records.
4. The study established KPLC insufficiently funded the records management activities in the organisation. The study acknowledges that the adoption of ICTs requires huge capital and skilled human resource. Therefore, the study recommends that Chief Finance Manager should in the budget making process factor in the appropriation of funds for purchase of computers, software and training of staff to improve their competence particularly in digital preservations of archives to improve service delivery as well curbing obsolescence.
5. The study found out that KPLC is grappling with the obsolescence of hardware and software. Therefore, digital preservation strategies are needed to ensure digital records and archives remain authentic and usable for archival development. They must ensure preservation of digital records in the simplest way possible. It is recommended Senior Records Officer (Reformatting) adopts migration and emulation as the key strategies of preservation.

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# Transforming Service Delivery in Uasin-Gishu County, Kenya through Enhanced E-Records Management Solutions

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## Abstract

*This chapter examines the management of e-records at Uasin-Gishu County, Kenya and assessment of its impact on service delivery in the County. The specific objectives of the study which led to the chapter were to identify the services provided by Uasin-Gishu county headquarters using electronic records; investigate how e-records are managed at Uasin-Gishu County; find out the correlation between electronic records management and service delivery at the Uasin-Gishu County headquarters; and analyse the challenges faced by Uasin-Gishu county government in the management of e-records. The study was based on the Records Continuum Model developed by Frank Upward (1980) and the Service Canada Model developed by the Canadian government (2005). It utilised a qualitative research approach based on a case study design. The study population comprised of 112 respondents drawn purposively based on their work experience in records management services in various departments of Uasin-Gishu County headquarters. The findings of the study indicate that Uasin-Gishu County headquarters generates vast volumes of paper records. It also revealed that the County headquarters faces challenges in electronic records management. Some of the challenges include poor storage of electronic records, slow retrieval of records, among other shortcomings. This has consequently affected the overall service delivery at Uasin-Gishu County due to inefficiencies. The study recommends the adoption of a comprehensive e-records management and service delivery model which links records management and service delivery.*

**Keywords:** *Electronic records, Records management, Service delivery.*

## 1 Introduction

Records are important information resources for organisations. They are used by public service agents like governments to make informed decisions based on facts they carry. Therefore, they are relevant to political and socio-economic activities for a people (Kemoni, 2007). According to Smith (2008), records are essential to the business of all organisations. They are used to support the delivery of services by documenting policies and statutes as well as determining what services are provided, who does what and how much it costs among so many functions. Records also support administrations by providing information for the direction, control, decision making and coordination of businesses. They document rights and responsibilities, legal provisions, evidence of work of public authorities and are useful for future research. Cox and Wallace (2002) corroborate the assertions by stating that accountability and transparency can only be possible when relevant information is available.

The ISO 15489 standard defines records as information created, received and maintained as evidence and information by an organisation or person in pursuance of legal obligations or in the transaction of business. Cox (2001) explains that records have been wrapped up with standards and other forms of activities they are used in. He asserts that all forms of definitions that include information, data, structure, origination or end user potential have transformed the way records are viewed and therefore hold a potential of blurring the understanding of what records really are. He settles on a definition of records as extensions of the human memory, purposefully created to record information, document transactions, communicate thoughts, substantiate claims, advance explanations, offer justifications and provide lasting evidence of events.

According to Wamukoya and Mnjama (2007), e-records are the recorded information, documents or data that give evidence of policies, transactions and activities carried out in e-government and e-commerce environments. These could be categorised as text files (files produced by word processing programs or by other software); data files (computer-generated files that keep numeric and sometimes textual information as quantitative values so that numbers can be manipulated using arithmetic processes); analogue audio and visual records (sound documents and images to be played back); disaggregated data; databases; machine instruction sets (records created by the action of intelligent machines); image files; and digital documents.

## 2 Purpose of the Study

The purpose of the study on which this chapter is based was to examine the state of electronic records management at Uasin-Gishu County headquarters and its contributions towards service delivery with a view to developing an appropriate framework that aligns e-records management with service delivery.

The specific objectives of the study were to: Establish the services provided by Uasin-Gishu County headquarters using electronic records; Investigate how e-records are managed at Uasin-Gishu County government headquarters; Analyse the correlation between electronic records management and service delivery at the Uasin-Gishu County headquarters; Identify the challenges faced by Uasin-Gishu County government in the management of e-records; and to propose a suitable framework that aligns electronic records management with service delivery.

### 3 Theoretical Framework

The study applied the records continuum model (1980) and the Service Canada model (2005). They are discussed hereunder.

#### 3.1 The Records Continuum Model

The records continuum model was formulated in the 1980s by Australian archival theorist Frank Upward based on four principles (Ngulupe 2006). These principles are:

1. A concept of “record”, inclusive of records of continuing value (archives), stresses their uses for transactional, evidentiary, and memory purposes, and unifies approaches to archiving/recordkeeping, whether records are kept for a split second or a millennium.
2. There is a focus on records as logical rather than physical entities, regardless of whether they are in paper or electronic form.
3. Institutionalisation of the recordkeeping profession’s role requires a particular emphasis on the need to integrate recordkeeping into business and societal processes and purposes.
4. Archival science is the foundation for organising knowledge about recordkeeping.

The records continuum model was the preferred model because it places particular emphasis on the need to integrate recordkeeping into business processes. The model also describes the processes for managing records (paper as well as digital) from the point of creation.

#### 3.2 Service Canada Model

The researcher triangulated Service Canada Model with the Records Continuum model. It is a comprehensive model that aims at excellence in service provision. Service Canada model, developed specifically for the Canadian government, provides Canadians with a single point of access to a wide range of government services and benefits. It is committed to improving services for Canadians by working with partners to provide access to the full range of government services and benefits that Canadians want and need through the Internet, by telephone, in person or by mail.

These two theories were sufficient to inform the study since they are wholesale in matters of electronic and paper records management approaches and they addressed the two objectives that touched on them.

### 4 Methodology

The study anchoring this chapter used a single-case study approach of Uasin-Gishu County headquarters. This case study was chosen to examine records management and service delivery at Uasin-Gishu County headquarters as a function and its impact on service delivery strategies of the County Government. The information collected assisted in developing a framework that brings the two tasks together into the County government operations. A qualitative study approach was used to identify the services the County Government offered and integrate the participants’ perceptions and views of the topic under study. The study population comprised of 112 respondents who included representatives of the ten (10) Chief Officers of Uasin-Gishu County, twenty-two Action Officers (22), twenty-five (25) Records Officers and fifty five (55) Clerical Officers. The Table 1 below presents the composition of the population.

Table 1: Study population

Cadre of Staff	Target Population	Sample size at Saturation level	Percentage
Chief Officers	10	6	60
Action Officers	22	10	45.4
Records Officers	25	15	60
Clerical Officers	55	20	36.3
<b>TOTAL</b>	<b>112</b>	<b>51</b>	<b>45.5</b>

Due to the relatively small number of respondents involved in the study, a census inquiry was adopted. Fraenkel and Warren (1993) explain that census is the total enumeration of the study population. This method is used when the target population is small. The authors purposed to interview the entire population. However, they reached saturation level after interviewing 51 respondents. Data was collected using a combination of semi-structured face-to-face interviews,

and an observation checklist. Data was analyzed based on the deductive approach. The researcher predetermined the findings structure guided by research questions.

## 5 Findings and Discussions

### 5.1 Records management practices at the Uasin –Gishu County Government headquarters

The Uasin-Gishu County Government headquarters has two separate registries. The major one, referred to as the Central Registry, deals with varied records. The other one is for human resource records. The registries are administered by a total of twenty-five (25) staff members. This registry uses a simple classification scheme that denotes the file ownership based on an acronym of the matter. Examples include ADM for administration and EDU for education. The major records kept by the central registry are land records organised in blocks. These blocks are a representative map of the entire Eldoret metropolis. The records contain land registration details (L.R. numbers) as well as copies of ownership details such as title deeds, search, and any literature on the particular land.

### 5.2 The use of e-records at the Uasin-Gishu County headquarters

The study sought to find out from the respondents how Information and Communication Technologies (ICTs) have been harnessed to manage records and provide consequent services at the County headquarters. The respondents were asked if there were ICT installations in the County headquarters that supported records management. All the respondents said that there was ICT infrastructure at the County headquarters that supported records management on various levels. One respondent stated:

*“Although there is the Integrated Financial Management and Information System (IFMIS) in place, the ICT personnel gave only technical support to maintain the created or received records in the system”*

Another respondent, however, contradicted his/her colleague when she stated that:

*“The ICT personnel managed all the records in the system and manipulated their use since they controlled all the hardware and software therein”*

This implies that electronic records and ICT-based information resources had no definite managers or policy makers. Thus, the status of e-records management was unclear at the County headquarters. Four respondents stated that e-records management was the responsibility of the respective departments which determined what was considered records and therefore stored for future use while the rest was disposed of. Areas that are earmarked to provide online services include e-revenue, hospital, government human resource information, enterprise fund, job and advertisements. The upcoming County government data centre had various aims as mentioned by two chief officers. These included a much more vibrant local area network (LAN), development of a management information system for the entire county government and linkages with all the County departments. Ten (10) Action Officers were asked to state the record formats maintained in their sections. Six (6) respondents said that they had paper records while four (4) stated that they had both electronic and paper records. When asked the type of electronic records in their custody, they identified e-mails and CD-ROMs. The respondents were asked to give information on the maintenance strategies applied on the electronic e-records and they gave the following replies:

*“E-mails received at the County headquarters and the Action officers had the mandate to pick the most important ones to be kept in any electronic storage media of choice or be printed and kept as paper records”.*

*“Records within the County system and data centre belonged to the respective County departments while the hardware and software was managed by the ICT section”.*

The Records Officers were asked to identify the type of e-records the registries managed. Eight (8) of them reported that it included electronic records. The types of electronic records mentioned included e-mails, websites and CD-ROMs. When asked about the practises and procedures applied in the management of records at the County headquarters, ten (10) respondents replied that no specific practices and procedures existed. When asked to explain who managed the electronic records at the County headquarters, eleven (11) respondents answered that it was upon the respective County offices to manage them. To the question on who is in charge of the security of electronic records, some replied that it is the responsibility of the ICT department and or the Action Officers and their office staff. When probed on their knowledge of ICT and electronic records, all the fifteen (15) respondents answered that they had no formal training on how to handle electronic records. These respondents were further asked whether they had any experiences on loss or damage of electronic records and all the fifteen (15) respondents answered in the affirmative and admitted that ICT and electronic records management faced a lot of challenges at the County headquarters.

The Clerical Officers were asked whether they had skills on how to manage paper and electronic records. Six (6) respondents indicated that they had the knowhow on both paper and electronic records. Eleven (11) stated that they lacked skills on the management of electronic records while three (3) thought they were not fully conversant with management

of electronic records. All the clerks acknowledged the existence of ICT installations at the County headquarters that support the management of e-records. When further probed on their knowledge of ICT applications that supported records management the following answers were received; they identified emails, IFMIS, DVD/CD ROMs, and County web sites. The IFMIS project was identified as a system that purely uses ICT applications at the County headquarters. Four (4) respondents explained that IFMIS generated a lot of paper records as well. These records, they indicated were often used by the County Chief Officers and Action Officers to procure and verify financial transactions of the County Government.

All the respondents said they were satisfied with the allocation of computers at the County offices. The respondents also held the view that networking of computers had made a big impact on the County systems and many databases could be accessed by staff members with ease. They noted that the County clients are nowadays served faster unlike before since in-house database systems are used to process payments. Therefore, queries are faster responded to promptly. ICTs come in handy since they facilitate cheaper and reliable communication between departments.

Through observation, they study found out that Uasin-Gishu County Government had invested a lot on ICTs. Many offices at the County headquarters had desktop computers. There was a lot paper processes in place with little ICT applications in use to manage records. The registries and County offices had personal computers for all the staff who served therein. A network system of computers was also in place. The ICT and record functions were intertwined at the County headquarters. Consequently, ICT personnel controlled electronic records activities as opposed to records managers.

### **5.3 Correlations between e-records management and service delivery and its impact on the services offered by Uasin-Gishu County Government**

The study examined the impact of e-records management on service delivery at the county government headquarters. The respondents pointed out the following as the benefits that are accrued from the use of e-records at the county government headquarters:

*"The ICT unit is now a fully-fledged department in the County Government and therefore e-records concept is clearly defined"*

*"Inception of the data centre by the County Government is a milestone. Four Chief Officers said that the data centre had drastically brought down costs in records management in terms of low paper usage and shared information resources in the client/server computer resource applications"*

*"The use of the County revenue collection and management system had reduced expenses in terms of personnel costs and the wider scope attained by the e-records availed to the public on the web. The County government, for instance, could now collect parking fees through mobile platform M-Pesa without staff interventions"*

*"The use of IFMIS system is an ideal platform that is fast and reliable. The nation-wide interconnectivity of IFMIS also alleviated corruption and saved communication costs. Availability of an audit trail has led to responsible financial expenditure"*

*"The records provided for by the county government facilitated the performance of the IFMIS project and the data centre consequently stored transactions undertaken"*

The respondents, however, considered the following as some of the weaknesses attributed to the use of e-records:

*"Lack of a comprehensive records management policy that covers e-records. This impedes a good records management practice and hence service delivery"*

*"Little appraisal and disposal done on e-records; this had brought about maintenance of unsuitable, non-current e-records in the data centre. As a result, the ICT staff wasted storage space. It also resulted in slow retrieval of records"*

*"Duplication of records: Some records are both in paper and electronic formats. This has led to wastage of space and funds of the county government"*

*"Poor management of e-records due to lack of policy"*

*"Inadequate staff trained and skilled in records management including digital preservation and records management"*

*"Technological obsolescence caused by the ever-changing technologies such as hardware and software"*

*"Poor maintenance of computers and storage devices by ICT personnel; this had resulted in failure to capture, store and disseminate crucial information required by the County government for service provision"*

The respondents gave the following suggestions as strategies that could improve e-records management at the County:

- The County Government could team up with other service providers and nongovernmental organisations resident in the county to provide a wide variety of services. An example given was web-based services to ease congestion at the County headquarters.
- Some of the devolved ministries, like health, had better recordkeeping systems which could be adopted by other

service areas.

- The establishment of *huduma* centres could provide a model for service provision for the County government together with other national agencies.

#### 5.4 Challenges faced by Uasin-Gishu county government in the management of e-records

Another objective of the study was to identify the challenges faced by Uasin-Gishu Government in the management of records for service delivery. Four (4) Chief Officers identified lack of a comprehensive policy on records management as one of the challenges faced by the County headquarters. The respondents explained that existing manuals did not comprehensively address the needs of all types of records that were received and generated by the County Government. According to one (1) Chief Officer, space is a major handicap in records management at the County headquarters. The chief officer in charge of the registries stated that the problem of space started immediately the County Government was established. He noted that the volume of records rose due to the increase in the number of staff and mandate of the County Government. Two (2) Chief Officers stated that a policy on records management was lacking. This had led to haphazard records management practices which consequently affected service delivery at the County headquarters.

Three (3) Chief Officers were of the opinion that the devolution of some national government ministries meant more records at the County headquarters. This resulted in too many records being transferred to the County headquarters with little or no appraisal and disposal being done. One (1) Chief Officer stated that land records were complex due to the approach adopted by the now defunct local authorities which operated at the County. An example given was that parts of land in Uasin-Gishu County before devolution were under the control of the defunct local authorities that operated in the County while others were under the then central government. The merging of the local authorities into one County government meant harmonisation of all land records into one. However, the Ministry of Lands was not devolved. This meant that the national government remained in charge of land records alongside the County Government.

Failure by the County Government departments to capture all the information in its operations is also an impediment that continues to affect services provided by the County Government. Five (5) Chief Officers noted that many meetings happened without proper communication being recorded for documentation purposes.

Conflicting records keeping practices adopted by different County offices was identified by two (2) Chief Officers as a weakness on records management. The finance department, for instance, did not classify records based on records management principles. Failure to hire trained staff in electronic records management was highlighted by four (4) Chief Officers who spoke about inadequacy of skilled Records Managers and low morale due to mismatch of skills. Lack of a disaster preparedness and recovery programme at the County headquarters could also jeopardize County records management services should a problem occur in the headquarters.

The following response given by one respondent summarises what majority respondents said:

*“The e-records management process experiences slowness due to missing files, slow procedures in use, little space, manual systems and inadequacy of staff to man a sound records management system”.*

The Chief Officers were of the opinion that the present manual system contributed to poor service delivery at the County Government. They were optimistic that the data centre would see all departments of the County Government network their services through computerisation.

Other challenges included: “low funding of e-records management system”; “inadequate supervision by Kenya National & Documentation Services on e-records management”; “low professionalism in systems and records maintenance resulting in inefficiencies in managing e-records”; “changing governance structures and service delivery strategies demanding newer technologies to address compatibility and operability of old and new systems at the County level”; “poor maintenance of ICTs, computers and storage devices caused by computer failures and virus attacks; “data integrity and security challenges; and “low ICT services among staff in other departments who lacked computer literacy skills.

## 6 Conclusion

County government functions rely on effective records management infrastructure. A reliable records management system leads to effective County operations and the ability to apply past experience for present and future guidance. The records should be able to present or represent business transactions or activities that brought their creation. This study established that services of Uasin-Gishu County Government depended on properly managed records for efficiency in service provision. The findings agree with IRMT (1999) which noted that in many African countries records management was widely seen as a lower grade service area that received little attention in the manner information is created, structured and managed. Despite the recognition by the respondents that records management was of great importance to the work of the county, records were still poorly managed. Though most of the staff interviewed at the county headquarters was aware of the significance of records management to business processes, records management function was found



to be low key. This is attributed to the lack of a records management policy in the County headquarters. There were no comprehensive documented procedures and laid-down protocols for the records management programme.

Staffing for the records management function in the County headquarters was inadequate. There are few records management professionals in the County headquarters and some of them had been deployed to perform non-records management duties. In many departments, the staff performing records management duties did not have any formal training in e-records management. The County Government had not been active in facilitating continuous training to the records management staff which had consequently contributed to poor service delivery. Johare (2006) argues that people need to be capacitated through training and education to provide skills and knowledge to run an effective records management system. The records management system currently in use is largely manual. The study established that there was very low usage of ICTs in the management and utilisation of the county records. Similarly, there was no ICT policy on records management. This has compounded into lack of a records management input on the existing ICT installations at the county headquarters.

The findings of the study revealed that besides the records challenge the County Government faced other types of challenges that ranged from policy, governance structure, operational, financial, compliance, technical and security. This is a ground for an ineffective records management system. These findings are in support of Shepherd's (2006) assertion that records in organisations where records are not properly managed will be inadequate for the purposes for which they are needed.

The findings revealed that poor e-records management impacted negatively on service delivery activities at Uasin-Gishu County headquarters. Failure to properly manage records had compromised the ability of the County Government to meet its legal, regulatory and compliance obligations and has created significant overhead costs in the County Government. The study also found that there existed ineffective processes for the creation, use, protection, retention and disposition of information. Records are critical components of prudent financial expenditure, auditing, compliance, strategy, transparency, accountability and many other services.

It can therefore be concluded that records management is a service delivery function and can be an effective tool in improving services provided by Uasin-Gishu County Government. This agrees with the view held by Wamukoya (2000) that records management programme is key in maintaining and upholding three domains namely: business, accountability and culture for the sake of good democratic governance in the public sector. The study therefore concludes that the poor state of records management at the county headquarters had contributed to inefficiencies in service delivery of the county government.

## **7 Recommendations**

The study revealed gaps and weaknesses in e-records management systems and practices at the Uasin-Gishu County headquarters which undermined service delivery. The following recommendations can help to strengthen records management as a critical success factor of service delivery at Uasin-Gishu County headquarters:

1. Development and implementation of an e-records management programme, implementation of policies and adoption of standards in records management. The study revealed a lack of e-records management policies, standards, guidelines and ideal procedures at Uasin-Gishu County government headquarters. To deal with the weaknesses and lack of records management programme, the Uasin-Gishu County government should develop policies that address programmes for the entire county government. This should standardise records access so as to ensure professionalism in records management that supports service delivery. The programme should capture all business process activities of the county government. It should strive to set records management standards through the records continuum from creation to disposition of records across the unique and entire county government business activities.
2. Staff recruitment, training and capacity building for records management personnel on e-records management. Having a qualified records manager to oversee records management activities at the county headquarters will provide leadership that is currently lacking at the County headquarters.
3. Automation of records management services and networking of departments. The registries should automate file tracking activities by introducing computerised file tracking systems. This will address concerns raised by the respondents of long retrieval periods due to loss, misplacement and misfiling of records.
4. Integration of service delivery and records management. The study recommends that the County chief executives should invest more resources to ensure improved electronic records management as a basis of proper service delivery throughout the County.
5. Vital records management and disaster management and recovery programmes. The study revealed that the county had not implemented vital records and disaster preparedness and recovery management programmes. This meant

that in cases of disasters, there would be loss of information or the response could be slow

6. Top County Government support. The study recommends that the County top executives should give maximum support to records management activities in form of policy and increased budgetary allocations.

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# Digital Records Preservation Practices in the Private and Public Sectors in Kenya

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## Abstract

*The purpose of the study from which this chapter is extracted was to investigate digital records preservation practices in both the private and public sector in Kenya. The specific objectives were to investigate the presence and use of digital preservation strategies; establish the records management services that have been digitised; identify the systems used for digitising records services; and identify the challenges facing digital records preservation in Kenya. A survey was used in this study and participants were drawn from both the public and private sector in Kenya. Quantitative approach was used to collect, analyse, present and interpret data. The study focused on the members of the Kenya Association of Records Managers and Archivists (KARMA). 100 members of the association were selected using purposive sampling to respond to self-administered questionnaires. The findings were analysed using SPSS. The findings reveal that most organisations have no strategies in place for preserving digital records while the systems used to digitise records management services are not appropriate because they are enterprise resource planning systems which lack essential functionalities for records management. The challenges identified include inadequate finances; lack of top management support; and resistance to change by staff. The study recommends creation of awareness of the digital records preservation strategies to staff as well as investment on training of staff on digital records management and change management.*

**Keywords:** *Preservation, Digitisation, Records management, Digital records, Digital records preservation.*

## 1 Introduction

A large part of the world's information is now produced digitally. Digital resources range from medical records to movie DVDs; from satellite surveillance data to web sites presenting multimedia art; from data on consumer behaviour collected by supermarket tills to a scientific database documenting the human genome; and from news group archives to museum catalogues (Webb, C. 2003).

MacNeil (2000) asserts that the rapid spread of information technology makes preservation of digital heritage a worldwide concern. More and more digital systems are being introduced everywhere for administrative purposes and a great many countries are digitising cultural materials for better access. The speed at which the digital world moves has upturned the order of all established preservation practices.

Deegan and Tanner, (2006) opine that generations of platforms, programmes and machines succeed one another so quickly that it is a matter of years rather than decades before materials become inaccessible as a result of compatibility problems. The timescale for preservation has shrunk. Steps to ensure that digital materials remain accessible have to be taken very early in their lifecycle.

On the other hand, Duranti (2009) argues that governments and policy makers should be aware that preservation of digital heritage is an urgent issue and that solutions cannot be found overnight. Traditional or digital formats should be preserved for conducting of organisations business as well as for historical and/or cultural evidence (including artefacts). With the onset of the electronic and/or digital era, little is being done to preserve digital information. There is a high risk of losing essential materials in which valuable resources have been invested. It is therefore crucial that countries assume responsibility for digital preservation and take steps to prevent such loss.

## 2 Rationale of the study

In the world of print, preservation can be achieved by preserving the paper object or, if that is not feasible, creating a durable surrogate, for instance, on microform. The equivalent in the digital world would be, for example, to preserve a CD-ROM, or transfer its content to another carrier. However, this does not achieve much more than preservation of the actual bits that make up a file. Whereas this is obviously a necessary condition for preservation, it is not sufficient to ensure that the information can be read and interpreted in the long run.

File formats and programmes also become obsolete, therefore preservation of digital materials has to deal with not only maintenance of the files themselves, but also with ways of keeping them accessible (UNESCO, 2012). This means that the software applications or programmes have to be preserved and somehow kept running on new platforms, or the files have to be converted to another format that can be interpreted by new programs. As the digital world evolves all the time, this is a continuous process necessary if materials are to be kept accessible for decades (or even forever). Due

to the complexity of managing the preservation of multimedia materials, varied formats and applications there is often case that result in loss of information, functionality and/or appearance, especially with complex, multimedia materials that combine a variety of file formats and applications.

This poses risks for integrity of digital materials: how can it be ensured that the digital object, moving from one environment to the next, remains complete and undamaged? A different but related issue is authenticity, which relates to the trustworthiness of materials, in particular of electronic records (Council on Library and Information Resources, 2005). As records are used for accountability and as evidence of transactions, it is crucial for future reference that the original exists as it was first created and that the record indeed is what it purports to be. Duff (2001) opines that integrity and authenticity do not only depend on protecting files against intentional changes by unauthorised persons, but also on controlling inadvertent changes resulting from misinterpretation or misrepresentation by computer systems.

### 3 Aim and objectives of the study

The aim of the study from which this chapter is extracted was to conduct a survey of digital records preservation practices in the private and public sectors in Kenya. The specific objectives of the study were to:

1. establish the types of records generated and where they are stored;
2. assess whether the organisations have a digital preservation strategy;
3. identify the records management services that have been automated;
4. examine the systems used for automation of records services; and
5. identify the challenges facing implementation of digital records preservation

### 4 Methodology

Kothari, (2004), states that research methodology does not only refer to the methods that are used in collecting research data but also considers the logic behind the methods used in the context of the study and an explanation of why a particular method is being used in order to draw a sample for data collection and not another method. The choice of the research design depends on the research approach.

The research approach used was quantitative. The research design adopted was a survey where members of Kenya Association of Records Managers and Archivists working in diverse organisations participated. The study population focused on the Kenya Association of Records Managers and Archivists (KARMA) members who are practising records management officers. The population of this study comprised of 100 records management officers drawn from both private and public sectors in Kenya. The entire population was used in this study. Leedy (1997) argues out that there is little point in sampling populations that are less than one hundred (100).

Data was collected using questionnaires. The questionnaires were self-administered to the respondents. Analysis and presentation of data for this study was done based on the objectives of the study. Descriptive data analysis was used for this study.

### 5 Findings

The response rate of the study stood at 68%. This response rate was considered appropriate for data analysis. Mugenda and Mugenda (2012) argue that a response rate of at least 50% is adequate for analysis; reporting a response rate of 60% is generally good; a response rate of above 70% is excellent. Kothari (2011) concurs with Mugenda and Mugenda (2012) that a response rate of above 70% is deemed to be very good.

#### 5.1 Types of records generated

The respondents were asked to state the type of records they generate. This question was meant to ascertain the type of records created and managed in various organisations. The response to this question was as follows: 10 (15%) indicated that they generated electronic records; 25 (37%) said they generated paper records; 30 (44%) reported that they generated both paper and electronic records; whereas 3 out of 68 (4%) did not respond to this question.

Despite the fact that most organisations are embracing automation of records management and use of electronic records, the preservation of digital information remains problematic. Digital records may be lost due to obsolescence of the technological platforms that they depend on.

The respondents were asked where they store the electronic records generated in the course of transacting their business activities. The responses were as follows: 3 (4%) did not respond; 20 (29%) indicated that they store their electronic records in flash disks; 15 (22%) said they use CD ROMs for storing their electronic records; 18 (27%) reported that they store their electronic records on computer hard disks; while 12 (18%) said that they store their electronic records in the cloud.

## 5.2 Digital preservation strategy

Preservation issues must be considered from the point of creation and throughout the entire life-cycle of the digital resource. The aim of a digital preservation strategy should be to achieve consistency in the management of digital records. It should identify the actions required for active preservation. It can be part of an integrated preservation approach in an organisation.

The participants were asked whether they have a digital records preservation strategy in their organisations. The response rate was as follows: 28 (41%) said they do not have a strategy; 30 (44%) said they have a strategy; 10 (15%) indicated that they were not sure if a strategy for digital records preservation exists in their organisation. From the above response, it is clear that most organisations generate electronic records yet they have no strategy in place to ensure the preservation of the same.

## 5.3 Automation of records management services

Automation is a mechanism that can be used to facilitate records management and archival functions. According to IRMT (1999), automation refers to the use of machines or systems to perform tasks normally performed or controlled by people. Furthermore, IRMT asserts that automation can help organisations to implement authentic and reliable record-keeping practices through the improved tracking of records through their life-cycle as well as the consistent application of records schedules and descriptive standards.

The respondents were asked if they have automated their records management services. The findings from the responses were as follows: 20 (29%), indicated they have automated their records management services; 45 (67%), said they have not automated; while 3 (4%), did not respond. From the findings, despite the fact that most of these organisations generate both paper and electronic records, it is clear that most of them have not automated their records management systems and processes.

## 5.4 Systems used to automate records management services

The respondents were asked to briefly describe the systems they have used to automate their records management processes or services. Out of 20 respondents who indicated that they have partially automated their systems, 3(15%) reported that they are using Desktop Tax Department iTax system; 5(25%) said they have automated using Access Document Archiving System (ADA System); 4(20%) reported that they are using System Administration and Products (SAP); 5 (25%) indicated that they are using Oracle system; 3(15%) indicated that they are using Electronic Document Management System (EDMS). From this response it is clear that records that are generated in most of these organisations are managed using systems that are not specifically dedicated for records management. The systems currently used have different functionalities that may not be specific for records management with the exception of two systems namely Access Document Archiving (ADA) and EDMS.

## 5.5 Challenges faced in automation / implementing automated systems

According to IRMT (1999), what are often perceived as automation problems arise not from the implementation of computer technologies but instead from insufficient analysis and planning prior to their implementation. Reed *et al.* (2013) observe that failure to identify and analyse systemic problems and carry out proper business process re-engineering prior to automation can lead to greater problems in the implementation and management of the new technologies. Problems also arise when the processes being automated are poorly designed in the first place, just to point out a few.

The respondents were asked about the challenges they faced in automating or implementing automated systems. 30(44%) of the respondents reported lack of funding as the most challenge affecting them; 26(38%) of the respondents said that lack of qualified personnel is a challenge that affects implementation of automation systems; while 12(18%) of the respondents reported that resistance to change is a challenge affecting the implementation of automation systems.

## 6 Conclusion

Taking into consideration the findings of the study, preservation of digital records needs to be in Kenya needs improved. Digital preservation strategies and policies should be developed in order to ensure reliability of records in the future with the ever-changing technological developments in this 21<sup>st</sup> Century (Schönberger, 2009). The study therefore makes the following recommendations: -

- Training and capacity building of staff working in both private and public sectors of should be conducted by experts in digital records preservation and change management. This will aid in creating awareness to staff in records units on digital preservation practices and strategies.
- More funds should be allocated for and channelled by the key decision makers to support records management functions as well as to help in the development of digital preservation strategies in both private and public sector.

- Involvement of records management experts/consultants in vetting process of acquiring records management system. This will curb the challenge of acquiring systems with functionalities that do not support records management.

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# Harnessing Electronic Records Management Solutions in Kenya's Devolved System of Government

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## Abstract

*This chapter investigates factors precluding the use of electronic Records Management Systems (ERMS) in supporting devolved system of government. The specific objectives of the study were to: identify current ERMS-supporting devolved system of government and assess the adequacy of the ERMS being used in Kenya's devolved system of governance. The study on which this chapter is based was a multi-case study involving four purposively selected county governments of Kakamega, Bungoma, Busia and Vihiga in western Kenya. 43 participants were purposively selected to participate in the study. They included chief officers, directors, head of records management units, departmental records officers and archivists. Recorded data was analysed thematically through reading, annotation of interview transcript, categorising, linking, corroboration and producing an account of the study. The major finding of the study is that mind-set of paper-based records management systems has undermined the effective use of EMRS for management of records in county governments. The study recommends that county heads of records management, departmental records management officers, archivists and top managers in county governments should jointly develop and implement a strategy to adopt ERMS. The results may be used by county governments to improve business operations and accountability in line with devolutionary reform agenda.*

**Keywords:** *Devolved government, Electronic Records Management Systems, Business Information Systems*

## 1 Introduction

Devolution is a public sector reform used by a number of countries in the world. It is management mechanism which moves discretion, authority, responsibility and accountability from a central agency to local devolved units (Sharpe, 1996). Devolution comes in various form each implementation unique to the context of each country. Devolution entails the transfer of some regular functions performed at the headquarters of governmental ministries, departments and agencies (MDAs) to sub-national levels closer to the people they serve or are supposed to interface with. Kinnie (1990) in (Sharpe, 1996) suggested a distinction between decentralisation and devolution by stating that decentralisation refers to changes in departmental structure while devolution implies changes in the allocation of authority. Devolved system of government follows multi-dimensional approach to organisation and management of governance and state power. It seeks to organise governance and manage state power both vertically and horizontally.

Devolution has worked in some developed countries for many years. However, in many developing countries, the reform has lagged far behind due to many factors. Political and economic events in 1980s brought about the resuscitation of democratic governance and this has paved way for national governments to build participatory institutions. The same period saw the development of new approaches to management of records such as the invention of the records continuum model to replace the records life-cycle model as the model.

Kenya's devolution model involves the national government transferring powers, functions and responsibilities by legal and constitutional means to 47 independent popularly elected county governments. According to Government of Kenya report on the implementation of devolved government (2011), the focus of Kenya's devolved governance is to facilitate national renewal, equity and equality, inclusiveness, as well as equal opportunity for all. Success of Kenya's devolution depends on several factors. Among these, a proper architecture, design, planning, development and maintenance of electronic records management systems. The environment within which the devolved governance system operates in Kenya implies the contribution of records is not apparent while in truth the state of records management in the country has impacted negatively on the delivery of services.

## 2 Electronic records management systems

Electronic records management systems are used to manage the creation, use, maintenance and disposal of electronic records for the purpose of providing evidence of business activities. ERMS provides contextual information and links between records to support their value as records throughout their life cycle. They are distinguished from Business Information Systems (BIS) by the role they play in providing organisations with evidence of business (Gary & Bowen, 2005). BIS is an automated system that creates or manages data about an organisation's activities. The primary purpose of BIS is to facilitate transactions between an organisational unit and its customers. Examples of BIS include: e-commerce

systems, client relationship management systems, purpose-built or customised databases, finance or human resources systems. Business information systems contain dynamic data that is commonly subject to constant updates, able to be manipulated and holds current data (non-redundant). In contrast, ERMS contain data that is not dynamically linked to business activities (i.e. it is time-bound), unable to be altered (inviolable), and that may be non-current (International Council on Archives, 2008).

Electronic records management systems differ from their manual counterparts in several ways among them is the fact that they are typically designed and operated by people other than either archivists or records creators. In addition, they are typically dependent on the hardware and software to function. The professionals who manage electronic records management systems demand that archivists articulate their functional requirements so that decisions can be made as to whether, to what extent, and how they should be satisfied. Common complaints about modern BIS are that personnel involved in the creation and use of electronic records have too much authority and too much responsibility for record-keeping and that the electronic systems circumvent the traditional procedural controls previously enforced by records management personnel. With the increasing use of computer-based information systems, contemporary organisations are seeking ways to replace record-keeping systems which require that all participants in the record-generating process learn and follow the rules for record keeping with systems where the rules are embedded in and enforced by software routines. In essence, organisations are seeking record-keeping systems that follow rules for records creation, maintenance, and preservation at all times.

It is widely known that the implementation of ERMS is a long and complex process. However, it is also recognised in the academic literature that the implementation of ERMS is worthwhile due to the numerous benefits that ERMS holds (Gary & Bowen, 2005). The implementation of ERMS leads to ease of coordination, higher quality, higher efficiency, and higher maintainability (Reijers *et al.*, 2003). Hellen and Andersen (2008) assert that use of ERMS can stimulate transparency and accountability of government institutions thus providing an unbiased, accurate and recorded account of responsibility.

The level of acceptance and use of the ERMS by governments and especially sub-national governments has often been low. Shepherd *et al.* (2011) investigated 19 different institutions in London and the South East of England and found that county governments were failing to deal adequately with digital records in spite of the expertise and IT systems in place. This may be attributed, in part, to the continuing paper-based mind-set among many devolved government staff. Low rate of use ERMS leads to an unproductive cycle where users who choose not to store records in the system are not likely to use the system to retrieve records since it is unlikely the records they are seeking would have been stored in the system in the first place. Low utilisation of ERMS means that records will not be properly managed and can be lost through destruction or deterioration. Loss of records impacts individuals, organisation and society in the short term and long-term through the loss of accountability and in long-term loss of history (Gary & Bowen, 2005).

According to the World Bank, Information Solutions Group and International Records Management Trust (2000) central government ERMS were adopted by sub-national units. However, these systems have been structured to support information needs of users in centralised government. Little thought had been given to the complicated task of redesigning the current records systems while taking the information needs of both national and devolved units into account. Nengomasha (2009) in Chigairo and Khumalo (2018) also conducted a study on electronic records management in the Namibian Public Service in the context of e-governance. The study was a multi-case study of seven ministries, two local authorities and two regional councils. The study recommended the adoption of ERMS and further investigation into the electronic information systems running in the public service.

The environment within which the devolved governance system in Kenya operates implies the contribution of ERMS to devolved government is not conducive. Okumu (2013) highlighted challenges of harnessing ERMS as including lack of skills in computers mainly at top level and low levels; lack of equipment to run the ERMS on; poor attitude to change; and poor budgetary allocations to the records management function. Other challenges are weak collaboration between stakeholders in devolution; poor monitoring and evaluation systems; insufficient legal frameworks; and inability to develop quality legislation.

### 3 Statement of the research problem

Devolved governments have increased significantly in scope, scale and complexity in recent years globally. A key challenge arising from this is the establishment of appropriate links between electronic records management solutions and devolved system of government. Electronic records management systems have the ability of improving business operations, accountability and meet community needs of county governments. Harnessing electronic records management systems is aimed at replacing the existing cumbersome manual records management systems as well as ensuring connectivity and linkage of public service offices. However, there are claims that countervailing factors can undermine the effective use of existing ERMS in supporting operations of devolved government. Smith (2007) attributed some of factors to the



inadequacy of ERMS. Shepherd, Stevenson and Flinn, (2011), argued that the failure was attributed to the continuing paper-based mind-set among the staff of sub-national units. In spite of the expertise and IT systems in place, they were unable to deal with digital records. Shepherd et al, (2011), further argued that sub-national governments were an under-researched field in respect to information management when compared with other parts of the public sector.

Since 2013 when the devolved system of government was established in Kenya, a lot of progress has been made in establishing county governments systems and structures in line with the constitution. However, there is little to show on the role ERMS are playing in supporting devolved governments as provided in the Transitional Authority Act (2012) and the Office of the President Circular OP/CAB.1/48 on the management of public records in the devolved system of government. Unless the situation is reversed management of records as evidence for business operations, accountability and community will be difficult to achieve. Absence of official records will increase legal risks and decrease operational functions of the devolved units. Consequently, this will derail the realisation of Kenya’s developmental devolved governance system entrenched in the Constitution of Kenya (2010) and expounded in the country’s Vision 2030 development blueprint. The inheritance by counties of ERMS previously owned by the national government has transferred huge responsibility for both identifying documents worthy of retention and applying descriptive metadata of those records to the county governments’ untrained end users. This is likely to lead to an unproductive cycle where users who choose not to store records in the system are not likely to use the system.

The purpose of this study, therefore, was to investigate ERMS implementation in Kenya’s devolved system of governance in order to suggest strategies which can be adopted to enhance the process of devolution. The research questions guiding the study were:

- 1) Which electronic records management solutions are currently supporting devolved system of government in Kenya?
- 2) How adequate are the current electronic records management solutions in supporting the devolved system of government in Kenya?

#### 4 Methodology

The research applied a qualitative approach underpinned by the interpretivist framework. A case study design involving four purposively selected sites was used. The sites were Kakamega, Bungoma, Busia and Vihiga counties. 43 participants from diverse backgrounds including chief officers, directors, county heads of records management units, departmental records officers and archivists were purposively selected based on convenience and accessibility was effective in gaining trust and cooperation of the participants. The distribution of participants was as follows: Vihiga (9), Busia (11), Kakamega (10) and Bungoma (5). Data for the study was gathered through semi-structured interviews, observation and document analysis. Interview sessions lasted between 30-60 minutes. All interviews were taped recorded and transcribed. However, recording was denied in one case where notes were taken. The process of data collection and analysis went side by side. Thus, the process of analysis started before completing the fieldwork. Recorded data was analysed thematically. This involved reading, annotation of interview transcripts, categorising, linking, corroboration and producing an account of the study. The qualitative data was reported verbatim. Table 1 shows the county governments and departments or officers visited.

Table 1: Summary of respondents from county governments and departments

DEPARTMENT	KAKAMEGA	BUNGOMA	BUSIA	VIHIGA
Governor	X	X	X	X
Health services	X		X	X
Agriculture, fisheries , cooperatives	X		X	X
Lands, physical planning ,	X	X		
Works, roads and infrastructure		X	X	
Human resource		X		X
Water, environment and natural resources	X		X	X
Trade, industry, tourism			X	
Enterprise fund			X	

#### 5 Findings

As table 1 shows, 21 different departments across the four counties participated in the study. The diversity of departments surveyed enabled a comprehensive identification of various ERMS being used to support devolved government. A visit to all the four governor’s offices enabled the comparison of the ERMS being used across the counties.

##### 5.1 Types of electronic records management systems used

Under the first research theme, the study sought to establish the type of ERMS currently supporting the devolved

system of government in Kenya. The findings show that records in county governments were managed using Integrated Records Management System, Emails, and Information File Management System as the major types of systems that were being used. The responses of some of the heads of records management units are presented hereunder verbatim.

*“At the moment we have scanned all the plot files and subject ones and this year (2016), our target is personnel files which will be uploaded into IRMS. The IRMS has to be interoperable with Enterprise Resource Program (ERP) which is being brought on board. ERP is a resource sharing program which has different modules including records management and revenue collection. At the moment, only feasibility studies have been done on how to implement the ERP” (Kakamega).*

*“People just write and send emails. Most of this is not on official email address but personal ones. When you want to obtain a copy of that record, you cannot be able to get it easily because the officer used a personal email address. We have talked to ICT people and they have developed an official email system and advised staff to use the official email address for any transaction” (Busia).*

*“We have a records management system called Information File Management System. The system has been installed in various departments and is being run on the Internet. One is able to know the name of the files, file reference, content of the file, the date the file was issued out of the records management unit, department to which it was issued out to, the date the file was taken out, and the person who took the file. The system is able to produce a report on a daily basis. I am the one who came up with it in consultation with a friend of mine taking computer engineering in Moi University” (Vihiga).*

Interviews with various county government heads of records management units indicated that different types of BIS systems rather than ERMS systems are used to manage records in county governments in Kenya. For instance, in the county government of Kakamega, an Integrated Records Management System (IRMS) was used for managing digitised images of plot and subject records. In Busia, there were plans to adopt an IRMS. The process of procuring an IRMS was complete and the functional requirements of the system had been determined by the county's head of records management unit. In Busia, personal email management systems were used to create, send and store official records. This was despite an official email address for the purpose being in place. In the government of Vihiga, Information File Management System (IFMS) had been deployed to track the movement of paper records into and out of the county records management units. There were plans in Kakamega to upload personnel records to the list of records managed by IRMS and the introduction of an Enterprise Resource Program (ERP). At the time of the study, feasibility studies had been undertaken with the aim of interoperating IRMS with ERP in Kakamega.

The departmental records management officers interviewed indicated that Local Authority Integrated Financial Operations Management Systems (LAIFOMS) and District Health Information System (DHIS) were being used in the department of Lands, Urban and Regional Planning and Trade in the County government of Bungoma. LAIFOMS was being used to manage records on single business permits, plot rates, and revenue collection. The departments of Health Services in the county government of Kakamega and Vihiga used the DHIS to manage patient records. One verbatim response of a departmental records management officer is presented below.

*“DHIS was there before devolution but it has been maintained because it is an information sharing platform. Now we have rights like issuing passwords to users who want to use our information; we can add datasets; we can do a bit of analysis and even; do many things with the DHIS which we were not able to do before devolution. We report to the county director of health and we also feed information to our programmes like malaria, HIV/AIDS, child nutrition, and other programmes running within the health departments. This is basically for them to make decisions on their activities aimed at intervening on various programmes within their undertakings” (Kakamega).*

The study established that the various business information systems used in the county governments were originally designed for now defunct local authorities and restructured provincial administration. The personnel using the systems in the creation and use of electronic records had too much authority and too much responsibility for record-keeping and the systems circumvented the traditional procedural controls previously enforced by records management personnel. The inherited systems were not redesigned to suit the county business and records management requirements.

## 5.2. Adequacy of electronic records management systems in devolved local units

The study sought to answer the second research question on the adequacy of the current ERMS in supporting devolved system of government. The views of county heads of records management units, departmental records management officers, directors and archivists were sought and used to answer the question. The view of the officers was that existing systems were inadequate for managing records needed by devolved government. Some of the responses are presented verbatim below.

*“They do data entry into the DHIS at the sub county level. However, not all the health facilities are authorised to access the system because not all of them have computers. So, they will send the data to the sub county headquarters where there are computers, and Internet. There are lots of things that are revealed by looking at the DHIS. These issues are the ones we discuss with the county health management team” (Vihiga)*

*“There is need to improve the district health information system to meet the information needs unique to the county. At the moment, it does not capture some indicators. We had a breakfast meeting with the chairman of health committee and his deputy together with the CEC*

*just to discuss monitoring and evaluation which in our context is intertwined with health records and information. They were surprised that a lot goes on in records and about DHIS that they still do not understand. They were saying that these are issues we are supposed to see in the budget and allocate money for. We are now asking; we need to be trained so that we train the entire health committee on data use” (Kakamega).*

## **6 Discussions**

The findings indicate that email management systems, district health information system, information file management system, local authority integrated financial operations management systems and integrated records management system were used to manage records in counties in Kenya. The majority of these systems were inherited from the defunct local authorities and the restructured provincial administration. The study confirms previous findings by World Bank, Information Solutions Group and International Records Management Trust (2000) that systems structured to support information needs of users in centralised government are adopted by devolved governments. In the process little thought is given before adoption to the complicated task of redesigning current systems while taking into account information needs of both national and devolved unit.

The findings also revealed that personal email accounts contained official records but were not managed as official records. The IT departments of county governments established official email addresses but the county government officers were hesitant to use them. This confirms the view that IT implementation in most public sector units is bureaucratic, hierarchical with distribution of authority, resources and responsibility. This can be a challenge as managers do not voluntarily give up their power base. The implication of this is that the organisation’s status quo remains after IT implementation. Managerial resistance to change is closely related to the power perspective on IT implementation. The implementation of an ERMS can mean that management deposits its power to the system and to those in charge of building the system. Another factor which may contribute to people’s tendency toward doing things in the old ways is their perception of how records and information management tasks should be done and their lack of willingness to embrace change. When it comes to records management, for instance, some users cannot accept the fact that the records they created in the course of business activities are not their own and that they are supposed to manage the records they created according to organisational policies. Another challenge is the management level staff expecting secretaries to do records management work for them.

The current study agrees with Aliza, (2009) who argued that email messages in many organisations were not usually considered as business records even though they were critical channels of communication for most government agencies.

The departmental records management officers viewed the health information systems as important decision making solutions for county government whose primary focus was creation and management of up to date county health records. However, the system’s effectiveness was undermined by lack computers in the health facilities, unavailability of Internet services at the health facilities, lack of awareness of the system benefits by decision makers, lack of support by top managers in the devolved units and inadequate budget allocation. These challenges led to irregularities in records creation such as creating records after the event putting at risk the reliability created records. DHIS was unable to meet county specific business and records management requirements. This was because it had been designed to meet national government business and records management requirements.

According to Orlikowski (2000) in Weimei (2017), when individuals do not want to use the technology or they have to go through a painstaking process to properly use the technology, they abandon it, or work around it, or change it, or think about changing their ends. Users respond to disliked functionalities by rejecting the system completely or establishing their own ways of coping with the difficulties encountered.

The county governments studied were at different phases of implementing IRMS. In Kakamega, the IRMS was being used for managing plot files. However, plans were in place of extending the use of the system to managing personnel records. In Busia, plans were in place to purchase the IRMS to address the problem of space for records keeping. IRMS was officially recognised in Busia and Kakamega counties. The aim of this recognition was to ensure that public service operated a standard system for ease of management and with a view to connectivity and linkage of public offices.

## **7 Recommendations**

The study recommends that there is need for a strategic plan on a migration from manual records management systems to ERMS jointly developed by county head of records management units, departmental records management officers, senior management, archivists and ICT officers. The plan should address current challenges of harnessing ERMS in supporting county governments such as lack of computer skills at top management level, lack of equipment for ERMS to run on, poor attitude to change, and poor budgetary allocation.

Heads of county records management units, with assistance of county ICT and Kenya National Archives and Documentation Service, should review and redesign existing inadequate business information solutions to incorporate

records management functionalities into them as recommended by International Council on Archives (2008). Input on the new systems should be obtained from staff of business units, legal advisers and auditors, computing specialists such as network administrators and application developers as well as compliance or quality assurance managers. External consultants might be hired if skills needed are not available within the counties. Though directors and senior managers may not be project team members, their requirements need to be taken into account.

Head of county records management units and ICT department should develop training and sensitisation programmes targeting all county staff and aimed at changing them from their paper-based records management culture to adopting and using ERMS in supporting realisation of county objectives. County governments should develop and implement an electronic records management policy to guide ERMS adoption. The ERMS policy should address the purpose, scope, requirements (records, system, and process), relationship with other policies, access, security, preservation of the ERMS. Similar studies on harnessing ERMS in the management of records in hybrid environments by devolved governments are also required.

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### About the Author

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# Implementation of Electronic Document and Record Management System at the County Pension Fund Financial Services in Kenya

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## Abstract

*The County Pension Fund (CPF) Financial Services is a retirement fund established in Kenya under the Retirement Benefits Authority (RBA) Act No. 01305 of 27th July, 2013. It is registered with the Retirement Benefits Authority for the staff of county governments with headquarters in Nairobi. This study investigated the implementation of Electronic Document and Record Management System (EDRMS) at the CPF with a view of proposing possible solutions to the challenges for successful implementation of EDRMS at CPF. The objectives were to: examine the functionality of EDRMS implemented at the CPF; establish the factors that influence the successful implementation of EDRMS; and establish the challenges of implementing the EDRMS at the CPF. The study was informed by the Records Continuum Model. This study adopted a case study design using a qualitative research approach. A sample of twenty-six (26) out of a population of sixty-four (64) were drawn from departmental heads, records management officers, ICT personnel and a focus group discussion with clerical officers were picked using purposive sampling. Data was collected using face-to-face interviews with the respondents. The thematic analysis was done using the ATLAS.ti software. Findings of the study established that the EDRMS was functioning effectively with increased multi-sharing of records and documents. However, implementation was faced with challenges such as high cost of maintenance, lack of a records retention and disposal software module and technophobia. This study concludes that EDRMS has improved the quality and consistency of CPF records management processes. The study recommended amongst others, investment on staff training specifically those dealing with EDRMS and change management, embracing new technology such as cloud computing to enhance records storage, installation of Optical Character Recognition (OCR) software which will enhance search capability of content and development of a records retention and disposal software module. The implementation process of EDRMS is a resource-intensive and complex with many challenges. This study provides practical implications on solutions and guidance on implementation of EDRMS.*

**Keywords:** *Electronic Document, Records Management Systems, Qualitative Methodology, Financial Service, County Pension Fund, Kenya*

## 1 Introduction

The successful implementation of an electronic document and records management system (EDRMS) is vital to every organisation. It enhances accuracy and improves output of records management processes. Organisations in the financial sector which have incorporated EDRMS operate at a superior level of productivity and efficiency in service delivery unlike those which depend on manual systems. Therefore, the EDRMS comprehensively brings solutions to managing the creation, capture, indexing, storage, retrieval, and disposition of documents and information assets on an organisation (International Council of Archives, 2008).

This study was conducted at the County Pension Fund (CPF) Financial Services which was established vide Kenya Gazette Supplement No. 190 dated 2<sup>nd</sup> December, 2016 with its headquarters in Nairobi (*The Retirement Benefits Act No. 3 of 1997*). The scheme is the umbrella pension scheme for all county governments, county agencies, county corporations and associated organisations. The scheme is the successor to the Laptrust Retirement Fund previously established and registered under the Trust Deed and Rules under the Retirement Benefits Authority Certificate Registration No. 01305. The County Pension Fund (CPF) Financial Services offers training, retirement benefits services, scheme administration, financial and consultancy.

Globally such studies have been done on the management of electronic records. However, little has been done to investigate the successful implementation of the EDRMS in Kenya. Therefore, there exists a research gap on how companies in Kenya have effectively implemented EDRMS. This study therefore investigates the implementation of EDRMS at CPF; challenges faced during the implementation and suggest possible solutions to the challenges for successful implementation of EDRMS at CPF.

## 2 Methodology

This study adopted a qualitative research approach. Data was collected using structured interviews thus allowing for

consistency in the interviews. According to Creswell (2014), data collection consists of in-depth and multiple interviews with participants. A sample of twenty-six (26) was drawn out of a population of sixty-four (64). The sample consisted of departmental heads, records management officers, and ICT personnel. Data was collected using face-to-face interviews with the respondents. A focus group discussion was also held with eight (8) of the forty (40) clerical officers who were picked using purposive sampling. Data was analysed thematically using ATLAS.ti software.

### 3 Findings and Discussions

The findings of the research are presented here according to the themes that were revealed by the qualitative data gathered during the study.

#### 3.1 Functionalities of EDRMS

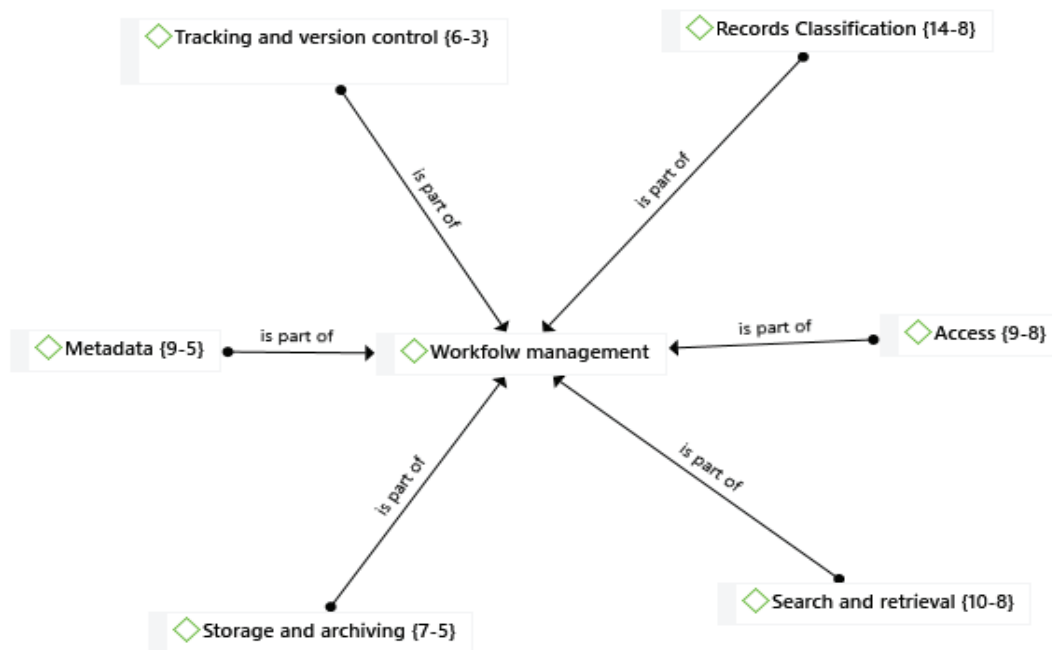
When respondents were interviewed on the functionalities of EDRMS two themes emerged. These were workflow management; and security and access of records. The two themes are presented using a network view of themes and codes.

##### 3.1.1 Workflow management codes

The codes showing the workflows are illustrated as follows:

- Metadata: 9 times in 5 primary documents
- Records classification: 14 times in 8 primary documents
- Access: 9 times in 8 primary documents
- Storage and archiving: 7 times in 5 primary documents
- Tracking and version control: 6 times in 3 primary documents
- Search and retrieval: 10 times in 8 primary documents

Figure 1 illustrates the network view of workflow management using six codes from data and their respective relationship.



**Figure 1: Workflow management**

Source: Research Data

The following are examples of excerpts from interviews with the respondents with regards to the functionalities of EDRMS:

*"I think the classification of records contributed greatly to the successful implementation of EDRMS. We no longer experience cases of misplaced physical files and documents. This is because all the records have been scanned, classified, coded, indexed and filed in accordance with established records classification schemes. This has enabled our staff to effectively search and retrieve records and therefore facilitates timely access to records."* - [Records Manager]

*"I can easily access records since all records have been captured, scanned, registered, and archived into the system for effective metadata management."* - [Clerical Officer]

*“The EDRMS has tracking and version control software which enables the records managers to automatically track the versions and a revision history of the edited records.”- [ICT Personnel]*

The study established that workflow begins by scanning and storing of records into the EDRMS. This facilitates routing of electronic records to different departments or individual action officers depending on the work-related tasks that should be undertaken. The study also revealed that the successful implementation of the EDRMS was enabled by the installation of a scanning module that facilitated scanning and imaging of all records and documents received. The study further showed that records and documents were captured and automatically registered, thus, enabling the records managers to manage and control records from one central repository. This is supported by the Records Continuum Theory by Upwards (2000). The theory gives the most suitable guideline for the management of electronic records since it is difficult in the digital environment to separate records from archives.

It was also established that the successful implementation of the EDRMS at CPF was entirely dependent on the development of an understandable, well-structured and effective records classification scheme. This practice ensured that CPF no longer experienced misplacement of physical files and documents. This is because all the records have been scanned, filed and stored in the system according to the established classification scheme. Nguyen et al. (2009) affirms that the development of a classification scheme is a critical factor before the implementation of an EDRMS. The findings also revealed that electronic records were organised in such a way that staffs are able to identify and arrange records into categories according to logically structured conventions, methods, and procedural rules represented in a classification system.

The study findings further showed that the classification scheme has facilitated capturing, classifying, coding and indexing of records. This facilitates quick identification and retrieval of records. It has also ensured security and access control as well as the retention and disposal of records. This action is supported by Upward (2000) through the Records Continuum Model. Upward (2000) affirms that once records and documents have been received or created, they go through the process of capturing. This is based on the context and in their capacity to act as evidence of business activities of an organisation. The documents and records are thereafter, organised using the established classification system which facilitates access to the records by the staff. This has guaranteed prompt retrieval of files leading to effective and efficient delivery of service to the customer. This has given CPF an added advantage.

Further, the findings established that classification of records at CPF has categories within the EDRMS as indicated below:

- i. DB - Defined Benefits with 6,000 pensioners.
- ii. DC - Defined Contributors currently at 15,000 pensioners.
- iii. IPP - Individual Pension Plan with 15,000 pensioners.
- iv. Other Files include 1. Administrative files, 2. Banks, 3. ICTs 4. Consultancy, 5. Auditors, 6. Insurance, 7. Investments, 8. County Governments, 9. Meetings, Communication and Properties.

Therefore, the findings affirm that the development of a proper records classification scheme enables staff to perform an effective search and retrieval of records and documents stored in the system. This enhances usability and access to records throughout the organisation.

With regard to search and retrieval of records, the study established that all records and documents received from both external and internal sources are scanned and captured into the system. It was revealed that with the guidance of the organisational policies and procedures and with the established records classification scheme, staff can easily search and retrieve the records from the EDRMS. In addition, the system has been configured in a way that allows multi-access to records. The records or documents that are stored in the system can be accessed by both staff at the headquarters and branches simultaneously. This makes it a real-time operation making CPF to have a competitive edge over other organisations. The effectiveness and efficiency of the system has led to high productivity because CPF employees are able to instantly retrieve records and advise clients based on the record retrieved. The study indicates that the system is capable of storing large amounts of records. This also enables tracking and version control of different records and documents.

### **3.1.2 Security and access codes**

The codes showing the security and access are illustrated as follows:

- Records integrity: 11 times in 4 primary documents
- Access rights: 9 times in 5 primary documents
- Protection of records: 3 times in 3 primary documents
- Access to records: 6 times in 6 primary documents
- Storage and archiving: 10 times in 7 primary documents

Figure 2 presents a network view of security and access. It identifies five codes and their respective relationship.

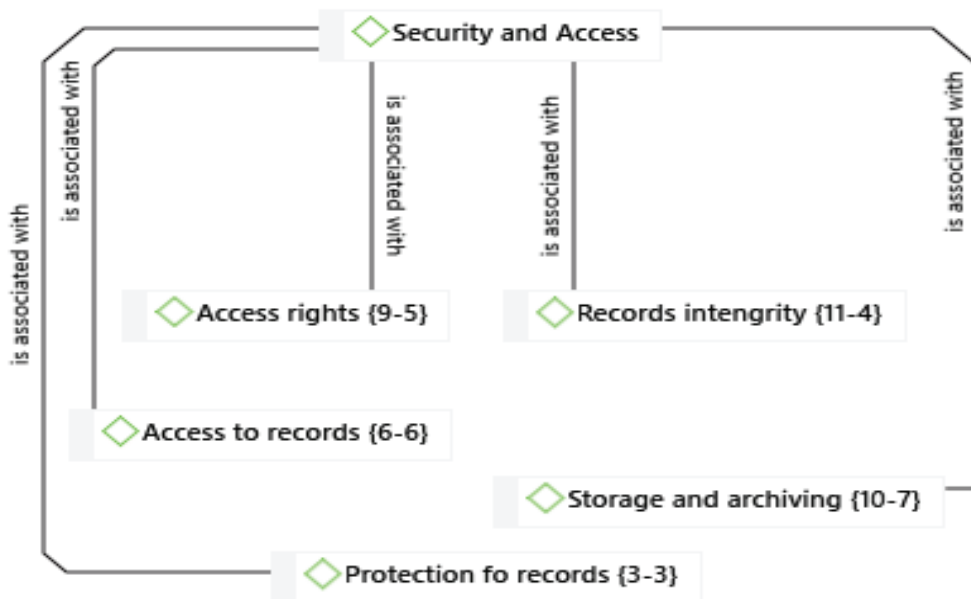


Figure 2: Security and Access

Source: Research Data

The following excerpts from respondents explain the security and access functionalities of the EDRMS.

*“The head of records management has the responsibility of assigning access rights to records to all authorised action officers at CPF. The EDRMS has the capacity of allowing multi-access to records, thus, eliminating delays in decision making.” - [Records Manager]*

*“With a well-defined records classification scheme, staff at the CPF headquarters and other branches can easily access records that have been stored and archived in the EDRMS. This can be done in real-time leading to high productivity since staffs are able to instantly retrieve records and advise a client.” - [Record Manager]*

*“The implementation of the EDRMS at CPF has eliminated loss of records and documents by ensuring that there is proper storage and archiving of records. This enhances the integrity and protection of records”- [Records Clerks]*

The findings established that security and integrity of records has increased and this is supported by Abdulkadhim, Bahari, Bakri and Hashim (2015) who affirms that digital records in EDRMS projects must be secured from unauthorized and undocumented alteration or misuse. The loss of documents has been eliminated as a result of enhanced storage and archiving of records in the system. Consequently, there is enhanced storage and archiving of records where records and documents are stored in different electronic archival devices and repositories. The findings also indicate that authorised access to records is controlled through access rights control. Adam (2008) and Joseph (2008) explains that security settings and access permission provides for the users to be assigned information security classification levels. Staffs are, therefore, assigned passwords that are strong to access and manipulate the system. This has guaranteed security and protection of records. This is supported by the Continuum Theory by Upward (2000) which indicates that the EDRMS has the ability to facilitate proper storage and controlled access to record. It was also established that access of records and documents was indicated to have improved where staff across all departments can remotely access records using different devices provided for by the system.

### 3.2 Factors that influence the success of EDRMS

When the respondents were interviewed on the factors that influence the success of EDRMS, two themes emerged. These were top management support, and implementation team. These themes are presented using a network view of themes and codes hereunder.

#### 3.2.1 Top management support codes

The codes below show the EDRMS implementation support from the top management at CPF.

- Policy: 11 times in 8 primary documents
- Finances: 9 times in 7 primary documents
- Performance: 8 times in 5 primary documents
- Training: 13 times in 9 primary documents
- Conducive environment: 5 times in 5 primary documents



- Quality assurance: 3 times in 3 primary documents

The following are examples of excerpts explaining the impact of top management support on the implementation of EDRMS at CPF:

*“Support from top level management has created a conducive work environment. This is through the provision of clear policy guidelines and direction on the implementation of EDRMS as embedded in the CPF strategic plan.” - [Records Manager]*

*“I believe the provision of adequate funding has enabled the implementation team to train and develop staff on the usage of the system” - [Clerical Officer]*

*“The system has enabled the management to monitor and evaluate staff performance. They now can know how many files have been acted on and the time taken can be quantified.” - [Senior Manager]*

*“I believe the major contributing factor to the successful implementation of the EDRMS was by hiring of professionally trained records managers and ICT personnel who trained and guided staff on how to report any inadequacies they face on the system” - [Records Manager]*

*“Quality assurance has been guaranteed due to staff’s strict adherence to the electronic records management procedures and filing of records in accordance with established classification scheme. This has contributed positively to effective and efficient service delivery.” - [ICT Staff]*

Kwatsha (2010) argues that for EDRMS projects to be successful, there should be champions among the management. The champions should understand the system, the needs of their departments as well as the users. They should also know how the system impacts on the organization performance as a whole and in particular, their units’ processes. The findings therefore, revealed that the successful implementation of EDRMS at CPF has been achieved through the commitment of the top level management in terms of policy guidance and direction. On a regular basis, the leadership issues circulars prohibiting the use of physical files unless there is direct authorisation from the Chief Executive Officer. The study also established that the leadership was involved in planning and implementation of the system, thus, ensuring that appropriate resources were allocated to the project implementation team.

The research revealed that the development of a records management policy provided a framework for the project management team. The team in liaison with the top level management was able to assign responsibilities and ensuring that accurate records of the business activities at CPF were created, received, maintained, accessed and disposed of in a controlled manner. In regards to the provision of records, the study established that the top level management provided adequate budgetary allocation to the project management committee. This proved to be a critical component and an ingredient for the implementation of the EDRMS. The allocation of sufficient resources was of utmost importance and is a factor which greatly influenced the successful implementation of the system at CPF.

The study also revealed that the introduction of the EDRMS has enabled the CPF to ascertain the performance of each staff through monitoring the flow of work from each staff. This has made it easy to establish how many files have been acted upon by employees and the time taken can now be quantified. It was established that this has led to increased productivity and improved customer service because the system brings an alert to the action officers on pending cases, hence, eliminating delays in decision making. The study also shows that the top level management support in training and development of staff is a critical factor in the implementation of EDRMS. In addition, it has created a conducive environment in which staffs can report any inadequacies they face when using the system.

The study further established that the governance of EDRMS project did not end with the successful rollout of the system at CPF. The implementation team has continued monitoring and evaluating the management and usage of the system to ensure that it meets the set standards of quality. This has contributed positively to making CPF a training ground and a suitable place for benchmarking for other institutions. The study also showed that CPF played a critical role in the adoption of the system in other institutions such as the Police SACCO and Kenya Ports Authority.

### 3.2.2 Implementation team codes

The codes below reflect the position of EDRMS implementation team at CPF.

- System design and development: 6 times in 6 primary documents
- Strategies: 4 times in 2 primary documents
- Training: 5 times in 3 primary documents
- System updates: 11 times in 6 primary documents
- Disaster management: 5 times in 3 primary documents
- Storage space: 9times in 6 primary documents
- Classification scheme: 8 times in 7 primary documents
- User needs assessment: 8 times in 5 primary documents
- Access rights: 10 times in 8 primary documents
- Progress reports: 8 times in 4 primary documents

The following are examples of excerpts from the interviewees on the implementation teams:

*“The top level management has established EDRMS implementation committee which comprises of ICT personnel and records management officers. These are charged with the responsibility of designing and developing a user-friendly system and superintend its successful implementation.” - [Senior Manager]*

*“The implementation team monitors and evaluates the system, thus, ensuring standards of quality in terms of filing records. This is done according to the established records classification schemes, hence, guarantees quality assurance” - [Records Manager]*

*“User needs assessment was undertaken to gather information about the user requirements. This positively contributed to the user acceptance of the new system.” - [ICT staff]*

*“The availability of proper records storage and development of a records disaster management programme caters for any eventuality, therefore, guaranteed protection of records.”- [Records Manager]*

*“The implementation team appointed a liaison officer who updates the top level management on quarterly basis on the progress and performance of the system.”- [Senior Manager]*

*“To facilitate successful implementation of the EDRMS, the team developed a classification scheme that was used for classifying, coding and indexing of records into the system.”- [Records Manager]*

*“I believe continuous training and sensitisation of staff on the use of the system was a critical component. It has provided users with adequate technical skills to interact and use the new system.”- [Records Manager]*

The study revealed that the establishment of a project implementation committee comprising of records management officers, IT staff and the top management was significant in the successful implementation of the EDRMS at CPF. The implementation team plays a vital role in developing and designing the system while IT staff provide technical support. The committee implements strategies which have clear policy guidelines and also ensures strict adherence to the records management procedures. This supported by Gunnlaugsdottir (2006) who affirms that the co-operation between the IT personnel and records managers in the system's development is one of the important factors to consider during the implementation of the system. The Hong Kong Government Records Service (2017) further affirms that the successful implementation of an EDRMS is critical and is entirely dependent on the establishment of or the pulling together of a team of people who have the requisite skills and knowledge to manage the implementation process.

The study further showed that the CPF project management committee understood the user needs and requirements. This is a critical component in EDRMS implementation. This has enhanced the successful implementation of EDRMS. The user needs analysis was undertaken in order to establish the readiness of the users towards using the new system. Indeed, if the user needs analysis had not been done appropriately, then the failure of implementing a system would have been imminent. The demonstration of good project governance by the CPF project management committee was as a result of the involvement and collaboration of the key stakeholders. This was essential to the successful implementation of the system.

The study showed that the team engaged all the stakeholders. They took into consideration the user needs and views when developing the required specifications which contributed immensely to the buy-in from the users of the system. The study further revealed that the project management team had appointed a liaison officer who had the sole responsibility of preparing progress reports for the purpose of updating to the top level management on a quarterly basis.

With regard to the training of staff on the use of the EDRMS, the study revealed that there is continuous training and sensitisation of staff on the usage of the system. The training of staff to adapt to the new system plays a pivotal role in enhancing acceptance by the users. This makes them feel comfortable working with a new system. The users are expected to know at an individual level how technology will affect their daily processes and their assigned role in the organisation. The study further revealed the users were empowered by equipping them with the essential skills and techniques to master the system. This has proved critical for the successful implementation of EDRMS at CPF.

From the study, the records management practices and procedures were understood and properly adhered to throughout the implementation period. The study further revealed that the on-going training created a supportive environment among staff. This alleviated the concerns of the users during the early stages of adoption of the EDRMS thus inculcated a positive attitude in the employees. Therefore, the training needs should go beyond the software to enable the users to build confidence and trust in using the new system and operate ideally in the new environment. The study further revealed that the records managers and ICT staff had developed implementation strategies that ensured the successful implementation of the system at CPF.

### 3.3 Major challenges in the implementation of EDRMS

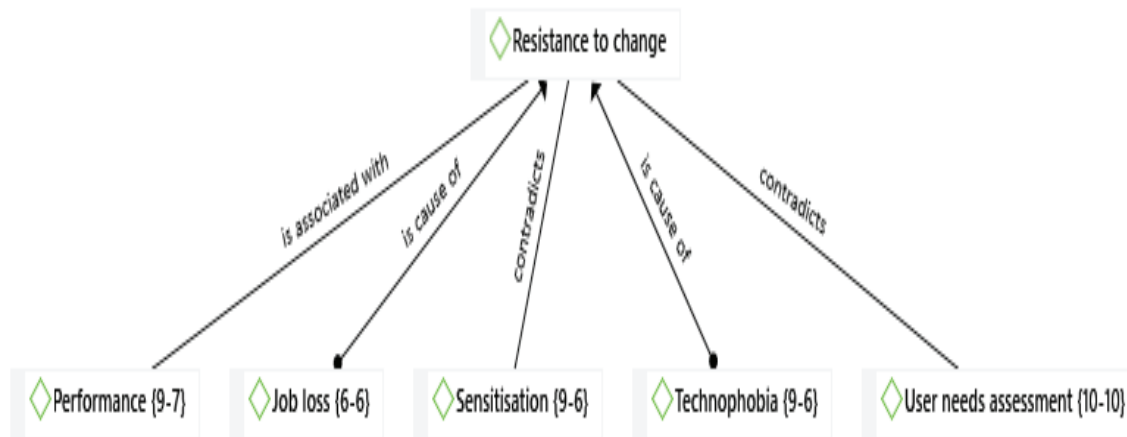
Two major themes emerged when the respondents were asked about the challenges they faced when implementing the EDRMS. They include resistance to change, and records retention and disposal schedules. These are presented by the following networks.

#### 3.3.1 Resistance to change codes

The codes below show the EDRMS implementation resistance at CPF.

- Job loss: 6 times in 6 primary documents
- Performance: 9 times in 7 primary documents
- Technophobia: 9 times in 6 primary documents
- Sensitization: 9 times in 6 primary documents
- User needs assessment: 10 times in 10 primary documents

This information is summarised by Figure 3. The network views the resistance to change by identifying 5 codes and their respective relationship.



**Figure 3: Resistance to change**

Source: Research Data

The following are examples of excerpts from the respondents on employee resistance to change during EDRMS implementation at CPF.

*“The resistance by the staff during the introduction of an EDRMS may be attributed to the fear of job losses and the fear of monitoring staff performance through the system. This is because the system automatically brings an alert to the supervisors on pending work.”- [Records Manager]*

*“At the inception, there was staff resistance to change. This could have been due to technophobia. The staff frequently forgot their passwords and there was fear of entering wrong data into the system. This was due lack of sensitisation.”- [Senior Manager]*

The findings established that there was some resistance by staff during the introduction of the EDRMS. According to Leikums (2012) resistance to change during EDRMS implementation is one of the major challenges experienced in EDRMS implementation. This was due to perceived fear of loss of employment through rationalisation. The findings further revealed that resistance to change was attributed to a provision in the system that brings an alert on pending work enabling the supervisors to monitor staff performance. The resistance was also attributed to technophobia. Contrary to their perception, the study revealed that the system created many job opportunities. This is because more staff were recruited leading to effective delivery of service. The finding further revealed that the fear of job losses can be mitigated through sensitisation and support from top level management. The study also revealed that it is important to carry out a user needs assessment as part of the implementation of EDRMS to eliminate fear of not knowing how to use it.

The study established that the system is expensive and is dependent on the service provider for upgrading. The system also attracts other costs such as licensing costs. It was also revealed that the frequently changing technology is a major challenge since it requires updating the system on a continuous basis; maintaining the system; and training of the staff. The study further revealed that lack of training especially for the new employees has greatly contributed to incorrect setting of scanner leading to the scanner failing to sense the image. Training of the new employees on usage of the system is, therefore, critical for the effective implementation of any EDRMS project.

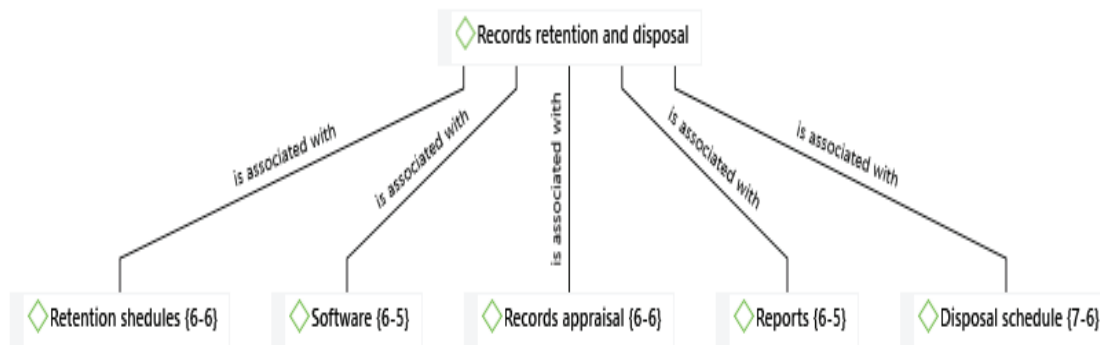
### 3.3.2 Records retention and disposal codes

The codes below show the EDRMS records retention and disposal at CPF.

- Retention schedules: 6 times in 6 primary documents
- Disposition schedules: 7 times in 6 primary documents
- Reports: 6 times in 5 primary documents
- Software: 6 times in 5 primary documents

- Records appraisal: 6 times in 6 primary documents

The Figure 4 shows a network view of the financial implication experience at CPF during the implementation of the EDRMS. It identifies 4 codes and their respective relationship.



**Figure 4: Records retention and disposal**

Source: Research Data

The following are examples of excerpts from the interviewees on retention and disposal using EDRMS at CPF.

*“Lack of a records retention and disposal schedule software for the electronic system means no appraisal has been carried out since the installation of the EDRMS.” – [Records Manager]*

*“There are no periodic reports because the system cannot automatically alert the records managers on the records which are due for disposal. This is attributed to lack of integrated records software that can manage disposal of records” – [Records Manager]*

The study revealed that there was lack of a records retention and disposal schedule software module. The electronic records cannot, therefore, be appraisal effectively. The software module would assist in ascertaining if there are any records that are ephemeral and require destruction or valuable records that need to be preserved securely for use in the future. The study further revealed that the software module should provide for retention schedules, automated reporting system and indicate the destruction action after appraisal. The MoReq (2001) model on records retention and disposal argues that a good system for managing electronic records “must provide a function that specifies retention schedules, automates reporting and destruction actions, and provides integrated facilities for exporting records and metadata. Lack of a records retention schedule implied that some records that were no longer needed by the CPF were still kept in the system and those that were needed by the organisation might have been destroyed thus leading to loss of vital and valuable records

## 4 Conclusion

Success of EDRMS projects entirely depends on establishing strategies and procedures to ensure that everyone participates in the implementation process. The establishment of an EDRMS implementation team which included ICT experts and records management professionals contributed greatly to the success of the system. Critical to this success was the development of information technology infrastructures needed to support quality electronic records management a CPF. User needs assessment analysis played a significant role in designing and developing an EDRMS that is acceptable and user friendly. The successful implementation of the EDRMS at CPF has greatly improved the quality and consistency of CPF records management processes.

## 5 Recommendations

The authors recommend the following:

1. The top level management should provide adequate funding for staff training specifically those dealing with EDRMS and change management.
2. The CPF management should embrace cloud computing which has the ability to manage and allow large storage of documents and records.
3. The technical staff should spearhead the installation of Optical Character Recognition (OCR) software which will enhance search capability of content.
4. The records management officers in liaison with the various heads of department should develop a records retention and disposal module. This can easily provide a function that specifies the retention schedules for each category of records and how long a record should be retained. The module should automate the reporting and destruction actions. Thus, the system can automatically appraise and bring an alert when the records are due for disposal. The

system should also provide integrated facilities for exporting records and metadata.

5. The technical team should facilitate the installation of the Strong Box module which will guarantee protection, integrity and the security of records. The module should decrypt and encrypt information by giving access only to staff who have authorised rights to view and use the document.

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SECTION 8:  

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INFORMATION  
  
AND  
  
KNOWLEDGE  
  
ORGANISATION  

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# Use of Knowledge Management Systems for Knowledge Sharing Among Academic Staff of Federal Colleges of Education in Kano, Nigeria

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## Abstract

*The chapter explores the types of knowledge management systems used by the academic staff of Federal Colleges of Education to share knowledge among themselves and the challenges they face when sharing knowledge. Quantitative research methodology using cross sectional survey design was used for the study on which the chapter is based. A total of 243 academic staff participated in the study. The findings of the study revealed that the majority of the respondents used e-mail and scheduling software, instant messaging system, and document management system to share knowledge. It was also found out that they do not use any bulletin board, decision support system and portal technologies to share knowledge. Lack of trust, time constraints, lack of awareness about knowledge management systems, lack of motivation, lack of infrastructure, lack of resources, lack of support from management, lack of training and unwillingness to share knowledge were the major challenges that hinder knowledge sharing among the academic staff of federal colleges of education in Kano. The findings of study provide an insight to the management of colleges of education in providing avenues that enhance knowledge sharing among academic staff. The study is a great contribution considering that there is scarcity of empirical studies of this nature focusing on knowledge management systems used for knowledge sharing.*

**Keywords:** *Knowledge management, Knowledge sharing, Academic staff, Federal College of Education, Kano State, Nigeria.*

## 1 Introduction

Colleges of education are responsible for training primary and lower secondary school teachers in Nigeria. The advent of Information and Communication Technologies (ICTs) has helped academic staff of colleges of education to obtain, share and reuse knowledge to solve daily problems and increase their productivity and quality of their services.

Knowledge sharing in educational institutions relies heavily on the availability of media that enable members of the organisation to interact with each other. Basically, the leaders of these institutions need to invest on the tools which are used more comfortably by the staff to develop the knowledge sharing procedures comprehensively. New technologies, and particularly knowledge management systems, enable academic staff to interact and share knowledge. The Internet tools enable people to share knowledge and work remotely on identified goals. Knowledge management systems such as videoconferencing, audio conferencing, instant messaging, portal technologies, blogs, and e-mail have evolved exponentially. These technologies support the sharing of ideas and knowledge as well the creation of mutual understanding among members of organisations.

Knowledge sharing can increase efficiency and save on work hours by ensuring that an institution learns from its past experiences and avoid duplication of effort (Weiss, 1999). Berends (2005) stated that to enhance the organisational performance, organisational members in academic institutions should focus on knowledge sharing among them in different departments. Sharma (2010) stressed that for the academic institutions to ensure success, achieve their goals and have constantly improve their performance, it is necessary for them to promote knowledge sharing among their academics, staff, and students alike. Knowledge sharing in colleges of education between academic staff can save a lot of time and energy if appropriate methods of sharing are applied.

## 2 Knowledge Sharing

Christensen (2007) defines knowledge sharing as a process of identifying existing knowledge in order to transfer and apply this knowledge to solve common problems in an organisation; or a process of creating new knowledge by combining existing knowledge. Lin (2007) defines knowledge sharing as an act of sharing relevant experiences and information among individuals in an organisation. Knowledge sharing is further defined as exchanging experience, events, thought or understanding on anything with an expectation to gain more insights and understanding about something. Knowledge sharing between individuals is the process by which knowledge held by an individual is converted into a form that can be understood, absorbed, and used by other individuals (Ipe, 2003). Knowledge sharing can also be seen as communication of all types of knowledge, which includes explicit knowledge information, the ‘know-how’ and ‘know-who’ (Hawamdeh, 2003). Connelly and Kelloway (2003) defined knowledge sharing as a set of behaviour

that involves the exchange of information or assistance to others. Knowledge sharing refers to the provision of task information and know-how to help others and to collaborate with them to develop new ideas, solve problems, or implement policies and procedures (Cummings, 2004). Knowledge sharing is a complex process as it refers not only to information but also beliefs, experiences, and contextualised practices that are difficult to convey (Davenport and Prusak, 1998).

Al-Ma'aitah (2008) reviewed relevant literature and catalogued the benefits of knowledge sharing as enhancing the sharing of knowledge with clients and partners, enhancing client capacity to access and make effective use of knowledge, enhancing new product development, supporting on-going organisational activities, increased company value, improving learning and reducing isolation, improving decision making process and problem solving, and establishing common understanding between an organisation's employees.

### 3 Knowledge Management Systems (KMS)

According to Cerchione and Esposito (2017), Knowledge Management Systems (KMS) are divided into two categories; knowledge management practices (set of methods and techniques to support the organisational processes of knowledge management) and knowledge management tools (specific IT-based systems supporting knowledge management practices). Alavi and Leidner (2001) define KMS as Information Technology (IT) based systems developed to support and enhance the organisational processes of knowledge creation, storage, retrieval, transfer, and application. They also point out that IT can be used as an enabler in knowledge management initiatives but stress that these initiatives do not necessarily involve the implementation of IT solutions. The KMS are tools and techniques that support knowledge management practice in an organisation (Gallupe, 2001). They can also be perceived as the means that aid members of an organisation in creating, sharing and using knowledge. These systems automate the input, storage, transfer and retrieval of knowledge, and include tools for capturing various types of knowledge from useful lessons learned, classifying knowledge documents, locating the relevant experts, facilitating expertise and so on (Kulkarni *et al.*, 2006).

Organisations across all sectors recognise the critical role of effective KMS in their future success (Shin, 2004). Turban *et al.* (2010) point out that KMS are intended to help an organisation to cope with rapid change, turnover, downsizing and leveraging knowledge use by making the expertise of the organisation's human capital widely accessible. Moreover, KMS can facilitate knowledge management by ensuring knowledge flows from the persons who know to the persons who need to know throughout the organisation (Bose, 2004). Moreover, Edwards (2009) explained that there is a need to coordinate people, processes, and technology successfully in KMS, since it is more than just technology, and represents a deliberate, conscious attempt to manage knowledge, usually in an organisation.

Knowledge Management Systems assist organisations to collect all relevant knowledge and experience and make it available whenever and wherever it is needed to support business processes and management decisions. Knowledge here could be perceived as the understanding that a person has gained through education, experience, discovery, intuition and insight or a combination of instincts, ideas, rules and procedures that guide actions and decisions (Kumar and Gupta, 2012). The KMS play a vital role in educational institutions as it helps members to access the knowledge they need when they need it, and provides the tools with which decision makers and users can leverage their knowledge in the context of their work (Chong and Chong, 2009). However, Edwards (2009) also stressed that technology used in supporting KM does not have to be "KM software"; it can be generic software such as e-mail or an Intranet. The KMS use different IT media such as collaborative systems, group decision systems, data mining tools, expert systems, knowledge repositories, intranets, Internet, extranets, electronic bulletin boards, groupware, Lotus Notes, portals, and data warehouses (Alavi and Leidner, 2001).

Knowledge Management Systems include intranets, document and content management systems, workflow management systems, business intelligence tools, visualisation tools, groupware and e-learning systems (Greco *et al.*, 2013). Bolloju *et al.* (2002) point out that in order to assist the creation of new knowledge effectively, KMS must support not only the creation but also the gathering, organisation, sharing and dissemination of existing knowledge. Nevo and Chan (2007) recommend that KMSs should be more strongly integrated with the overall technology in the organisation.

### 4 Challenges Associated with Knowledge Sharing

Several scholars highlight a number of challenges associated with knowledge sharing. Dyer and Nobeoka (2000) suggest that these challenges are related to three principal reasons: lack of motivation of participants to participate and openly share valuable knowledge in the network; the problem of free riders; and the costs associated in finding the opportunities to share knowledge. According to Shin (2004), fear of loss of hegemony and lack of up-to-date knowledge prevent people in an organisation to share knowledge. Lack of commitment or negligence, cultural incompatibility, knowledge diversity due to lack of common experience, lack of trust, resistance to change, lack of training and lack of incentive were also listed as challenges to knowledge sharing in an organisation (Carnabuci and Operti, 2013; Taylor and Wright,



2004; Salmi, 2003).

Knowledge sharing challenges could be categorised into three main domains; individual, organisational and technological. At individual level, challenges are often associated with factors such as lack of communication skills and social networks, differences in national culture, differences in position status, and lack of time and trust. At organisational level, the challenges are related to factors such as lack of infrastructure and resources, the accessibility of formal and informal meeting spaces and the physical environment. At technological level, challenges are correlated to factors such as unwillingness to use application, unrealistic expectations of IT systems, and difficulties in building, integrating and modifying technology-based systems (Riege, 2005).

## 5 Statement of the Problem

Knowledge sharing is important when different individuals are working towards achieving common objectives because participants need to distribute existing knowledge and construct knowledge through explaining, clarifying, critical thinking, and reflecting from different perspectives. Storck (2000) asserted that sharing knowledge is important to building trust and improving the effectiveness of group work. Despite the importance attached to the use of KMS in sharing information, it was observed that academic members of staff of Colleges of Education in Nigeria do not adequately exploit these technologies to enhance their productivity and mutual understanding among themselves. By implication, academic staff of Colleges of Education in Nigeria could be lagging behind in their quest for improving teaching and research as well as efficiency in job performance. Consequently, this study was designed to examine the types of KMS used by the academic staff of Colleges of Education to share information among themselves and the challenges they face in sharing knowledge. The specific objectives were to examine the types of KMS used by the academic staff of Federal Colleges of Education in Kano; and find out the challenges associated with knowledge sharing by the academic staff of Federal Colleges of Education in Kano.

## 6 Methodology

A quantitative methodology using cross sectional survey design was adopted for the study. Questionnaire was used as a research instrument for the study. Face to face hand delivery method of administration of the questionnaire was used during data collection. The questionnaire was divided into three sections A-C. Section A had three (3) items which solicited demographic information. Section B had thirteen (13) items which solicited information on the types of KMS used. Section C had twelve (12) items which solicited information on the challenges associated with the sharing of knowledge.

The population of the study was made of up all academic staff of Federal College of Education Kano and Federal College of Education Bichi. There is total number of 660 academic staff in these institutions. Two hundred and forty-three (243) academic staff was randomly selected as the respondents of the study.

The sample size was determined using Cochran's (1977) sample size formula:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where;  $n_0$  is Cochran's sample size recommendation,

$N$  is the population size, and

$n$  is the sample size.

Hence;  $385/(1+(384/660)) = 385/1.582 = 243$  (sample size)

## 7 Findings and Discussions

The results of the questionnaire distributed to the respondents was analysed and is presented in this section. Respondents were asked to choose the type of knowledge management system they used for knowledge sharing. Table 1 presents their responses.

Table 1: Types of Knowledge Management Systems (KMS)

S/N	Types of Knowledge Management Systems	Frequency	Percentage
1	Audio Conferencing System	16	6.6
2	Bulletin Board	0	0
3	E-mail and Scheduling Software	231	95.1
4	Video Conferencing System	16	6.6
5	Decision Support System	0	0
6	Wikis and Blogs	80	32.9
7	Institutional Repository and Databases	104	42.8
8	Online Group Discussion	71	29.2
9	Portal Technologies	0	0
10	Voice Mail System	90	37
11	Instant Messaging System	202	83.1
12	Document Management System	156	64.1
13	Intranet and Extranet	51	20.9

From 243 respondents, the majority 231(95.1%) chose e-mail and scheduling software as the most used knowledge management system for sharing knowledge; 203(83.1%) chose instant messaging system; 156(64.1%) chose document management system; 104(42.8%) chose institutional repository and databases; 90(37%) chose voice mail system; 80(32.9%) chose wikis and blogs; 71(29.2%) chose online group discussion; 51(20.9%) chose intranet and extranet; 16(6.6%) chose audio conferencing video conferencing respectively; and no one chose bulletin board, decision support system and portal technologies.

The results tallied with Abbas (2017) study on the adoption and use of knowledge management systems for service delivery in Nigerian Federal Inland Revenue Service Agency where all the KMS had been adopted with the exception of virtual reality and modelling tools. Subashini, Rita and Vivek (2012) argue that knowledge sharing is facilitated through ICTs including computers, telephones, e-mail, databases, data-mining systems, search engines, video-conferencing equipment and many more.

Table 2: Challenges associated with knowledge sharing

S/N	Challenges Associated with Knowledge Sharing	Frequency	Percentage
1	Lack of time	205	84.4
2	Lack of trust	234	96.3
3	Lack of training	128	52.7
4	Lack of participation	119	48.9
5	Lack of incentive/reward	104	42.8
6	Unwillingness to share information	126	51.9
7	Resistance to change	98	40.3
8	Lack of communication skills	69	28.4
9	Cultural/religious differences	96	39.5
10	Lack of infrastructure/resources	167	68.7
11	Lack of awareness about KMS	190	78.2
12	Lack of motivation to share knowledge	178	73.3
13	Lack of support from the management	166	68.3

The Table 2 above shows the challenges associated with sharing knowledge from the respondents' view point. From 243 respondents, 234(96.3%) selected lack of trust as the major challenge for knowledge sharing; 205(84.4%) chose lack of time; 190(78.2%) agreed that lack of awareness about KMS inhibit knowledge sharing; while 178(73.3%) indicated that lack of motivation affect knowledge sharing. 167(68.7%) selected lack of infrastructure/resources; 166(68.3%) chose lack of support from management; 128(52.7%) chose lack of training; 126(51.9%) chose unwillingness to share knowledge; 104(42.8%) chose lack of incentive/reward; 98(40.3%) chose resistance to change affect knowledge sharing; 96(39.5%) agreed that cultural/religious differences hinder knowledge sharing; while 69(28.4%) said lack of communication skills is a challenge of knowledge sharing.

The findings were in line with Shahmoradi, Safadari and Jimma (2017) who in their systematic review of knowledge management implementation and the tools utilised in healthcare for evidence-based decision making found that infrastructure (technological) constraints, lack of motivation of employees to share knowledge, system unreliability, lack of senior management support, organisational politics patients' privacy issues, reluctance of clinicians to use ICT tools on daily basis-mainly due to lack of time, inadequate awareness about KMS among others were the major challenges associated with the knowledge sharing. Nisar ul Haq and Haque (2018) also examined the impact of trust, attitude, and ICT use on knowledge sharing among degree students of universities in Vehari using self-efficacy theory and found that trust, attitude, and ICT use are the key factors that boost knowledge sharing amongst students.

In a nutshell this study found out that: The academic staff of federal colleges of education in Kano mostly used e-mail and scheduling software for sharing knowledge. Instant messaging system, document management system, institutional repository and databases, voice mail system, wikis and blogs, online group discussion, intranet and extranet, audio conferencing and video conferencing were also used. However, they do not use bulletin board, decision support system and portal technologies; Lack of trust, lack of time, lack of awareness about KMS, lack of motivation, lack of infrastructure/resources, lack of support from management, lack of training, unwillingness to share knowledge, lack of incentive/reward, resistance to change, cultural/religious differences and lack of communication skills are the challenges facing the academic staff of colleges of education in knowledge sharing.

## 8 Conclusions

The main aim of this study was to find out the types of knowledge management systems used by the academic staff of federal colleges of education and the challenges they face when sharing knowledge. From the findings of the study it is evident that academic staff of Federal Colleges of Education preferred to use e-mail and scheduling software, instant messaging system and document management system to share knowledge. This could be due to their user-friendliness and users' trust in these systems. In terms of challenges facing knowledge sharing, it was found out that lack of trust, lack of time, lack of awareness about KMS, lack of motivation, lack of infrastructure/resources, lack of support from management, lack of training and unwillingness to share knowledge hindered knowledge sharing. This could be due to the lack of forum where they can interact and build good rapport among themselves.

## 9 Recommendations

The following recommendations are made based on the findings of the study:

1. The Colleges of Education Academic Staff Union, with collaboration of management of these institutions, should engage in campaigns on the importance of knowledge sharing especially via knowledge management systems.
2. There is need to provide infrastructure/resources that facilitate knowledge sharing in offices, common rooms and libraries.
3. There is need to provide ICT training to the academic staff of Colleges of Education. This can help them to utilise KMS available for knowledge sharing.

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# The Influence of ICTs on Knowledge Sharing Among Library Staff in Selected Universities in South Africa

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## Abstract

*Application of Information and Communication Technologies (ICTs) in university libraries has brought revolutionary changes in information processing, storage, dissemination and distribution. The information stored in libraries has thus taken a major shift from volume-limiting paper to limitless multimedia, digital form that can be shared via an integrated system. Despite the role played by ICTs in universities, library staff remains the main actors in disseminating and sharing knowledge. This chapter, therefore, examines the influence of ICTs on knowledge sharing among library staff in selected universities in South Africa. A survey research design and a self-administered questionnaire were employed. Interviews were utilised to validate the results from the survey questionnaire. There was no sampling; a census was used. The universities studied were the Durban University of Technology (DUT), the University of KwaZulu-Natal (UKZN), the Mangosuthu University of Technology (MUT) and University of Zululand (UNIZULU). It was established that ICT infrastructure that supports knowledge sharing was needed to enable staff to have ready access to the organisations' codified knowledge and to share tacit knowledge. Hence, ICT infrastructure, like a SharePoint tool, was seen as an enabler of knowledge sharing to overcome geographical boundaries, enabling library staff to benefit from the expertise of others. The findings suggest that formulation of strategies like the use of a SharePoint tool should enable staff to share knowledge and connect with individuals that possess the expertise they are seeking in trying to solve their problems.*

*Keywords: Knowledge Sharing, Librarians, Social Networks, Universities, South Africa*

## 1 Introduction and Background of the Study

In South Africa, the development of Information and Communication Technologies (ICTs) within university library settings has led to the growth of new applications such as groupware, online databases and Intranets, which facilitate libraries to enhance knowledge sharing. The World Wide Web (WWW) is perceived as one of the most effective and convenient ways by which library staff in universities exchange knowledge through sharing of resources, experiences and learning from external sources. The development of ICTs has played a major role in improving information flow and accessibility as well as satisfying users' information needs in university libraries (Sarrafzadeh, Martin and Hazeri, 2010).

Mpofu (2011) noted that the application of information technologies in university libraries in South Africa had widened the scope of knowledge acquisition, which is a key process in managing knowledge in university libraries. In spite of the role played by ICTs in universities, library staff remains the main actors in distributing and sharing knowledge. Consequently, ICT infrastructure can be seen as an enabler of knowledge sharing to overcome geographical boundaries thereby enabling staff to benefit from the expertise of others (Ramirez, 2006). Using ICTs, as knowledge-sharing tools, enable library staff to connect with professional colleagues that possess the expertise they are seeking in trying to solve their problems (Rosen *et al.*, 2007).

The 21<sup>st</sup> century global explosion of ICT has obvious implications for the increasing use of ICTs in university libraries. *Information Communication Technologies (ICTs)* refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT) but focuses primarily on communication technologies. These include the Internet, wireless networks, cell phones, and other communication media (Balubaid, 2013; Sarrafzadeh, Martin and Hazeri, 2010). In libraries, ICTs support the creation, capture, storage and dissemination of information (Rah, Gul and Ashraf-Wani, 2010:25). Examples of ICTs that are increasingly being used in university libraries are social networking sites, and databases, among others. Social networking sites are playing a pivotal role in the dissemination of information and knowledge sharing among library staff through blogging and twitting.

The use of Web 2.0 technologies as knowledge sharing tools is a topical issue that have been given preference in many libraries around the world. For example, many university libraries across the world were found to be using Web 2.0 tools such as, Facebook, Twitter, blogs and podcasts to engage with users across the globe (Munigala, 2014). Facebook has become popular as one of the social networking tools in university libraries where staff and students get to know each other, exchange information and share ideas about library services, university policies, events and many other things (Munigala, 2014). In university libraries, Twitter allows informal collaboration that provides relief from rising email volumes (Balubaid, 2013).

The problem that was investigated in the current study stems from the fact that even though many libraries in South Africa have rolled out the use of ICTs in their libraries, they have not adequately used ICTs for knowledge sharing (Muchaonyerwa and Mutula, 2017). Studies by Wamundila and Ngulube (2011) and Oguche (2017) have also shown that

there is a gap between knowledge sharing and ICT competences among staff in universities, which calls for attention. Kim and Lee (2006) noted that lack of skills and expertise to use ICTs is responsible for the negative attitude of librarians towards knowledge sharing. It is against this backdrop that this study sought to establish the influence of ICTs on knowledge sharing among library staff in selected universities in South Africa. Overall, this chapter investigated if libraries in the selected universities have ICT infrastructure that enhances knowledge sharing.

## 2 Problem Statement

In many library settings, there are no systematic approaches to organising the knowledge of the enterprise and making it available to other staff in order to improve the operation of the library (Jantz, 2001). As a result, each time librarians leave their job, they carry what they know with them. If knowledge is shared through systematic approaches, it would ensure that important knowledge would still be available even when such members of staff leave the organization. Generally, many libraries in Africa have not yet embraced the use of ICTs as knowledge sharing tools due to lack of skills and a negative attitude towards adapting such tools to share knowledge of work-related activities by staff (Muchaonyerwa and Mutula, 2017).

Effective knowledge sharing depends on employees' ICT competencies which influence their attitude towards using ICTs within the organisation. Lack of ICTs skills impedes the knowledge sharing behaviour of staff. The application of ICTs and social networking sites are central to knowledge sharing activities and facilitate organisations to get work done and to manage the knowledge assets of the organisation. Therefore, the role of ICTs is fully understood if it relates to the motivation for knowledge sharing.

Despite South Africa being a pioneer in the ICT infrastructure development on the continent, it is worth mentioning that most of the ICT platforms in university libraries do not facilitate knowledge sharing of work-related activities of staff (Makori, 2011; Muchaonyerwa and Mutula, 2017). The intensity and effectiveness of knowledge sharing through the open network largely depends on the user-friendliness of the information technology system that has been created as well as the organisational culture of the institution (Lekay, 2012).

This chapter provides answers to the following questions: (i) Which types of ICTs are available for knowledge sharing among library staff in university Libraries in South Africa? (ii) What is the attitude and perception of library staff towards knowledge sharing using ICTs in their libraries? (iii) What factors affect ICT usage for knowledge sharing by library staff?

## 3 Methodology

The respondents were drawn from four universities in the KwaZulu Natal (KZN) Province of South Africa. These were Durban University of Technology (DUT), the University of KwaZulu-Natal (UKZN), the Mangosuthu University of Technology (MUT) and the University of Zululand (UNIZULU). Convenience of the research domain necessitated choice of these academic institutions. In addition, the sample of the libraries in academic institutions surveyed comprised a mixture of traditional, comprehensive and technology-based universities mostly involved in research productivity and teaching excellence.

A survey research design was employed in examining the influence of ICTs on knowledge sharing among library staff in university libraries in KwaZulu-Natal. Methodological triangulation (quantitative and qualitative approaches) was employed. These approaches enabled the researcher to unravel the factors instrumental for understanding the multiple perspectives of the phenomena being investigated. The total sample consisted of 130 library staff including eight senior managers as shown in Table 1.

Table 1: Relative population of the study

Institution	Frequency	Percentage
UKZN	41	31.5
DUT	33	22.3
UNIZULU	29	25.3
MUT	27	20.7
<b>Total</b>	<b>130</b>	<b>100</b>

The librarians in the four university libraries included acquisitions librarians, library assistants, subject librarians, senior managers and directors. Data was collected by administration of questionnaires to all the 122 professional library staff and the eight (8) senior managers or library directors. In addition, interviews were further administered to the senior managers or directors of the library to complement data that was collected through questionnaires. Quantitative data was analysed using descriptive statistics facilitated by SPSS computer software. This data was presented using charts, tables and graphs. Data collected from the interviews was mainly qualitative. As such, content analysis emerged as the appropriate technique to analyse the data. The data was first coded and categorised into themes for easy interpretation. The main method for data presentation was narrative. University websites were used as the sampling frame to identify all library staff. Telephone follow-ups were made to library directors and or senior managers to verify the staffing information.

## 4 Findings and Discussions

A total of 102 respondents filled the questionnaires. Among the 102 respondents from the investigated institutions, 76 (74.5%) were female and 26 (25.5%) were male. This indicates that more females than males responded to the questionnaire.

### 4.1 Types of ICTs used for knowledge sharing

Library staffs were asked about the types of ICTs they use to share knowledge on work-related activities. Results are presented in Table 2.

Table 2: Types of ICTs used for knowledge sharing

ICTs used	Responded	Did not respond
Library blog	38.6%	61.4%
Email	46.5%	53.5%
Facebook/Twitter	41.6%	58.4%
Share Point Tool	17.8%	82.2%

From Table 2, 47(46.5%) indicated that they used communities of practice as a strategy of knowledge sharing, 42(41.6%) were using Facebook and Twitter; 39(38, 6%) indicated that they used a library blog while only 18(17.5) were using a SharePoint tool to share knowledge with colleagues within the library and beyond. From the responses, although majority agreed that they shared knowledge through communities of practice, most of the staff in university libraries was not familiar with the use of such strategies for knowledge sharing purposes, as indicated by the low percentages of those who responded as shown in Table 2. To a greater extent the study agrees with Kim and Abbas (2010), as well as Nazim, Mukherjee and Hindu (2012) who in their studies also found that the most widely used Web 2.0 tools in university libraries are social networking sites such as Facebook and Twitter, blogs and Really Simple Syndication (RSS) feeds (Kim and Lee, 2006). Facebook, for example, allows the creation of groups which can discuss library activities through wall posting on the Facebook application, while Twitter allows libraries and librarians to disseminate and share knowledge with users (Munigala, 2014).

However, library staff did not perceive the use of such social media as knowledge sharing strategies probably due to lack of familiarity and understanding of using such tools to share knowledge of work-related activities. The study indicates that the use of these types of ICTs to share knowledge of work-related activities by the library staff in universities is poor as shown by the low responses in Table 2. This also concurs with a study by Makori (2011) who found that few libraries in African countries have incorporated tools such as library blogs, wikis and social networks for knowledge sharing. To address the challenge, the author holds the view that there is a need for staff members to be encouraged to use ICT facilities for knowledge sharing purposes. This has also been emphasised by Onifade (2015) who posits that library staff should be encouraged to join platforms such as librarians' forum and other networking sites to exchange knowledge and interact with colleagues. The findings generally reveal that ICTs enhances a flow of network and communication, which also supports the librarians. This is also supported to a great extent by O'Dell (2010) who asserts that social networks offer a greater opportunity for library staff to gather and share knowledge through interaction with one another. In a study of Twitter usage in libraries in India, Munigala (2014) found that librarians were attempting to leverage Twitter to share knowledge with colleagues both outside and inside the organisations.

Interviews conducted with senior managers revealed that university libraries in KZN Province did not have knowledge repositories/databases to document/codify tacit knowledge for future reference. The university libraries were losing operational knowledge of experienced staff when they retire or leave the organisation. Wamundila and Ngulube (2011) also share similar sentiments that the use of knowledge repositories to document tacit knowledge of academics does not exist at the University of Zambia. Similarly, Dewah (2011) revealed that most organisations do not codify tacit knowledge of outgoing staff. Codification/documentation of tacit knowledge for relevant operational knowledge in university libraries allows for knowledge retention that could be shared with new staff during their induction period (Wamundila and Ngulube, 2011). Exchange of explicit/codified knowledge through an integrated system enhances skills transfer and knowledge retention within organisations (Bartol and Srivastava, 2002; Kankanhalli and Tan 2005; Dewah, 2011; Akramet *et al.*, 2011). Research has also shown that many university libraries are losing knowledge assets since the large portion of knowledge is tacit and deeply rooted within individuals' mind and is not captured or documented (Jain, 2007).

However, further discussions with senior managers at one of the universities indicate that staff posted their views on a SharePoint tool. There was an innovation committee that continuously scanned the horizon and updated staff on what was happening. These findings show that library staff were able to gain operational knowledge through exposure and contribution of knowledge to a SharePoint tool. Given these results, one could argue that progress has been made at one of the university libraries in KwaZulu-Natal where staff shared knowledge amongst themselves using the SharePoint tool. Around the world, university libraries in Western countries are reportedly implementing knowledge management

programmes and knowledge management systems, such as SharePoint tools, to improve knowledge sharing among academic staff (Jantz, 2001; Dankert and Dempsey, 2002).

4.2 Perception of library staff towards knowledge sharing using ICTs

The findings established that the elderly members of staff had phobia towards ICTs as indicated by the majority 39(38.2%). Elderly members of staff are far less likely to use information technologies than younger ones to share knowledge. Young people easily adapt to changes in the working environment especially on the use of ICTs compared to their elderly counterparts. This has been supported to a greater extent by Eastman and Iyer (2004) as well as Earney and Martins (2009) who assert that young people are more active and often participate on social media. In concurrence with the observation by Kim and Lee (2006), this study also found out that what determined the attitude of individuals on technological advancement is the perceived ease of use and also the beneficial essence of the new system.

The less complicated the system, the greater the potential of an increase in staff use and participation. Although there was an increased participation in using social media by the junior staff, it was noted with concern, that they were not used to share knowledge of work-related activities. From the findings, a few respondents 22(21.6%) indicated that they used ICTs to share knowledge on work-related activities. Ram, Anbu and Kataria (2011) had similar findings in their study which showed that there is a high level of awareness in the usage of social media like Facebook and Twitter. However, their usage in sharing library work-related activities is very low. Besides, elderly staff presented a negative attitude towards using ICTs as knowledge sharing tools and that might be caused by lack of skills as reflected by 6(5.9%) of the respondents who said that they did not have the skills to use information technology. The results in Figure 1 illustrate the perceptions of library staff towards the use of ICTs.

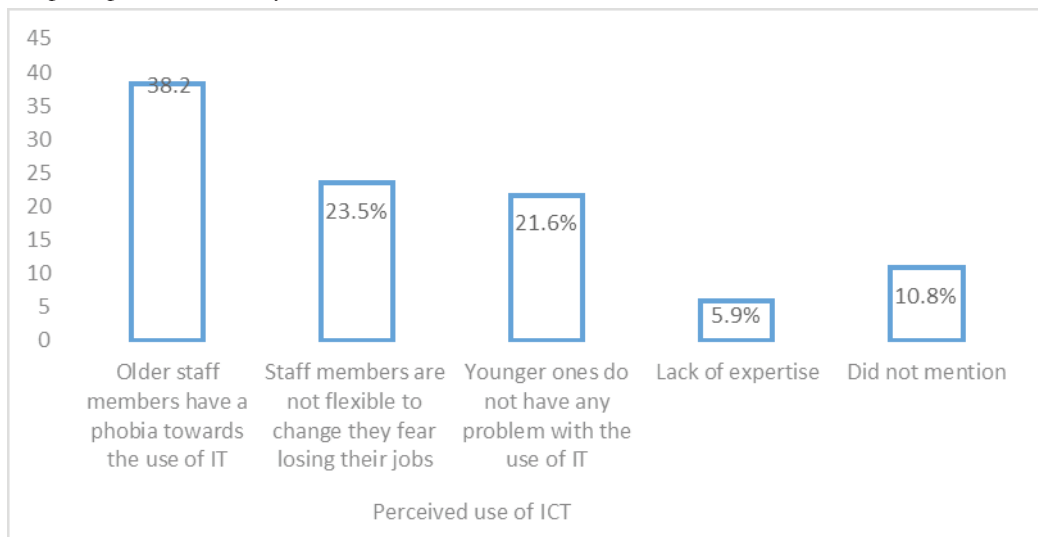


Figure 1: Perceived use of ICTs

4.3 Correlation between KS and Factors Affecting ICT Usage

The perceptions of library staff on using ICTs significantly affect their beliefs and norms because of lack of trust to post their views and opinions on social media. In general, staff members did not value the use of ICTs (social networking sites, and knowledge repositories) to communicate and share knowledge of work-related activities.

Table 3: Relationship between phobia towards use of ICTs and knowledge sharing

Pearson Correlations		Knowledge Sharing Index	Tools of Knowledge Sharing	Attitudes and Perceptions of Staff (KS)
Tools of Knowledge Sharing	Correlation	0.251*		
	p-value	0.014		
	N	96		
Skills and Expertise	Correlation	0.165	0.369**	0.442**
	p-value	0.119	0.000	0.000
	N	90	90	92
Phobia towards use of ICTs	Correlation	0.076	0.060	0.135
	p-value	0.457	0.562	0.178
	N	99	97	101

\*\*Correlation is significant at the 0.01 level (2-tailed)



The Pearson correlation analysis shows that there is no significant relationship between preferred ICT channels of knowledge sharing and knowledge sharing, as shown by the correlation p-value sig. (0.251 to 0.014) on knowledge sharing index. The respondents showed a positive attitude that they have the skills and expertise to use the preferred channels of communication as shown by the p-value sig. (0.442 to 0.000). The results, however, showed the unwillingness of staff to share their skills and expertise as shown by the p-value sig. (0.165 to 0.119) on skills and expertise. The results from Pearson correlation analysis also show that there is no significant relationship between phobia towards use of ICTs and knowledge sharing as indicated by the correlation p-value sig. (2-tailed 0.076 to 0.457) as shown in Table 3.

In addition, elderly staff seemed generally uncomfortable to share knowledge using ICTs. The views expressed by senior management show that elder staff were not comfortable with posting their views on social media because of differences in personality and untrustworthy relationships between colleagues. To a greater extent the study concurs with the finding by Riege (2005) that many people, especially elder staff, are unlikely to share their knowledge on social media without having an assurance that such knowledge will not be misused. The use of social networking sites for the purpose of knowledge sharing of work-related activities in university libraries in KwaZulu-Natal was not evident from the results. The social networks were, however, frequently used for social activities. Reiterating the same point, Stafford and Mearns (2009) opined that in most organisations, employees used social networks for social purposes, rather than for organisational knowledge sharing.

## 5 Conclusions and Recommendations

The study revealed that regardless of the influence of ICT in knowledge sharing, many universities have not adopted such tools and strategies for knowledge sharing purposes. This has been proved by lack of knowledge repositories to document explicit knowledge and enabling ICT infrastructure that encourage knowledge sharing. Furthermore, the low use of library blogs, Facebook/Twitter and SharePoint as ICT communication facilities impedes knowledge and information sharing. These ICT applications and social networks are central to knowledge sharing activities and assist organisations to get work done and to manage the knowledge assets of the organisation. It has also been noted that elder staff have a negative attitude towards the use of ICT facilities within the working environment. This solely depends on the ease and less complexity of the system which influences the probable use of the facilities by the staff. Thus, if the system is not user friendly, the staff are unlikely to cooperate. It is highly recommended that universities should ensure that they have systems set up to enhance the use of ICT facilities in knowledge and information sharing. The use of a SharePoint tool to enable staff to share knowledge and connect with individuals that possess the expertise they are seeking in trying to solve their problems is encouraged. In addition, there is need to address resistance of employees towards the use of ICT facilities. Universities should offer and encourage staff to attend training workshops to enhance system use amongst the staff members.

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# Knowledge Management in a Virtual Church: The Case of the Natal West Methodist District in South Africa

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## Abstract

*Knowledge management is important for the success of organisations. As information and communications technologies (ICTs) have become pervasive in homes and various spheres of life, research has broadened to examine new motivations for using these technologies. Recently this has focused on how ICTs facilitate the creation, sharing and preservation of information in religious institutions. While the uses of ICTs by practitioners of various faiths have been examined, far less is known about how religious organisations adopt, use or reject ICTs in KM initiatives. The primary purposes of this chapter are to explain perceptions regarding ICT use to support knowledge management and to identify suitable ICTs to support various ministerial initiatives at the Natal West Methodist District in South Africa. The chapter explores the nexus between ICTs and knowledge management in church management, worship, preaching, pastoral care, and outreach. The study also examined the intersection of legal, ethical, and theological issues in integrating ICTs and knowledge management into religious practice. The research design for the study which informed this chapter was largely qualitative. Data was collected through literature review, questionnaires, interviews and observation. The study found that survey respondents held positive attitudes towards the use of ICT to support different components of church ministry because of their potential to enhance effectiveness.*

**Keywords:** *ICTs, knowledge management, Methodism, Methodist Church of Southern Africa, Natal West Methodist District*

## 1 Introduction and Background

Knowledge management (KM) is a concept in which an organisation consciously and comprehensively gathers, organises, shares, and analyses its knowledge in terms of resources, documents, and people skills (McInerney & Koenig, 2011). In the recent past, advances in information and communication technologies (ICTs) and the way in which people currently access and share information have revolutionised this concept. Many enterprises now have some kind of knowledge management framework in place (Afzal, 2012). A knowledge management survey, therefore, involves an analysis of corporate goals and a close examination of the tools, both traditional and technical, that are required for addressing the needs of the organisation (McInerney & Koenig, 2011).

The use of ICTs for information creation, management, and dissemination can offer great opportunities to churches and other faith-based organisations. The use of these powerful tools can also pose legal, ethical, and theological challenges that need to be managed by churches as responsible information organisations (Helland, 2011).

This chapter explores a range of views regarding the use of modern ICTs as information management tools in a religious context. The chapter identifies potential information management challenges and suggests some ways in which churches and other faith-based organisations can bring to bear in order to address these challenges. Observations are drawn primarily from a survey conducted in three societies within the Natal West Methodist District in South Africa. The societies in question are: the Camperdown Church, a relatively rural and smaller society with a predominant black membership, the Hilton Society, a semi-urban society whose membership is predominantly coloured, and the Wesley Church, a very large suburban church with a preponderous of white membership.

The concept of ICTs has no universal definition since the methods and applications involved are constantly in flux (Chisa & Hoskins, 2016). For the purposes of this study, ICTs will be understood as “a wide range of services, applications and technologies, using various types of equipment and software, often running over telecommunications networks which enable users to access, store, transmit, and manipulate information” (European Commission, 2001:3). The chapter examines the ways in which ICTs are understood to be beneficially impacting knowledge management within the context of church life. The challenges with the adoption of these technologies as identified by church leaders, and from participation observations, are also be discussed, with insights from the literature. In conclusion, a number of key areas of legal, ethical, and theological concern are identified.

## 2 Context of the Study

Methodism, as a Christian belief system, began with John and Charles Wesley in England in the 1700s. John Wesley started very disciplined small groups that met to study the Bible, pray, serve others and hold one another accountable in their Christian walk. Others laughed at how seriously these groups took their faith, calling them “Methodists” because they were so methodical and disciplined in the way they lived out their Christian convictions (Bentley & Foster, 2008).

While “scriptural holiness” was of primary importance for John Wesley, he also emphasised what became known as the “Wesley Quadrilateral”. The Wesley Quadrilateral expressed the importance firstly of scripture, but also emphasised that people can know and experience God through a combination of scripture, tradition, reason and experience (Bentley & Foster, 2008).

Methodism was introduced in South Africa in the early 1800s. Today, the Methodist Church of Southern Africa (MCSA) includes the countries of South Africa, Namibia, Mozambique, Swaziland, Botswana and Lesotho. According to Bentley and Foster (2008), the MCSA is considered to be a “Connexional Church”, which means each church does not stand on its own. Together, Methodist churches are all accountable to:

- Conference - Conference meets once per year to make decisions about the running of the whole MCSA. It is made up of representatives who are elected from the various districts and departments.
- The Presiding Bishop - The Presiding Bishop is the chief spokesperson of the MCSA. The Presiding Bishop at the time of this study was Rev. Zipho Siwa.
- Bishops - The MCSA has 12 Districts (arranged geographically), each of which has a bishop. The district that the three churches under review belong to is the Natal West District.
- Synods - Each district has a yearly Synod (made up of clergy and lay people) which meets to make policy decisions.
- Circuits - Districts are made up of smaller units called circuits, which are made up of societies (churches), a Superintendent and the Clergy who are responsible for the societies in that circuit (Bentley & Foster, 2008).

The Natal West District (hereafter, the District) shadows much of the geographical area of KwaZulu-Natal. About 60% of the circuits in the district are rural, with the rest being semi-rural and urban. The membership is also diverse, consisting of blacks, whites, indians and coloureds, and this can be seen in the constitution of the District Executive Committee. Strategically, the district has functional structures in place for running the mission work effectively. In predominantly black circuits, the minister/society ratio is at an average of 1:25, while in white circuits it is usually 1:1 (MCSA 2017).

### 3 Research Problem

Afzal (2012:102) defines information organisations as “organisations that engage in all or one of the activities involving acquisition, organisation, preservation, processing, recording, creation, assimilation, packaging, repackaging, presentation, dissemination, transfer, and access of information”. Libraries, archives, museums, publishing houses, music companies, and news channels are all examples of information organisations. This chapter proposes that churches are also information organisations.

On a weekly basis, churches create and disseminate an enormous amount of information in the form of sermons, classes, bible studies, and music through organised events and activities. To manage these activities, churches produce documents like newsletters, pew leaflets, bulletins, and reports in print and increasingly in digital formats. Churches are also preservers of genealogical, legal and cultural data such as births, deaths, marriages, baptisms, finances and even community events (Chisa & Hoskins, 2016).

Moreover, churches are voracious consumers and disseminators of educational, evangelistic, and worship materials. In order to reach out to their wider communities, churches have historically adopted technologies such as television and radio. They are now experimenting with the power of the Internet and social media in order to achieve that goal. In this regard, literature offers ample evidence of the many ways that Christian churches are engaging with modern ICTs in order to mediate faith and to evangelise their communities (Hutchings, 2015; Campbell, 2010; Michels, 2010).

However, while the various uses of ICTs by practitioners of faith institutions have been examined, far less is known about how officials within these institutions adopt, use and reject these tools especially for purposes of knowledge management. The study draws conclusions regarding the use of ICTs in church management, worship, pastoral care, and outreach, and the challenges in integrating ICTs into religious practice.

### 4 Research Question and Objectives

This chapter seeks to answer this overarching question: How does the District adapt ICTs for church management, worship, pastoral care and and what are the challenges encountered in integrating ICTs into religious practice? Within that broad scope, special focus is on the following objectives:

- Examine how ICTs are used to enhance church leadership by churches at the District.
- Understand how the churches within the District use ICTs to actively engage the congregation on a weekly basis with contemporary worship and teaching.
- Examine how modern ICTs allow the churches to extend their reach beyond their own congregations.

- Assess how the churches manage information challenges in the digital age; and
- Provide recommendations based on the findings of the study

## 5 Literature Review

Religious organisations tend to have strong but diverse views regarding how modern ICTs and new media in general can be appropriated within a religious context. Campbell (2010: 44), for example, identifies three models regarding how religion can interface with ICTs. The first model is “ICTs as conduit”, whereby ICTs are perceived “as a neutral instrument that can be used for good or evil” depending on the motivations of the user. Religious groups who hold this view adopt technological innovation with little ideological conflict, and use it to further the goals of the religious community. Examples of this kind of adoption in the 20<sup>th</sup> Century might be how evangelicals have used television and radio as effective tools of evangelism (McCarthy, 2003), and the manner in which the Roman Catholic Church has sometimes used film for positive cultural appropriation (Ortiz, 2003). Thus, Campbell (2010: 45) observes that “many religious Internet advocates have an idealistic view of the technology as an equalising medium able to be moulded for religious purpose”.

The second view suggested by Campbell (2010: 45) is “technology as a mode of knowing”. Seen from that perspective, ICTs are biased, with their values rooted in the nature of the technology concerned. This could be demonstrated in the shift from print media to visual media where entertainment is prioritised over information, and also by society’s increasing dependence on technology. Grant (2003: 46), exploring objections to television as a vehicle of fantasy being used for evangelism, observes that “religious users are encouraged to be suspicious of media lest they cultivate ... values ... that run counter to their faith”. In another study, Michels (2010: 276) observes that “the real religion is...the dominant forces of the technological society”. In other words, by embracing ICTs as a knowledge management enabler, Michels (2010) argues that the church loses its ability to critique the nefarious values inherent in this powerful tool.

A third perspective opts for the middle ground between the two theories postulated above. In this model, ICTs are deemed as “a social institution” (Campbell, 2010: 48) where the Internet and other social media platforms are understood both in terms of their production, and the user’s perception of the content. This is a reflective approach that seeks to understand the nature of ICTs and their long-term implications, while also understanding the nature of socially constructed messages. In this regard, Dyer (2011) offers his input to create that middle ground. He contends that most Christian critiques of ICTs are not premised within theological and biblical parameters but rather are rooted in where we sit on the technological timeline. Dyer (2011: 28) explains this philosophically:

“We question the young for the blind acceptance of the latest gadgets, but we do so driving our computerised cars to and from church ...”.

Echoes of each of these three views were identified by the author in the interviews held with church leaders in this study: utopian views about ICTs, rejectionist views, and reflective views. The reality, however, is that each of the three churches under review had deliberately chosen to embrace modern ICTs, purportedly, in order to enhance their own ministries. Some leaders clearly saw the undeniable potential of these technologies as a necessary component to drive their religious agenda in the existing information society. A church leader from the Wesley Society, for example, noted as follows:

“I see technology changing the church ... we need to be there if we are going to evangelise to youth who are the future of the church ... we need to reach them where they are at.”

All the three churches reviewed in this study used ICTs for a variety of purposes. They used ICTs internally to collect and manage information and to enrich their own worship and teaching. The churches also used ICTs as an important tool to propagate their mission beyond the boundaries of their own churches. Moreover, the churches used these technologies to engage in wider conversations within and beyond the perimeters of their own congregations.

## 6 Methodology

The study leading to this chapter was conducted at three societies within the Natal West Methodist District. The societies in question are Wesley and Hilton which fall under the Pietermaritzburg Metro Circuit as well as the Camperdown Society which falls under the South Midlands Circuit.

The research design for this study was largely qualitative. Information gathering instruments included a literature review, questionnaires, interviews and observation. The closed-ended questions constituted 80% of all the questions, while 20% were of the open-ended type. The questions asked included personal information about the respondents, their leadership positions, their information sharing habits, and finally, the remarks or comments on the use of ICTs to enhance church leadership and management.

The oral interview schedules were largely used to clarify some aspects of the questionnaire. It is believed by many researchers that interviews tend to have a better response rate than questionnaires (Bailey, 1994). The interview schedule included questions on personal data (name, address, age, marital status, and literacy level) and questions on academic

qualification of the respondent and daily working schedule. Other questions included in the interview schedule asked for the availability and accessibility of ICTs, as well as the usage and effectiveness of these technologies. The interviews were conducted largely by using an audio tape recorder. Besides the interviews with church leaders, the researcher was also allowed to sit in on some church functions. In those events, various forms of ICTs were observed to be in regular use for various purposes. Observation always assists the researcher to gain first-hand knowledge of the subjects. Both obtrusive and unobtrusive observation was employed in this study.

The study employed a simple random sampling procedure in selecting the respondents. The sampling technique was chosen because it ensures that each element in the population has an equal chance of being selected (Kothari, 2004).

A total of 18 respondents were randomly selected from the three societies for the study. The decision of how many respondents would be included in the sample from each society depended largely on the society's size and the availability of respondents during interviews. The sample frame was drawn as follows: Hilton Society 6, there were 8 respondents from Wesley Society, while the Camperdown society had 4.

The content analysis method was applied to analyse responses from open-ended questions. The responses were organised and assigned to major categories, then analysed by use of descriptive statistics in order to obtain frequencies and percentages. Other responses from the unstructured questions were grouped together according to their similarities and either summarised or presented as they were. Quantitative data was analysed using the Statistical Packages for Social Sciences (SPSS).

## 7 Findings and Discussions

The method of analysis which is adapted from Momodu (2002) is purely descriptive and is devoid of tables or graphs for easy assimilation. The use of ICTs as an enabler of knowledge management in the three churches within the District was examined from the perspective of three broad categories, namely: ICTs for leadership, ICTs for worship and teaching, and ICTs for outreaching.

### 7.1 Use of ICTs for leadership

The literature shows how clergy in various churches have long turned to technology to enhance their religious work. Contemporary research has confirmed the adoption of ICTs and social media platforms as regular and efficient tools to advance pastoral ministry (Campbell, 2005). This was also found to be the case amongst ordained and lay church leaders in this study. The researcher noted in this study that church leaders routinely used modern social media platforms such as email, WhatsApp, Facebook and Skype (amongst others) for administrative and communication purposes. Church leaders used emails and WhatsApp mainly to arrange meetings, communicate policy decisions, and to exchange information pertaining to church meetings (e.g. Church Council minutes).

Leaders at Wesley Church, for example, exchanged relevant documents through Internet cloud services like Google Docs. It was also noted that leaders were not always physically available to attend meetings, but were able to use ICTs in order to participate. In a crucial church meeting at one of the churches, for example, one church leader participated and ably contributed to the meeting via Apple Face-time. Thus, most church leaders expressed great enthusiasm about the use of ICTs in church governance. In this regard, a Wesley church leader declared with enthusiasm that: "we can communicate with members of the congregation instantaneously". Similarly, a Brentwood church leader observed that "it makes it much easier to access people at a larger level ... it's easier to deal with the data ... and prepare documents and get them out quickly and easily."

An important characteristic of the leaders' information behaviour was the reliance on people as trusted information sources. The pastor at Wesley Church, for example, shared that when his leadership team felt they needed official advice, they Skyped a lay leader for a real-time consultation during meetings. Secondly, leaders also used ICTs to quickly gather information for decision-making both corporately and individually. During meetings, leaders were routinely observed accessing online information using smart devices. Many of the leaders also described extensive use of online information sources for personal faith development and preparation for their leadership role. For example, a pastor at Hilton Church described the use of YouTube videos for personal devotions and related websites for study materials. These online tools enriched the information environment in which church decisions were made.

However, using ICTs in the leadership context also presented challenges. For example, one Camperdown church leader admitted that he never used email: "when I left work, I left the computer...." Other leaders in that church voiced similar concerns, noting that when online tools became the primary means of communication, some members inevitably felt left out, and that these tools gradually diminished face-to-face interaction that they felt was valuable. Researchers such as Barna (2012) and Chisa & Hoskins (2016) have studied the impact of the digital divide in different communities. Chisa & Hoskins (2016), for example, looked at the marginalising impact of the digital divide in the province of KwaZulu-Natal in South Africa where many people still cannot gain online access for reasons of cost, lack of skills, personal barriers, and limited literacy. It is noteworthy that all the churches under review in this study are located in the province of KwaZulu-Natal.

The use of online information by church leaders also raised theological issues. Several pastors expressed concern about church members accessing theologically unsound content online. In the recent past, the negative impact of the Internet on traditional religious authority has been an important theme in the sociology of religion literature. For example, Gunton, Bruce and Stoodley (2012) identify the erosion of religious authority as a significant concern as the Internet increasingly becomes a harbour for fringe and unwholesome religious literature which is often antithetical to mainstream religion. When asked about information selection criteria, church leaders frequently cited 'orthodoxy' or 'doctrinal soundness' as an important criterion. However, leaders in all three churches confessed to routinely accessing online content from outside their religious tradition for purposes of personal growth or to support church decision-making.

Finally, it was clear that the three churches' gathering of online information raised potential legal and ethical concerns although this was not readily acknowledged by church leaders themselves. To begin with, what are the legal and ethical issues at play when a church routinely gathers, mines, and exchanges large volumes of personal data about its congregation and communities? Blaikie and Ginn (2006: 363) observe correctly that "a cleric always ... has access to various sorts of information. Some of that information is personal and confidential". It can be argued that South Africa currently has legislation governing the use of personal information. However, whether this legislation is wholly respected by faith-based organisations in the country is a fertile area for future study.

Some key principles that Blaikie and Ginn (2006) raise are that church-based organisations, such as the District, are accountable for the personal information they collect and are strictly limited in their collection to the purposes intended. They must at all times safeguard that information and must be open about their information policies and practices. Even when not required by law, churches have an ethical obligation to be good stewards of personal information belonging to their congregations.

## 7.2 ICTs for worship and learning

Hutchings (2015) outlines examples of online mega churches that actively use smart media platforms to engage with thousands of global viewers on a weekly basis with contemporary worship and teaching. Though significantly smaller in size, the three churches identified in this chapter used many of the same tools and techniques in order to engage their congregations. All had buildings capable of accommodating modern ICTs, and each church deliberately used these technologies to enhance dynamic worship experiences. One of the churches even engaged part-time staff members with professional expertise in video and audio production.

The author observed with awe at one of the churches how a typical Sunday service was planned and produced using subscription software in order to create dynamic visual presentations. Video and other media were routinely used in sermons in all the three churches. One pastor, for example, played a YouTube video of a famous sermon during a visioning workshop. Another church made heavy use of video clips during the services for weekly notices and pastoral matters. Although some videos were produced in-house, the churches also used materials developed externally. Thus, the use of these modern technologies enriched the services and allowed the churches to preserve and publish their own content online.

It is worth pointing out that churches that use media which they have not produced themselves have an obligation to address copyright issues. Blaikie and Ginn (2006: 204) observe that "copyright is an area of law frequently more honoured in the breach than the observance". Churches are not exempt from copyright obligations and are required to either get permission from the holder of copyright or obtain a license through a licensing body (Blaikie & Ginn, 2006). All three study churches claimed to have licences allowing them use of worship songs in their services, as well as other print and digital materials. However, the presentation of videos in meetings or the use of video clips downloaded from YouTube also requires licensing while web streaming and podcasting, as forms of broadcast, require different permissions and licenses (Blaikie & Ginn, 2004).

The presence of cameras also caused some discomfort in the churches. During one Sunday service, a church member commented to the researcher as follows: "I think that there should be somewhere where people can sit without being on the camera." The researcher noted that many congregation members chose to sit on the sides in order to avoid appearing in the video. The ability to extend the boundaries of the service and create an interactive preaching experience has merit in terms of transformational preaching and worship, but not everyone was comfortable with the perceived intrusion of their privacy. Although many churches are beginning to develop privacy policies, the researcher did not see any privacy policy about the use of live streaming video of services for any of the study sites.

## 7.3 ICTs for outreaching

Modern ICTs allow churches to extend their reach beyond the realms of their own congregations. During one service at one of the churches, the pastor shared that a former member of the church, now a tertiary student in another province of the country, had emailed to say that because of the live streaming of church services, she felt like she was still an active member of the church. Churches engaging online are not a new phenomenon and Helland (2011) describes a long

history of activity in this regard, ranging from bulletin boards, to listservs, to streaming media.

After the pastor proudly shared with his congregation about the student's email, a concerned church member commented that only those who are physically present should be considered as church members. This is consistent with Hyatt (2009) who argues that "there is no virtual church". Hyatt (2009) explains that "because [the ICT enhanced church] has all the easiest and most instantly gratifying parts of community without the harder parts, it ends up misshaping us."

This study found that many people experienced the three study churches online in one form or another. All the three churches used social media as communication tools. At the Wesley Church, one leader argued that: "the more contact you can have with people, the better. If a person was already using Facebook or Twitter, we join the conversation where they are already having it." A leader at the Hilton church in defending the use of Twitter said: "awesome. I don't use it but I love it...I've got a twitter account. I've tweeted once ... I'm totally for the social media."

Facebook and Twitter in that church began as a means of posting church announcements, but soon featured inspirational thoughts. Facebook was also used to post "teasers" about upcoming sermon topics. Twitter, on the other hand, became an important means of reaching the church youth. Through followers and re-tweets through members' personal accounts, church tweets reached more than three times the number of members in the congregation, according to one church leader. The Camperdown church was much slower in its adoption of social media but has gradually developed sizeable followings. However, social media adoption was not without resistance. One leader openly said he was "anti-Facebook". In one leadership meeting, a leader complained that "the problem with social media is, you don't get that relationship...rather than calling up or talking to people you are texting or twittering them... I think this is isolating people".

Based on the aforementioned, churches need to be aware of the ways in which online technologies can build and undermine their own communities. They also need to be conscious of the reach of their online presence. Thus, before venturing online, churches need to ask who is speaking for the church online. In the three study churches, some clergy were active bloggers and tweeters, but most of them relied on the technical expertise of lay members of the congregation.

## 8 Recommendations

This study has shown that both knowledge management opportunities and challenges were encountered in the three study churches in their interaction with ICTs. Thus, this study recommends three areas that church leaders need to carefully consider when adopting ICTs into church ministry:

1. **Legal obligations around information** - Churches have the responsibility to understand copyright law as it applies to various forms of media and their powerful information gathering and dissemination capabilities. Unless the church is the creator of the content, or the use is permitted under a statutory exemption, permission must be solicited in order to use that content strictly for church purposes only. Secondly, churches have a legal obligation to use personal information of its members responsibly and appropriately. They need to be aware of the laws that apply in their jurisdiction. Churches must ask why they are collecting this huge trove of personal information, and ensure that the collected information is safeguarded and remains accurate at all times (Grant, 2003).
2. **Ethical obligations to church members** - Churches have an ethical obligation to protect the safety and privacy of their members. Privacy is an important social value and church members expect their privacy to be respected at all times. In the existing networked environment, this will raise additional challenges that churches will need to address. Some denominations have, rightly, developed guidelines for church privacy policies (Helland, 2011). Additionally, modern smart technologies offer ways to connect to new and diverse audiences and build communities in new ways. However, these same technologies can isolate and exclude some members by entrenching the digital divide culture in congregations. Rather than avoid online conversations, churches need to be creative to bring in offline conversations as well (Helland, 2011).
3. **Theological implications of ICTs** - We live in the midst of an information explosion that offers a wealth of new resources to build the church. Thus, church leaders must be clear on the role of these new tools, and wrestle with their responsibilities to teach and lead in the midst of a cacophony of voices. This means that new forms of community and communication will challenge our conventional ideas of fellowship and belonging. Thus, churches will need to define their own obligations to the world they engage online. Churches will need to discover how to share and care in this new and wild space (McCarthy, 2003).

## 9 Conclusion

Modern ICTs are becoming more and more ubiquitous in our societies. It is virtually impossible to make it through the day without interacting with some form of new media, either directly or mediated. As a result, many churches are also embracing these technologies in order to further their mission both in their immediate congregations and broadly. Equipping both church leadership and congregations to engage with modern ICTs and their inherent challenges can



be addressed through religious information literacy training (Gunton, 2012). These challenges also create opportunities for information professionals to come alongside churches and assist them in developing their information policies. New technologies are neither to be avoided nor accepted uncritically, but can be adopted with great benefit, if they first address the legal, ethical and theological implications.

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# Application of Information Systems Theories in Library and Information Science Research: A Content Analysis

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## Abstract

*There is a widely-held belief that the library and information science (LIS) field does not have theories of its own but borrows heavily from a variety of fields. One of the subject domains from which LIS borrows theories is information systems (IS). The purpose of this study was to examine the extent and nature of application of information systems theories in the library and information science research using content analysis techniques. The study extracted relevant data from the Library, Information Science and Technology Abstracts (LISTA), and Library Information Science Source (LISS) databases using the names of 130 IS theories. Data was analysed to determine the most commonly applied theories; the trend of application of the theories in LIS research; the nature of theory application; and the LIS subject areas in which IS theories are mostly applied. The findings reveal that the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) were the most commonly applied theories in LIS research; theoretical triangulation is rarely applied in LIS research; specific subject areas of IS application in LIS research are diverse with technology acceptance topping the list. Conversely, LIS researchers are increasingly conducting research on areas that relate to ICTs, hence substantial visibility of IS theories in the LIS literature. This pattern has immense implications on LIS research, education and training.*

**Keywords:** *Library and Information Science; Research; Information systems; Theories; Theoretical Models*

## 1 Introduction

Theory is said to be one of the most fundamental components or elements of research (Creswell, 2014; Lim, Saldanha, Maliadi & Melville, 2013). The application of theory in research is more pronounced at postgraduate level where students are required to include a section on theory or theoretical framework in their dissertations and theses. Worldwide, many universities have developed guidelines, for university students and field supervisors, wherein they advise on how students can address theoretical issues in their theses and dissertations. Equally important and noteworthy mentioning is that, of late, some journals have made it mandatory for authors to explain, in their manuscripts, the theoretical framework that informed their research studies. The student and supervisor guidelines as well as the author instructions require researchers to position their research study within a specific conceptual or theoretical framework. Citing several authors (Barkhi & Sheetz, 2001; Gregor, 2006; Orlikowski & Iacono, 2001), Lim, Saldanha, Maliadi and Melville (2013) reinforce this view by observing that the application of theory helps researchers to ground their arguments and position their studies in the appropriate context.

There have been calls for researchers to engage in multi-, inter- and trans-disciplinary research so as to address myriad socio-economic and political problems that the world faces (Mitchell, 2005). Research that transcends conventional academic boundaries is therefore increasingly becoming common in spite of the challenges associated with such research. This scenario has furthermore brought together researchers from different disciplines and with different worldviews and paradigms (i.e. epistemological and ontological perspectives), resulting in the convergence of theories that were hitherto exclusively applied in one field and now are applied in multiple fields. Hence, it is not uncommon to find researchers in one field borrowing theories from another or other disciplines (e.g. Stock, 1997).

Despite the widely-held view that the LIS field does not have its own theories, a number of theories have increasingly come to be associated with the field. In fact, some scholars have termed these theories LIS theories although they were not originally developed within and for the field. The theories include those that address information as a concept/construct, information behaviour, interactive information retrieval, information search process model, berry-picking theory, information foraging theory, sense-making theory and methodology, information seeking model, information use environment, cognitive models of information seeking and retrieval, everyday information seeking model, anomalous states knowledge, relevance as a theoretical construct, and principle of least effort, just to name a few. The School of Information and Library Science at the University of North Carolina at Chapel Hill (SILS, 2013a) provides a list of theories that it believes have been borrowed from other fields and applied in the LIS field. Among the 'imported' theories, according to SILS (2013b) are: social cognitive theory, sense-making theory, theory of reasoned action, technology acceptance model, diffusion of innovations theory, social network theory, structuration theory, trans-theoretical model of behavior change, reader response theory, activity theory, distributed cognition, and human information processor

model.

Evidently, therefore, the field of LIS is a beneficiary of other disciplines' growth and development. LIS researchers have adopted and/or adapted theories from other fields to achieve a variety of objectives in their studies. While acknowledging that there has been a growth of theory and/or use of theory in the LIS field, Ocholla and Le Roux (2011) observe that LIS largely relies on theories from other disciplines. Similarly, Pierce, as early as 1992, observed that LIS researchers tend to borrow theories from other disciplines (Pierce, 1992). This is evident in the study conducted by Pettigrew and McKechnie (2001) and McKechnie and Pettigrew (2002) who noted that most LIS researchers borrowed theories from social sciences, which posted a total of 45.4% of the articles analysed in the study, followed by information systems (29.9%), the sciences (19.3%) and humanities (5.4%).

## **2 Problem Statement**

Information technology, information systems, and related or associated concepts, have for a long time constituted the core components or courses of many LIS schools' curricula/syllabus (Al-Shwabkah, Hamad, Taha & Al-Fadel, 2016; Onyancha & Majanja, 2017). The courses are known by different names, including information technology, computer applications in LIS, information systems, information and communication technologies in information science, computers in libraries, and so on (Al-Shwabkah, Hamad, Taha & Al-Fadel, 2016; Edegbo, 2011; Onyancha & Majanja, 2017). In terms of research, an examination of some of the online research taxonomies reveals that IT-related topics constitute niche areas of LIS research. For example, the Association for Library and Information Science Education (ALISE, 2016) has listed several IT-related areas within which scholars can conduct research. The topics include: database systems, discovery systems, information system design, library technology systems, open source software, social software, and social media, among others. Consequently, LIS researchers are increasingly researching issues associated with the adoption, acceptance, integration, application and management of ICTs in the field/sector of LIS. This has, in turn, led to the introduction and application of IS theories in LIS research. The trends, uptake patterns and context of the application of the IS theories in LIS are however unknown.

This study investigated the extent, patterns and nature of the application of IS theories in LIS research using content analysis techniques with a view to: determining the most commonly applied IS theories in LIS research; finding out the trend of application of IS theories in LIS research; exploring the triangulation of IS theories in LIS research; and establishing the LIS subject areas in which IS theories are mostly applied.

## **3 Research Methods and Materials**

A quantitative content analysis design was adopted to conduct the current study on the extent and nature of application of IS theories in LIS research. Bryman (2012: 710) defines content analysis as "an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner". The content that was analysed in the current study was already organised in the online databases which were used to source the data. The study sought to quantify the data according to the themes or categories reflected in the above-outlined objectives.

The study obtained a list of names of 103 theories from a Wikipedia page sponsored by the Brigham Young University (see [https://is.theorizeit.org/wiki/Main\\_Page](https://is.theorizeit.org/wiki/Main_Page)). The site provides the names of theories and links for further information about the theories. Information provided include the theories' independent and dependent variables, description of the theories, and studies that have applied the theory. We also consulted published literature on IS theories (e.g. Lim, Saldanha, Maliadi & Melville, 2013) in order to validate and refine the list of theories. The names of the theories were then used as search query terms to retrieve relevant data for the study from two online databases, namely the Library, Information Science and Technology Abstracts (LISTA) and the Library & Information Science Source (LISS). The two databases are the largest storehouses of library and information science documents (including research articles). Once the data was retrieved from the two databases, the data was saved in text (.txt) format, which is compatible with the several computer-aided software (i.e. VosViewer, Microsoft Excel and Ucinet for Windows) that were used to analyse and present the data. The data was analysed to obtain the number of articles in which each theory appears, the number of theories per year, the number of articles in which the theories are jointly applied, and the subject content of the articles in which the theories are applied. The data is presented in tables, line graphs and visual networks.

## **4 Findings and discussion**

This section presents and discusses the findings under the following headings:

- Most commonly applied IS theories in LIS research;
- Trend of application of IS theories in LIS research;
- Theoretical triangulation of IS theory in LIS research; and

- LIS subject areas in which IS theories are mostly applied.

#### 4.1 IS theories most applied in LIS research

Out of the 103 theories that were targeted for the study, 55 (53.4%) were applied in LIS research between the years 1966 and 2017. This study therefore focuses on the 55 theories, thereby excluding those theories that did not yield any article in the LIS research published by 2017. Table 1 shows that *Technology Acceptance Model* (TAM) appeared in most of the articles. Out of the total 1721 articles in which the theories were mentioned, TAM appeared in 371 articles, accounting for 21.56%. In the distant second position is *Theory of Planned Behavior* (TPB) with 97 (5.64%) articles, followed closely by *Game Theory* (GT) (95 or 5.52%), *Actor Network Theory* (ANT) (91 or 5.29%), *Diffusion of Innovation Theory* (DoI) (77 or 4.47%) and *Unified Theory of Acceptance and Use of Technology* (UTAUT) (74 or 4.30%). The information in Table 1 provides the top twenty (20) most commonly applied theories in LIS research. The theories may be used to reveal the topics of LIS research, particularly through the analysis of the variables or constructs of a theory. For instance, the application of TAM would indicate that technology acceptance, ease of use and perceived usefulness of technology in LIS are the key areas of research within the LIS context. Regarding the TPB, LIS researchers' focus might have been the assessment of how an individual's behaviour affects the adoption and use of ICTs, with the main determinants or variables of measurement an individual's attitude toward the ICTs, the subjective norms surrounding the performance of the ICTs, and an individual's perception of the ease with which the ICTs can be used. Studies on machine-human interaction may explain the high ranking of the GT. Generally, it can be said that LIS researchers are more concerned with the individual behaviour and attitude towards ICTs, which behaviour is dependent on several factors, some of which are ICT-inherent.

Table 1: IS theories with the highest number of articles in LIS research (N = 1721)

No	Theory/Model	No. of articles	% of total articles
1	Technology acceptance model	371	21.56
2	Theory of planned behavior	97	5.64
3	Game theory	95	5.52
4	Actor network theory	91	5.29
5	Diffusion of innovations theory	77	4.47
6	Unified theory of acceptance and use of technology	74	4.30
7	Institutional theory	69	4.01
8	Social network theory	69	4.01
9	Theory of reasoned action	67	3.89
10	Social cognitive theory	66	3.83
11	Structuration theory	47	2.73
12	Task-technology fit	43	2.50
13	Social capital theory	41	2.38
14	Design Theory	35	2.03
15	Flow theory	34	1.98
16	Chaos theory	33	1.92
17	Social exchange theory	33	1.92
18	Stakeholder theory	33	1.92
19	Agency theory	31	1.80
20	Contingency theory	25	1.45

Source: Research Data

The study also sought to determine the IS theories that have been applied the longest in LIS research and noted that *General Systems Theory* (GST) was first and last applied in 1966 and 2016, respectively, thereby spanning 50 years of informing and hence developing the LIS field. Proposed in 1936 by a biologist, Ludwig von Bertalanffy, and further developed by Ross Ashby, the theory holds that the output of a system is a function of several factors, including input, throughput, feedback, control, and environment goals. In the second position in Table 2 is *Equity Theory* (EqT) which was first applied in LIS research in 1967 and latest in 2016. In terms of the regularity with which the theories are applied per year, TAM led the pack with 18.55 articles per year followed by UTAUT (6.73), TPB (4.41), SCogT (4.40), SCaT (4.10), ANeT (3.96), DoI (3.85), SNeT (3.83) and InsT (3.63) and TRA (3.53), just to name the theories that appeared in at least 3 articles each.

Table 2 further shows that most of the theories are still relevant in LIS research. It is, however, not clear why the *SERVQUAL* theory is no longer in application in LIS research as it was last applied in 1996. We, however, think that the non-usage of the theory could be due to the emergence of other quality service assessment tools/models that have broader application, for example, web-based services. The protocols include SITEQUAL, E-SERVQUAL, WEBQUAL and DigiQUAL.

Table 2: IS theories with longest period of application in LIS research

Theory/Model	Start year	Last year	Av articles per year	Years of application
General systems theory	1966	2016	0.26	50
Equity theory	1967	2016	0.18	49
Game theory	1970	2017	2.02	47
Behavioral decision theory	1979	2012	0.18	33
Socio-technical theory	1978	2011	0.09	33
Design Theory	1985	2017	1.09	32
Contingency theory	1985	2016	0.81	31
Information processing theory	1985	2015	0.50	30
Complexity theory	1988	2017	0.83	29
Agency theory	1989	2017	1.11	28
Cognitive dissonance theory	1989	2017	0.21	28
Chaos theory	1993	2017	1.38	24
Actor network theory	1994	2017	3.96	23
Theory of planned behavior	1995	2017	4.41	22
Structuration theory	1995	2017	2.14	22
Technology acceptance model	1997	2017	18.55	20
Diffusion of innovations theory	1997	2017	3.85	20
Task-technology fit	1997	2017	2.15	20
Elaboration likelihood model	1997	2017	1.10	20
Institutional theory	1998	2017	3.63	19

Source: Research Data

#### 4.2 Trend of application of IS theories in LIS research

The trend of application of IS theories in LIS research was tracked since 1966 when the GST first appeared in a LIS publication to 2017. Figure 1 shows a slow and lull period between 1966 and 1984. Collectively, the period between 1966 and 1984 yielded 10 papers. None of the years yielded more than one paper bearing at least one IS theory. Nine of the 19 years recorded zero number of theories. Although there was an upsurge in the number of papers in which IS theories were applied in 1985, which recorded four papers, it was not until 1988 when there were glimpses of moderate application of IS theories. The period between 1988 and 2003 yielded a total of 83 papers, accounting for an average of 5 papers per year. The situation changed drastically after 2003. Unlike the period 1988-2003 in which some years recorded no study applying any IS theory, the least number of papers in which IS theories appeared in any given year after 2003 was seventeen (17). The total number of LIS papers that incorporated IS theory in them was 399, thereby averaging 29 papers per year.

Table 3 further shows that during the period of investigation, i.e. from 1966 to 2017, the majority of theories were applied in 2016 whereby a total of 35 (2.1%) theories featured. Thirty-four theories were applied in the years 2015 and 2017, thirty-two in 2011 and 2013 while thirty-one theories featured in 2008, 2009 and 2014. There were eight (8 or 17%) years in which IS theories were not applied in LIS research, meaning the years went by without any application of any of the IS theories in LIS research. All the years in which no IS theory was applied in LIS research were before 1988. Thereafter, each year yielded at least one paper in which at least one IS theory was mentioned. The trend of publication of LIS papers mentioning IS theories shows that there was little reliance on IS theories in LIS research in the early years (i.e. 1966-1988). The years 1989 to 2003 witnessed a moderate growth in the number of papers while the greatest intensity of IS theory application was recorded after 2004. The trend of IS theories application in LIS research reveals three time periods, namely low (1966-1988), medium (1989-2003) and high intensity (2004-2017) periods of application. Although there could be several factors or reasons to explain the aforementioned pattern, we believe that the rapid growth of ICTs after the mid-1990s is one such factor.

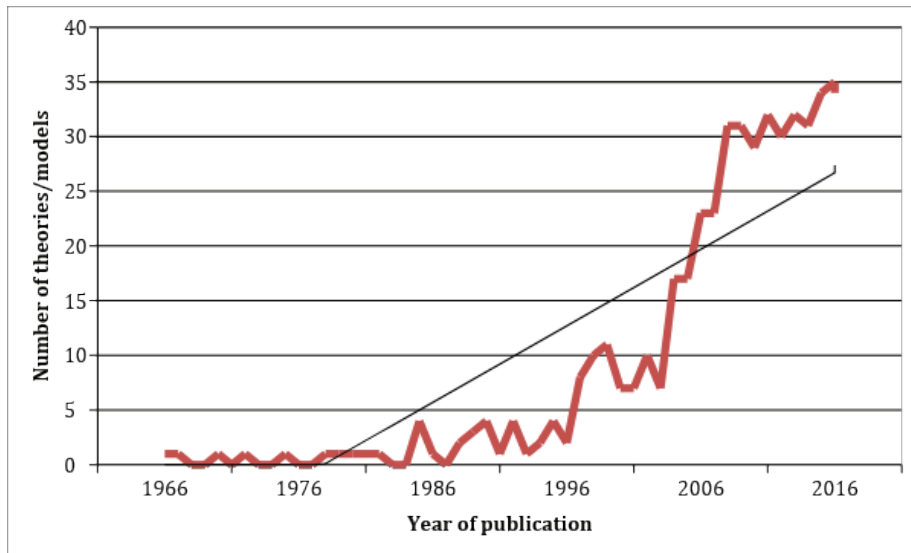


Figure 1: Trend of application of IS theories in LIS research, 1966-2017

Source: Research Data

Table 3: Number of IS theories applied in the years between 1966 and 2017

Number of publication years	Number of theories	Percent (N=47)	Cumulative Percent
8	0.00	17.0	17.0
10	1.00	21.3	38.3
3	2.00	6.4	44.7
1	3.00	2.1	46.8
4	4.00	8.5	55.3
3	7.00	6.4	61.7
1	8.00	2.1	63.8
2	10.00	4.3	68.1
1	11.00	2.1	70.2
2	17.00	4.3	74.5
2	23.00	4.3	78.7
1	29.00	2.1	80.9
1	30.00	2.1	83.0
3	31.00	6.4	89.4
2	32.00	4.3	93.6
2	34.00	4.3	97.9
1	35.00	2.1	100.0
47		100.0	

Source: Research Data

Specifically, the emergence and introduction of the Internet (including the World Wide Web, Email, and social media technologies) in diverse areas of information and knowledge management processes might have tremendously resulted in high research production revolving around ICTs in the late 1990s and beyond. Onyancha and Majanja (2017), in their study which partly sought to track the subject focus of LIS research in sub-Saharan Africa, observed that ICT-related subject terms have increased in number among the top most common topics of research in LIS. Among the ICT-associated terms that have recently emerged as topmost researched concepts in LIS include *information and communication technologies* which was 4th ranked in 2011-2015 period in Onyancha and Majanja's (2017) study, followed by *information technology* (7th), *Internet* (11th), *digital libraries* (18th), *social media* (20th) and *electronic information resources* (20th). Similar revelations have been observed by Garg and Sharma (2017) and Udo-Anyanwu (2018), among others.

#### 4.3 Triangulation of IS theories in LIS research

The use of multiple theories in a single study seems to be gaining acceptance and popularity among researchers. Lim, Saldanha, Maliadi and Melville (2013) as well as Nevo and Wade (2010) posit that studying how theories are used together in a single research (or research paper) can provide insights into how theories can be merged to generate new knowledge or explain a phenomenon. Cairney (2013) explains that the combination of multiple theories may produce new perspectives and new research agenda. However, Cairney (2013) warns that the process of combining theories is not straightforward as the practice raises important ontological, epistemological, methodological and practical issues.

There are three approaches, according to Cairney (2013: 1) through which one can combine theories in a research, that is:

- Synthesis - in which we produce one theory based on the insights of multiple theories;
- Complementary - in which we use different theories to produce a range of insights or explanations; and
- Contradictory - in which we compare the insights of theories before choosing one over the other.

Some scholars (Johnson, 1997; Olsen, 2004; Hussein, 2009) have described the application of multiple theories in a single study as theoretical triangulation. They define theoretical triangulation as the use of multiple methods, mainly quantitative and qualitative methods, in studying a phenomenon for purposes of increasing study credibility or validity (see Johnson, 1997; Olsen 2004; Hussein 2009).

In its analysis of the use of multiple IS theories in LIS research, this study found that a total of 131 (out of 1711) titles applied more than one theory each. Twenty eight (28), out of the 55 theories, were found to be combined in a single study. Of the theory combinations, the majority were two-theory combinations which accounted for slightly over half (50.9%) of the IS theories investigated in the current study. As Figure 2 and Table 4 demonstrate, the *Theory of Reasoned Action* (TRA) and the *Theory of Planned Behavior* (TPB) were co-applied eight times each while *Technology Acceptance Model* (TAM), *Diffusion of Innovation Theory* (DoI) and *Social Cognitive Theory* (SCOGT) were each co-used in six (6) studies. The co-appearance of theories in LIS articles could imply many things. These include the complexity with which the discipline has become to be associated with, the rise of multidisciplinary and interdisciplinarity of the discipline, or the LIS researchers' increased use of mixed methods research in their studies.

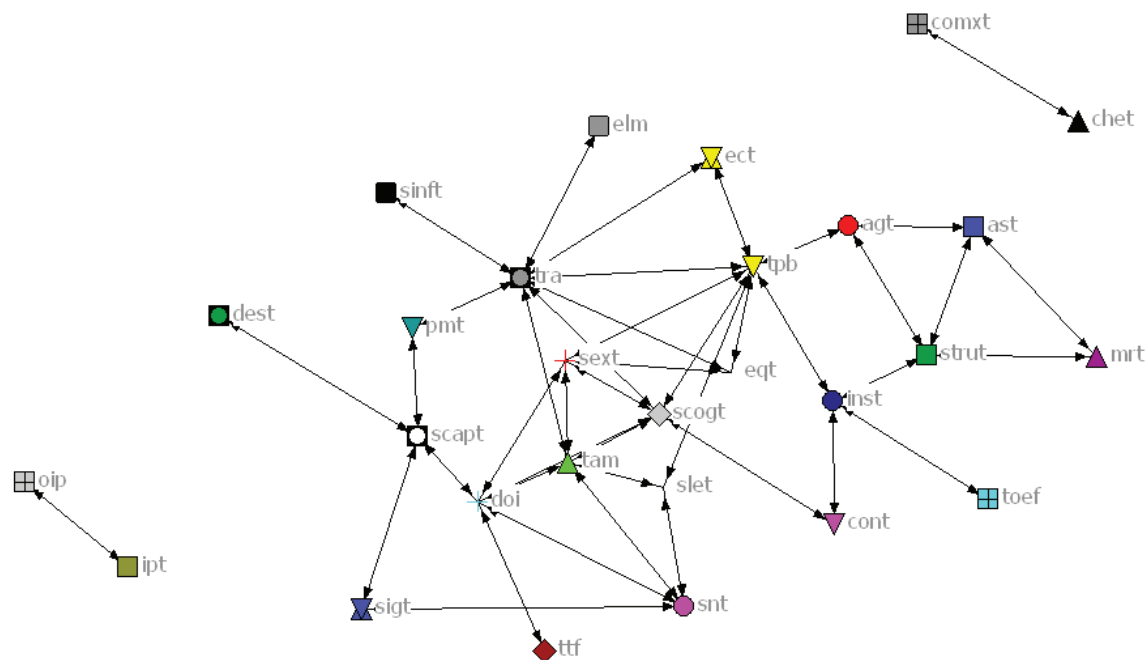


Figure 2: Map of multiple application of IS theories in LIS research, 1966-2017

Source: Research Data

Table 4: Multiple application of IS theories in LIS research, 1966-2017

	Cluster	Links	Total link strength	Frequency
Technology Acceptance Model (TAM)	1	6	34	30
Theory of reasoned action (tra)	1	8	27	26
Theory of planned behavior (tpb)	1	8	18	29
Diffusion of innovations theory (doi)	1	6	17	16
Social cognitive theory (scogt)	1	6	16	14
Structuration theory (strut)	2	4	14	12
Adaptive structuration theory (ast)	2	3	13	11
Institutional theory (inst)	4	4	8	9
Social exchange theory (sext)	1	5	8	9
Equity theory (eqt)	14	3	4	3
Social capital theory (scapt)	13	4	4	5
Social network theory (snt)	17	4	4	3
Agency theory (agt)	6	3	3	3

	Cluster	Links	Total link strength	Frequency
Contingency theory (cont)	4	2	3	3
Social learning theory (slet)	16	3	3	3
Chaos theory (chet)	3	1	2	2
Complexity theory (comxt)	3	1	2	2
Expectation confirmation theory (ect)	9	2	2	4
Information processing theory (ipt)	5	1	2	3
Media richness theory (mrt)	11	2	2	2
Organizational information processing theory (oip)	5	1	2	2
Protection motivation theory (pmt)	12	2	2	2
Signaling theory (sigt)	15	2	2	2
Social Influence Theory (sinft)	19	1	2	2
Design Theory (dest)	7	1	1	1
Elaboration likelihood model (elm)	10	1	1	1
Technology-organization-environment framework (toef)	18	1	1	1
Transactive memory theory (ttf)	20	1	1	12

Source: Research Data

#### 4.4 LIS subject areas in which IS theories are mostly applied

This section presents and discusses the findings regarding LIS subject areas in which IS theories have been mostly applied. This analysis can assist to further debate on the relationship between information science and information systems. The application of IS theories in specific LIS research areas may have implications on how IS is helping to shape LIS research and the curriculum as well as other aspects or sub-fields of LIS.

Table 5: Subject areas in which IS theories are mostly applied: author-supplied keywords (N = 1721)

No	Author-supplied keyword	Number of Publications	%
1	Technology Acceptance	49	2.85
2	Trust	42	2.44
3	E-Government	38	2.21
4	Knowledge Sharing	37	2.15
5	Internet	36	2.09
6	Knowledge Management	31	1.80
7	Social Capital	30	1.74
8	Technology Adoption	29	1.69
9	Perceived Usefulness	29	1.69
10	Adoption	29	1.69
11	Social Media	27	1.57
12	Institutional Theory	27	1.57
13	Social Networks	26	1.51
14	E-Learning	25	1.45
15	Consumer Behaviour	23	1.34
16	Facebook	20	1.16
17	Information Technology	18	1.05
18	Information Management	18	1.05
19	Perceived Ease of Use	18	1.05
20	Self-Efficacy	17	0.99

Source: Research Data

Table 5 presents the analysis of the author-supplied keywords while Table 6 lists the top 20 subject terms. This analysis is done in a bid to determine research areas in which the IS theories are mostly applied in LIS research. *Technology acceptance* had the most frequency of occurrence (2.85%) in the author-supplied keywords. This was followed closely by *Trust* (2.44%), *E-Government* (2.21%), *Knowledge sharing* (2.15%), and *Internet* (2.09%). Whereas such author-supplied keywords as *technology acceptance*, *social capital*, *technology adoption*, *perceived usefulness*, *adoption*, and *perceived ease of use* are concepts drawn from the variables of IS theories, the rest of the keywords are LIS-specific. It is illustrative that the LIS research areas are associated with core activities or processes associated with the LIS profession (e.g. *Knowledge sharing*, *Knowledge management*, and *information management*.)



Table 6: LIS subject areas in which IS theories are mostly applied: subject terms (N = 1721)

No	Subject term	Number of Publications	%
1	Information Technology	159	9.24
2	Structural Equation Modeling	101	5.87
3	Knowledge Management	87	5.06
4	Mathematical Models	85	4.94
5	Internet	83	4.82
6	Information Resources Management	76	4.42
7	Technological Innovations	70	4.07
8	Internet in Public Administration	67	3.89
9	Electronic Commerce	63	3.66
10	Factor Analysis	54	3.14
11	Information Storage & Retrieval Systems	53	3.08
12	Research	53	3.08
13	Diffusion of Innovations	52	3.02
14	Information & Communication Technologies	52	3.02
15	Self-Efficacy	50	2.91
16	Decision Making	50	2.91
17	Information Sharing	46	2.67
18	Information Resources	45	2.61
19	Consumer Attitudes	41	2.38
20	Social Media	40	2.32

Source: Research Data

The picture is replicated in Table 6 where a number of LIS-specific subject terms constituted the top twenty (20) areas of research in which the IS theories are utilised. The research areas include *information technology*, *knowledge management*, *information resources management*, *information storage & retrieval systems*, *information sharing*, and *information resources*.

## 5 Conclusion and Recommendations

The utilisation of IS theories in LIS research, according to the data obtained from the two databases, is relatively a recent occurrence, spanning about 47 years. The study found that most IS theories have been applied quite recently with the majority of them spanning 15 to 20 years of utilisation in LIS research. The uptake of the IS theories started slowly and became more intense after the mid-1990s, coinciding with the coming into being of the Internet. It was, however, not until 2004 that LIS research witnessed a sharp increase in the intensity of the usage of IS theories whereby the number of studies applying the theories averaged 29 per year in the period 2004–2017. This period has witnessed the emergence and introduction of diverse ICTs in information and knowledge management in LIS. We also noted that some theories that were utilised in the 1970s and 1980s were seldom used in the 1990s and 200s, signalling a shift in focus on research too, from issues related to information systems (e.g. library integrated systems, automation systems and management information systems) to those issues associated with adoption, acceptance and use of ICTs. This pattern is reinforced through the analysis of subject of LIS research whereby information and knowledge management and information resources management as well as technology acceptance and perceived usefulness dominated the top most commonly researched LIS areas.

Whereas the Technology Acceptance Model (TAM) is the most utilised in LIS research, the Unified Theory of Acceptance and Use of Technology (UTAUT) seems to be gaining popularity among LIS researchers. This trend can be attributed to the fact that the UTAUT is a consolidation of a number of previous models namely Theory of Reasoned Action (TRA), TAM, Motivational Model, Theory of Planned Behaviour (TPB), a model combining TAM and TPB Model of PC Utilisation, Diffusion of Innovation Theory (DoI), and the Social Cognitive Theory (Bozan, Parker & Davey, 2016; Khechine, Ndjambou & Lakhal, 2016; Kiwanuka, 2015; Attuquayefio & Addo, 2014; Shen & Khalifa, 2010; Oye, Iahad & Rahim, 20014; Venkatesh *et al.*, 2003). As a result of its broad scope and coverage, the UTAUT model is likely to continue drawing more attention from LIS researchers in the future.

Although this study did not delve into the purposes or rationale for the application of IS theories in LIS research, we have noted that a number of scholars have observed that the application of theory in research depends on the nature of research as the purpose for which theory is applied in research differs from one research to another. For instance, Creswell (2014: 51) argues that quantitative researchers “test theories as an explanation for answers to their questions” while in qualitative research, “the use of theory is much more varied... [as the] inquirer may generate a theory as the final outcome of a study” or the theory may “come at the beginning and provide a lens that shapes what is looked at and the questions asked”. The theories can be discussed or explained within the literature review (Creswell 2014: 51) or on a

separate section of research papers or theses and dissertations. Further research is therefore recommended to investigate how the IS theories are applied in LIS research to answer such questions as: are the theories applied as lenses or do the LIS researchers use the theories to test hypotheses or to test and validate the theories themselves?

Regarding theoretical triangulation, the study found minimal application in LIS research. As was the case with the trend of IS theories' utilisation, it was noted that theoretical triangulation is a recent occurrence. We, however, are likely to witness more cases of multiple theory applications in LIS research as research problems become more complex and therefore requiring multidisciplinary approaches.

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# Technologies for Knowledge Sharing Among Academics in the Faculty of Communication and Information Science at the National University of Science and Technology, Zimbabwe

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## Abstract

*Universities worldwide generate knowledge that can be shared to improve staff competency, research, teaching and learning as well as creating and sustaining competitive advantage and improving service delivery. The study leading to this chapter was conceived against a background of poor knowledge sharing practices associated with many organisations. In universities, the most important knowledge is often in the minds of academics and is unquestionably difficult to share with colleagues because of various factors. The aim of the study was to establish whether academics in the Faculty of Communication and Information Science at the National University of Science and Technology (NUST) freely share knowledge with a view towards enhanced research output, teamwork and collaboration. Using a census method, a questionnaire was administered to 55 academics from all the four departments in the faculty. Results indicate that academics are aware of the importance of sharing knowledge but they do not share it frequently; NUST provides an environment for knowledge sharing though the Internet is not reliable; mobile technologies (smart phones, tablets, laptops) hold great potential for communication and sharing of knowledge to senior management positions; staff require new knowledge for postgraduate supervision and writing grant proposals, among others. Lack of knowledge flow from one department to another, lack of communication, lack of incentives and poor team work were the major barriers to knowledge sharing in the faculty. The study recommends that NUST should avail mobile technologies to middle managers, chairpersons of departments and all academics for knowledge sharing; promote a culture of interdepartmental knowledge sharing, improve Internet connectivity and other organisational ICTs for knowledge sharing.*

**Keywords:** Academics, ICTs, Knowledge sharing, NUST, Technologies, Zimbabwe.

## 1 Introduction

Knowledge is a key resource that organisations, universities included, cannot do without. The use, transfer and sharing of knowledge in universities promote excellence in both teaching and research. Knowledge in higher institutions of learning is an important resource that can affect the quality of education. As such, all knowledge processes need to be deliberately and explicitly managed in order to realise their potential value not only in universities but in a wider global marketplace (Sulisworo, 2012). Tan and Noor (2013) point out that due to the substantial availability and complexity of knowledge-based resources, knowledge management is an important factor in university environment.

The two related constructs, knowledge sharing and knowledge transfer, are aspects of knowledge management. Stevens, Millage and Clark (2010) argue that the transfer of knowledge is a critical process that gives organisations competitive edge by fully optimising the knowledge at their disposal. Knowledge management is about making knowledge accessible and usable. Therefore, knowledge sharing and knowledge transfer, being part of a bigger knowledge management framework, play a major role in ensuring that knowledge is used, re-used and re-created. Nesheim and Gressgard (2014), on their part note that there is a correlation between knowledge sharing and knowledge use. Felu and Rodrigue (2017) analysed articles that were published between 2013 and 2016. They found that there is an increase in the publication of articles related to university business relations and knowledge transfer.

Witherspoon, Bergner, Cockrell, and Stone (2013) defined knowledge sharing as a building block for the success of the organisation. This makes knowledge sharing a crucial aspect in knowledge management. It implies that knowledge needs to be shared in order to make an impact. While knowledge sharing is imperative to universities and faculty members for career advancement, reputation, and self-empowerment (Patel and Ragsdell, 2011), it is crucial in the generation of new knowledge (Ryhan and Mohammed, 2013). Moreover, the generation of research through sharing allows universities to collaborate and partner with various industries and research bodies, and such collaborations provide opportunities for generating funds. In addition, this contributes in improving the university's global position, putting the university in a better place than other universities (Ryhan and Mohammed, 2013). A study by Sengupta and Ray (2017) demonstrates that knowledge transfer strengthens the research pillar through positive intervention amongst past and future research happening through academic engagement channels. Moreover, the study showed that a university's past performance and the research pillar also support the knowledge transfer pillar over time.

Knowledge transfer, on the other hand, has been defined by Knights and Scarborough (2010) as a result of the

interaction within a dual relationship. Ryhan and Mohammed (2013) opined that knowledge transfer ultimately leads to the promotion of knowledge processes and knowledge technologies which are paramount in the effective management of knowledge for improved service delivery in higher education.

It is also interesting to note that the producers of knowledge who are also consumers of knowledge generated by other scholars are not keen to share the knowledge they have produced. A study by Tenopir *et al.* (2011) found that 46% of researchers do not make their data electronically available to others. However, the results also showed that 60% of the respondents across all disciplines in the same study responded that the lack of access to data generated by others is an obstacle to progress in their field. In a study by Feliu and Rodríguez (2017), the authors posit that better opportunities experienced by universities nowadays to produce and transfer knowledge may be exploited for local economic growth.

Previous studies have demonstrated that Information and Communication Technologies (ICTs) can be utilised to facilitate knowledge sharing and knowledge transfer in a university environment. ICTs are a powerful tool for disseminating knowledge and advanced scientific research. The advances in modern communication are revolutionising the exchange of ideas and knowledge (Ryhan and Mohammed, 2013). Use of ICTs in knowledge management provides the potential for greatly enhanced access to knowledge combined with the challenge of how to manage the access. In addition, it promises improvements in the quality, efficiency, and effectiveness of higher education process.

Information Technology (IT) is a term used to refer to computer equipment and the name of the discipline in context, while Information and Communication Technologies (ICT) is the integration of technology into other disciplines such as science (Pretto and Curro, 2016). According to Olusesan and Adu (2016) ICT is a canopy word which includes communiqué tools or application devices or application that links them. There is a consensus amongst scholars that the foundation of every organisation is effective communication. Matlakala and Pretorius (2016) on their part, posit that knowledge management system refers to any form of IT system with functionalities and technical capabilities to facilitate and support knowledge management processes.

It is said that ICT is the foundation of the state survival and development as the world is constantly changing at a very rapid rate (Olusesan and Adu, 2016). As a result of this, universities around the world are evaluating their ICT systems. A university's knowledge management includes a set of strategies, methods, practices and tools for the identification, creation, sharing and application of knowledge in order to achieve the university's objectives (Opera, 2011). According to Conole and Alevizou's (2010) report commissioned by the Higher Education Academy of 2010 identified four trends which influenced the adoption of technology in Higher Education in the period between 2010 and 2015. These are: (i) The abundance of online resources and relationships inviting a rethink of the educators' role in sense-making, coaching and credentialing; (ii) An increased emphasis on, and expectation of, ubiquitous, just-in-time, augmented, personalised and informal learning; (iii) The increased use of cloud computing, challenges and existing institutional IT infrastructures, leading to notions of IT support becoming more decentralised; and (iv) The work of students being seen as more collaborative in nature and therefore, a potential for more intra and inter institutional collaboration exists.

Opera (2011) views knowledge sharing as an essential instrument for tertiary institutions as it assists in achieving one of its objectives, knowledge transfers from researchers to the academic community. Venkatesh, Thong and Xu (2016) report that studies have shown that the Internet, email and productivity tools are the most commonly used ICT tools in tertiary institutions for sharing and transferring knowledge. Opera (2011) refers to the ACIDI\_UPG system, which can be utilised as a decision support tool for future planning research activities in universities. According to the author, this system integrates knowledge modelling by making use of a specific ontology. It was developed to evaluate the academic research activity at various levels within the university structure. This system can also be utilised in research activity as a decision support tool for the adoption of new strategies (Opera, 2011).

## **2 Statement of the Research Problem**

When knowledge is not properly managed, it can easily get lost or be destroyed. The study was conceived against a background of poor knowledge sharing practices that is associated with many organisations. In universities, the most important knowledge is often in the minds of academics and is unquestionably difficult to share with colleagues in the university because of a variety of factors such as time and resource constraints. Numerous universities have begun developing their knowledge management systems in order to improve their performance (Opera, 2011). The aim of the study anchoring this chapter was to establish whether academics in the Faculty of Communication and Information Science at the National University of Science and Technology (NUST) share knowledge using technologies.

This study draws from Nonaka and Konno's (1998) '*ba*' model which states that knowledge is shared within a contextualised shared space called *ba*. This is a Japanese word meaning place that might be physical, virtual, or mental, providing a platform for advancing individual and/ or collective knowledge. *Ba* is a concept that unifies physical spaces such as an office and virtual space for example e-mail and mental space. It also refers to a physical and a non-physical space where social interchange can take place and generate knowledge.

Specifically, the study sought to answer the following questions: (i) How is knowledge that is generated from the Faculty Boards Committee meetings shared? (ii) Does NUST provide an enabling environment where knowledge can be acquired, shared or transferred? (iii) What are academics' reasons for sharing information/knowledge? (iv) How frequently do academics use the available university ICTs for knowledge sharing?

### 3 Research Methodology

The method used for this research was largely quantitative in nature. Using a census approach, the study targeted 55 academics (lecturers, research fellows and teaching assistants) in the Faculty of Communication and Information Science at NUST. A total of 55 questionnaires were administered to all the academics in all the four departments (Journalism and Media Studies, Library and Information Science, Records and Archives Management and Publishing Studies) in the faculty. The academics completed the questionnaires at their convenient time and returned them through their departmental secretaries. The number of questionnaires which were completed and returned was 45 giving a total response rate of 81.81%. However, 10 (18.18%) questionnaires were not returned. The collected data was then analysed using SPSS version 18.

### 4 Findings

The respondents were asked questions about personal information such as their gender, education, title, experience and nationality. The majority, 15(34.1%) of the respondents were from the Department of Library and Information Science, followed by the Journalism and Media Studies with 13(29.5%). Respondents from Records and Archives Management were 10(22.7%) and Publishing Studies 6(13.6%) was ranked third and fourth respectively. Of the respondents 25(55.6%) were male and 20(44.4%) were female. Analysis by levels of education revealed that most, 25(55.6%) respondents had acquired masters, 8(17.8%) had doctorates, 7(15.6%) had bachelor's degrees while 5(11.1%) had MPhil qualification. Regarding titles, it emerged that 34(75.6%) were lecturers, 8(17.8%) teaching assistants, 1(2.2%) senior lecturer, 1(2.2%) professor and 1(2.2%) research fellow. In terms of experience, 33(73.3%) indicated that they had worked for between 0-10 years, 8 for between 11-20, 1 for between 21-30 years and 3 said above 30 years of experience.

#### 4.1 Faculty Boards

The respondents were asked to identify the faculty board to which they belong for the purposes of running university business. The results are shown in Table 1. The International Conference on Communication and Information Science Organising Committee (ICCIS) Committee is large because it rotates within the faculty and each member of the department participates whenever their department is organising the event that particular year.

Table 1: Faculty Board representation

Name of University Committee	Number	Percentage %
Academic Appointments Board	2	4.4%
Faculty Board of Planning	4	8.9%
Faculty Board of Examiners	9	9.20%
Faculty Board of Studies	6	13.3%
Higher Degrees Committee	5	11.1%
International Conference on Communication and Information Science Organising Committee	21	46.7%
Non-Academic Appointment Board	4	8.9%
None of the above	17	37.8%

The respondents were asked how they share the knowledge that is generated from these board committee meetings. Participating in joint publication were 14(31.1%), social gatherings 17(37.8%), through voice calling (telephones and mobile phones) 19(42.2%), through emails 16(35.5%), through social media (Whatsapp, Facebook, Twitter) 21(46.6%). Social media emerged as the most and widely used means of sharing knowledge generated from committee meetings. Faculty members also participate in joint publications to share knowledge amongst each other and other academics. Brennenraedts, Bekkers and Verspagen (2006) argue that publications as tools for knowledge transfer are not sufficient due to the fact that they are only concerned with explicit knowledge and not the tacit knowledge. The current finding is in sharp contrast with what Sarka (2014) found in a study entitled "tools of internal communication from knowledge transfer perspective" where the respondents indicated that face-to-face communication was the most efficient means of knowledge transfer. Phone calls and instant messaging followed face to face. What seems similar in the current study is that Sarka (2014) found out that web conferences and emails were the least favourite means of knowledge sharing. However, voice calling (telephones and mobile phones) and social gatherings were preferred means through which knowledge is shared.

#### 4.2 Use of ICTs for knowledge sharing

The respondents were also asked how frequently they used the available university technologies for knowledge sharing. This closed-ended question was structured using the Likert-scale format ordered as frequently, very frequently, less frequently, not at all and undecided. For ease of interpretation and better appreciation of the significance of the results the responses

of Very frequently and frequently are considered together as frequently. Results in Table 2 indicate that Computers was selected by 42(93%) of the respondents, Internet 39(86.6%), mobile phones 38(84.4%), social media 36(80%) and USB 27(60%) are technologies used frequently for sharing knowledge while fax machines selected by 34(75.6%) respondents, radio 30(66.6%) and TVs 30(66.6%) are no longer being used to share knowledge by the faculty staff.

Table 2: Technologies for knowledge sharing

ICT Devices/Facilities	Very frequently	Frequently	Less Frequently	Not at all	Undecided
Computers	37(82.2%)	5(11.1%)	2(4.4%)		
Mobile phones	29(64.4%)	9(20%)	5(11.1%)		
Social media	24(53.3%)	12(26.7%)	8(17.8%)		
Fax machine			5(11.1%)	34(75.6%)	
Radio		2(4.4%)	8(17.8%)	30(66.6%)	1(2.2%)
Television		6(13.3%)	4(8.9%)	30(66.6%)	1(2.2%)
Digital camera/photos	5(11.1%)	8(17.8%)	13(28.9%)	13(28.9%)	1(2.2%)
Internet	29(64.4%)	10(22.2%)	3(6.7%)	1(2.2%)	
CD-ROMs	3(6.7%)	5(11.1%)	17(37.8%)	15(33.3)	
USB drive	12(26.7%)	15(33.3%)	9(20%)	6(13.3%)	
Tele-conferencing		3(6.7%)	11(24.4%)	25(55.6%)	2(4.4%)
Video conferencing	1(2.2%)	2(4.4%)	11(24.4%)	22(48.9%)	2(4.4%)

Radios, televisions as well as tele-conferencing and video conferencing are rarely used at NUST when it comes to information sharing. Knowledge transfer aims to incorporate the knowledge transferred into a value chain so that it generates an economic return (The Interuniversity Consortium of University Management, 2012). Research has it that face-to-face communication is a rich medium (Dee and Leisyte, 2017).

#### 4.3 Frequency of academics in sharing knowledge and information on new technologies

The respondents were asked how often they share knowledge on new technologies. The results indicate that most; 31(68.9%) frequently share information on new technologies. Only 4(8.9%) do not frequently share information on new technologies and 3(6.7%) does not share information on new technologies at all. Literature shows that there are factors that motivate people to share knowledge though there are barriers such as a lack of trust that hinder people from sharing knowledge (Jain, Sandhu and Sidhu 2015; Mueller, 2014). Lack of trust is identified as an inhibiting factor on knowledge sharing. According to a study by Tan (2015), there is a correlation between trust and knowledge sharing tendencies between faculty members. Tan defines trust in the context of her study as the willingness of faculty members to engage in a strong relationship with their colleagues, which will further lead to the sharing of knowledge with those that the person trusts. Xue, Bradley and Liang (2011) revealed that trust in the team climate tends to affect the knowledge-sharing behaviour of individuals, both externally and internally.

#### 4.4 Enabling environment for knowledge acquisition and sharing

The other objective was to establish if NUST provides an enabling environment where knowledge can be acquired, shared or transferred. The research showed that NUST provides physical and virtual space that enables knowledge transfer and knowledge sharing through formal meetings as indicated by 39(86%) respondents, intranet/emails 38(84.4%) as well as ICTs 28(62%) and Senior Common Room interaction 20(44.4%). The other knowledge sharing environment albeit less popular with faculty members were luncheon 14(31%), blogging 11(24.5%), sporting facilities for staff 10(22%) and tea break 8(27.8%). Figure 1 presents the results.

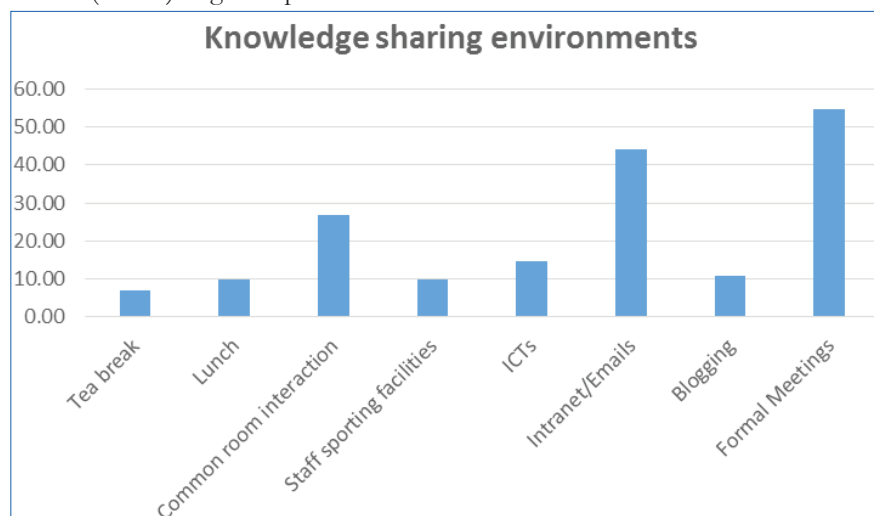


Figure 1: Knowledge sharing environment

This result corroborates Lwoga, Ngulube and Stilwell (2010) who observe that although the *Ba* model was adapted from the Japanese community it can be used successfully in a non-Japanese environment. Von Krogh, Ichijo and Nonaka (2000) suggest that organisations need to create an enabling environment, the *ba* or place (physical, virtual, mental) where knowledge can be acquired, shared or transferred. Universities, like NUST, can create space for knowledge sharing through strategies such as promoting a knowledge sharing culture, use of communities of practice, project teams and implementing knowledge sharing policies where people of several different capabilities are brought together in order to generate knowledge.

#### 4.5 Reasons for sharing information and knowledge among academics

Academics were asked to indicate their reasons for sharing information and knowledge using the available ICTs. The results reveal that most faculty feel that their major reasons for sharing information is to uncover new ideas and strengthen the academic culture through improving research output and supporting research activities. Few members of faculty share information for the sake of gaining popularity among their colleagues. Results are shown in Figure 2.

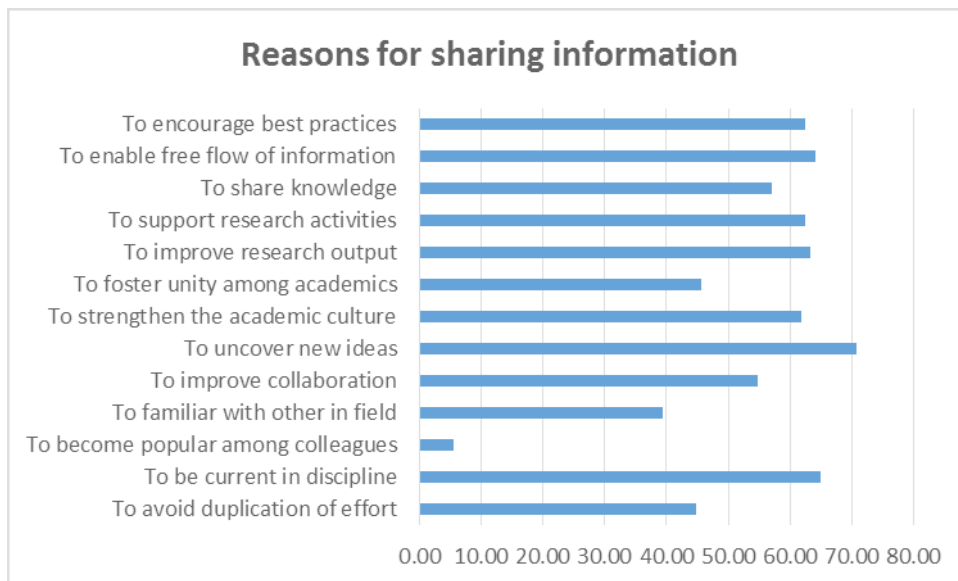


Figure 2: Reasons for sharing information and Knowledge among academics

Contrary to the current study which found that knowledge sharing was incentivised by intrinsic motivators. Fullwood, Rowley and Delbridge (2013) found that knowledge sharing was motivated by the prospect of rewards. The respondents in the study had a positive attitude towards knowledge sharing. The authors believe that knowledge sharing offers opportunities for external appointments and internal promotion. Furthermore, the respondents in the study held the view that knowledge sharing contributes in improving relationships with colleagues. Similarly, Cheng, Ho and Lau (2018) in their study of knowledge sharing in academic institutions in Malaysia showed that academics are encouraged to share knowledge if the incentives and reward mechanisms are encouraging to create conducive knowledge sharing environment. According to the authors both the monetary and non-monetary incentives were essential in order to generate the passion for sharing knowledge. Also, personal expectation and the aspiration to build a reputation as an expert in one's field encouraged the respondents to share and transfer knowledge. Jeon, Kim, and Koh (2011) contend that the extrinsic and intrinsic motivation have a positive influence on the knowledge sharing attitude of individuals and that dictates the behaviour towards knowledge sharing and transfer.

#### 4.6 Views and suggestions on knowledge sharing in the faculty

The respondents were requested to provide in writing, their views on technologies for knowledge sharing in the Faculty of Communication and Information Science at NUST. Some of their responses are presented hereunder:

*"We need to actively and progressively take leadership in the use and deployment of ICT-based innovations for the promotion of knowledge sharing at NUST."*

*"Apart from email, faculty members should have a faculty-specific knowledge sharing platform such as instant messaging group to ensure timely and efficient data/ knowledge sharing culture."*

*"We must have an active WhatsApp group for the faculty."*

*"There is need for online presence of members so that their work could be accessible by both colleagues and students."*



These individual opinions are consistent with Ryhan and Mohammed (2013) who pointed out that the benefits of knowledge sharing have compelled companies to spend a considerable amount of time and money in launching knowledge management initiatives and system that facilitate collection, storage and dissemination of knowledge.

## 5 Conclusion

The chapter is based on the study that aimed at investigating the technologies for knowledge sharing among academics in the Faculty of Communication and Information Science at the National University of Science and Technology, Zimbabwe. The subject matter discussed in this chapter was underpinned by the 'ba' model (Nonaka and Konno, 1998) for its theoretical framework. The results of the study showed that employees preferred sharing knowledge through social media, social gatherings, "Sisonke" emails and voice calling frequently using such technologies as computers, internet, mobile phones, and telephones. The NUST provides an enabling environment for knowledge sharing. The academics' main reasons for sharing information were to uncover new ideas and strengthen their academic culture through research activities.

The study concluded that academics in the Faculty of Communication and Information Science at NUST are aware of the importance of technologies in sharing knowledge. The NUST provides an environment for knowledge sharing; mobile technologies (smart phones, tablets, laptops) for communication and sharing knowledge are organisational benefits only available to senior management positions. Lack of incentives and poor teamwork were the major barriers to knowledge sharing in the faculty. The study recommended that NUST should avail mobile technologies to all academics to facilitate and enable knowledge sharing and transfer. Besides the university should promote a culture of interdepartmental knowledge sharing, improve internet connectivity and other organisational ICTs for the purposes of knowledge sharing.

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# State of Readiness for Implementation of Knowledge Management at the Kenya Power and Lighting Company

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## Abstract

*In the 21<sup>st</sup> Century, organisations are realising the need to come up with strategies for managing and leveraging their business knowledge. The way an organisation creates, organises and disseminates its knowledge determines its competitiveness. Effective management of organisational knowledge begins with aligning the knowledge management strategy with the organisational business strategy. This chapter explores the factors that influence the successful implementation of knowledge management at the Kenya Power and Lighting Company Limited. The general objective was to establish the level of readiness for the successful implementation of a knowledge management initiative at the company. The research methodology involved a review of existing scientific literature and studies for comparison purposes. The study used mixed research methods to collect primary quantitative and qualitative data. 45 respondents were selected purposively from all levels of staff to participate in the study. The findings indicate that Kenya Power and Lighting Company does not have systematic processes for collecting, organising, disseminating and securing knowledge assets. Nonetheless, the company is gradually reinforcing a framework for knowledge management. Unfortunately, the majority of the employees are not aware of the organisational knowledge management efforts. Besides, decision-making process in the company is hierarchical and bureaucratic while divisions were operating in silos. It was concluded that the company is currently at the initial stages of knowledge management implementation. The company needs to develop and implement suitable strategies and policies for a structured knowledge management culture.*

**Keywords:** Knowledge Management, Readiness, Kenya Power Lighting.

## 1 Background Information and Introduction

The realisation that the diverse knowledge created globally if well managed is crucial for organisational innovativeness and development stimulated global calls for the development of sustainable knowledge strategies that encourage information creation, sharing and free access. The capital basis of industrialised economies has shifted from natural resources to intellectual assets. In Kenya, the energy sector is recognised as a key pillar for the acceleration of Kenya's economic development. It is mandated with ensuring low cost and increased efficiency in the management of energy. Kenya Power and Lighting Company (KPLC), a crucial player in the energy sector, is a limited liability company that transmits, distributes and retails electricity. The company seeks to leverage knowledge management to meet the national and global requirements for quality, low cost power distribution.

The company's strategic plan infers its efforts to scan the environment in order to come up with necessary medium-term corporate operational and financial strategies that are aligned to stakeholder interest and contribute to the achievement of its business goals. By borrowing from the knowledge strategy concept, KPLC acknowledges the existence of knowledge assets alongside other resources like finances, materials, labour and land. KPLC has among its medium-term corporate goals a strategy for the implementation of a knowledge management framework. This chapter explores the organisation's readiness for the implementation of a knowledge management programme.

In the knowledge economy, organisations are in a rush to manage their intellectual property as they come to terms with the fact that knowledge is crucial to organisational competitiveness. The foundation of industrialised economies has experienced a paradigm shift from natural resources to intellectual assets. Organisations are coming up with business strategies to develop knowledge management as an integral component of their businesses. As a result, it is essential for such organisations to seek appropriate approaches to the successful implementation of their knowledge management programmes. A company's choice of strategy depends on its nature of business and financial status, among other things (Haggie and Kingston, 2003). A knowledge management strategy enables a calculated and consistent approach when it comes to the implementation of knowledge management in an organisation. No single approach, however, can be said to have the best outcome. Many attempts at knowledge management have failed to meet desired goals for both the organisation and employees and ended up in frustration.

Despite the said failures, it is important to assess knowledge management readiness in any organisation before commencing the actual implementation exercise. This is because, like any other project, knowledge management demands some specific changes in the way things are done in the organisation. It demands a cultural change, technological adjustments

and environmental scanning, among others, all of which need to be evaluated beforehand if a comprehensive approach has to be developed (Kusek and Ray, 2014).

Organisational readiness for change refers to the readiness of individuals as well as their shared resolve to embrace change and their belief in the successful implementation of the said change. Variables for organisational change include the value that individuals place on the change determinants which include capabilities, responsibilities, resource availability, incentives and demand for the said change. When readiness for change is high, employees of an organisation are more likely to initiate and complete the change exercise. They are more likely to be committed, resilient and have good cooperation at work, which in return ensures successful implementation of the desired change. Readiness assessment assumes that an organisation needs to have the programme and looks at the organisation's readiness and capability for implementation, use and sustainability. It provides the analytical guide for developing the actual programme-based framework for knowledge management implementation (Jody & Ray, 2014).

A knowledge management readiness appraisal helps in the identification of existing knowledge gaps and existing defects and recommends the necessary prerequisites critical for knowledge management implementation.

## 2 Statement of the Problem

Research studies indicate that the majority of organisations attempting to implement knowledge management for the first time have failed. Many organisations that have attempted to implement knowledge management have ended up abandoning the project midway (Bonfour, 2009). The implementation of a knowledge management initiative involves a lot of change management in order for it to be successful. Empirical studies point to the fact that any change, including implementation of knowledge management, comes with a myriad of challenges like resistance, apathy and other related issues that can become dramatic. Implementation of knowledge management in an organisation may not yield the desired outcomes when the staff and the organisation are not well prepared for such a change (Daven, 1998).

Information is a key production factor in the knowledge economy making it necessary for organisations to generate and consume the right knowledge if they are to remain competitive over time. Although the notion of becoming competitive and gaining an advantage over others is not necessarily the main focus of the public sector, the process of knowledge management has an important role to play in the public sector. One of the roles is that organisations should be strategically aligned to provide value services to their clients by becoming more sensitive to their needs (Fowler and Pryke, 2013). They can only do so by leveraging on the availability and use of the right information and knowledge. This is especially important for the public sector in terms of service delivery. More specifically, this applies to KPLC which is largely responsible for electricity service provision to the public.

Few scientific research literatures are available to guide KPLC in its knowledge management implementation efforts. There is therefore a generalised fear of a failed attempt at knowledge management in KPLC management. The study on which this chapter is based therefore aims to increase the project's success rate by investigating the knowledge management readiness factors and gaps that exist in KPLC. The chapter also provides valuable insights which may be applied for knowledge management implementation programmes in other similar organisations.

## 3 Research Objectives and Questions

The general objective of the study anchoring this chapter was to establish the level of readiness at the KPLC to successfully implement its knowledge management initiatives. The specific objectives of the study were to:

1. Examine the effect of organisational structure on the existing state of knowledge management at KPLC;
2. Establish the knowledge management gaps in KPLC; and propose a model for knowledge management implementation at KPLC.

The questions which guided the study were:

1. What is the current state of knowledge management at KPLC?
2. How does organisational structure influence readiness for knowledge management at KPLC?
3. How does organisational culture influence readiness for knowledge management at KPLC and in what ways?
4. What are the effects of information technology infrastructure on readiness for knowledge management at KPLC?
5. What is the suitable model for knowledge management implementation at KPLC?

Knowledge management if well implemented enhances employees' performance and organisational competitiveness. If not implemented well, it may lead to poor performance or even the failure of such organisations. This chapter assesses the readiness of KPLC in implementing knowledge management by examining the key factors which influence the successful implementation of knowledge management.

## **4 Methodology**

The research design for the study was a case study. According to Donald and Tromp (2006), case studies lead to an understanding of the complexity or uniqueness of a particular case. The case study used a mixed research (both qualitative and quantitative) methods of data collection and analysis data collection, analysis and interpretation. The mixed research method enabled a critical analysis and an in-depth analysis of the level of readiness of KPLC to successfully implement its knowledge management initiatives.

The study used structured questionnaires with closed ended and open-ended questions to collect quantitative and qualitative data respectively. Qualitative data on awareness, opinions, attitude, perception, use and understanding of knowledge management was collected through interviews with the key players. Knowledge management readiness was evaluated through enablers like organisational structure, culture and technology. Purposive sampling was used to identify 45 respondents comprising of key information from top managers. Quantitative data was analysed for frequency, percentages, mean and standard deviation using SPSS software. Descriptive data collected through guided interview was processed to identify patterns and themes. Data was then grouped into respective themes and patterns which were coded for analysis.

## **5 Findings and Discussions**

The study targeted a sample of 45 respondents for both questionnaires and interviews. Feedback from 40 respondents was received and recorded. This constituted a response rate of 89 percent which was adequate for generalisation of the findings of the study on the target population.

The 40 respondents composed of general staff (65%), middle level managers (25%) and top managers (10%). The respondents were drawn from various departments. The majority (50%) had served at KPLC for more than 10 years. Thus, the majority of the respondents had served for long period of time and were therefore knowledgeable on the implementation of knowledge management initiatives at KPLC. The inclusion of respondents from all job categories and departments at KPLC ensured that data collected represented all units in the organisation and allowed for generalisation of the findings.

### **5.1 The State of Knowledge Management at KPLC**

The study sought to establish the status of knowledge management at KPLC. The majority (55%) of the respondents stated that KPLC does not have systematic processes for collecting, organising, disseminating and securing knowledge assets. The findings revealed that KPLC is gradually reinforcing a framework for collecting, organising, disseminating and securing knowledge assets. Nonetheless, the majority of the employees were not aware of knowledge management in the organisation.

The study also established that decision-making process at KPLC is hierarchical and bureaucratic. A top-down approach is predominant at KPLC. Most of the decisions are made at strategic management levels involving top managers only. Other barriers to information and knowledge sharing across functional departments in KPLC include employees having little interest in sharing information; ineffective feedback mechanisms; lack of time allocated for knowledge sharing; the lack of a system to identify employees in need of specific knowledge; the employees lacking understanding of the importance of their participation in knowledge management and fears of vulnerability upon sharing information.

Moreover, knowledge management is hindered by professional groupings; unwillingness to share knowledge due to high positions held in the company; lack of collaboration among departments and divisions at KPLC; lack of a clearly defined system dedicated to knowledge management; lack of a strategic plan for knowledge management; lack of support by top management; lack of mentorship policy; and silo-working styles which hinders knowledge sharing across departments.

### **5.2 Organisational Structure and Knowledge Management**

The study examined the effects of organisational structure on the current state of knowledge management at KPLC. The study established that organisational structure had moderate influence on knowledge management. The study established that KPLC has implemented the following measures to a moderate extent: availability of knowledge sharing platforms; formulation of short term objectives for knowledge management; monitoring and evaluation of short term and long-term objectives for knowledge management; and documentation of knowledge management activities. However, KPLC lacked a strategic plan for knowledge management; sufficient funds allocated for knowledge management and a dedicated unit to implement knowledge management programmes in the company.

The study also established that KPLC lacks an effective reward system devoted to the creation of new innovative knowledge. KPLC has to a moderate extent been engaging, encouraging and sustaining innovation, employee input and attractive well-thought-out ideas. The respondents stated that the bonus payment, employee recognition, job promotion and teamwork were factors that encourage new innovative knowledge.

### 5.3 Organisational Culture and Knowledge Management

The study established the influence of organisational culture on knowledge management at KPLC. The findings revealed that, to a moderate extent, the organisational culture contributed to knowledge management at KPLC. The company had, to large extent, created a dynamic environment for learning. It was established that some practices were moderately inculcated in the organisational culture aimed at facilitating the effective implementation of knowledge management initiatives. These practices were training of staff; dissemination of organisational knowledge to all staff; and creation of an environment that encourages employees to share ideas and performance appraisal within the knowledge management system.

A majority of the respondents (45%) indicated that different divisions of KPLC had a collaborative work relationship while 35% said KPLC had a divided work relationship. Only 20% of the respondents stated that different divisions of KPLC had a situational work relationship. The collaborative approach to work was facilitated through joint meetings that brings together various departments leading to the integration of business processes within the departments. The divided work relationship was attributed to factors such as nepotism, negative ethnicity and professional groupings which resulted into unhealthy competition.

The majority (52.5%) of the respondents stated that KPLC does not encourage and reward knowledge sharing across departmental boundaries. Lack of rewards was a discouragement for knowledge sharing. Because some departments worked in silos, there was lack of synergy between the departments. Nevertheless, KPLC's employees shared knowledge through platforms such as "Barazas" (open meetings) facilitated by the human resource department; training of some members of staff; induction training; team building and leadership trainings. However, the trainings conducted were not sufficient because the majority of the employees had not been involved. The barriers to comprehensive and all-inclusive training include lack of policies on championing training, lack of established channels to facilitate such trainings, as well as lack of monitoring and evaluation of the outcomes of such training.

The majority (52.5%) of the respondents agreed that the organisation had experts in different business areas. The study established that though KPLC had experts in different business areas, the transformation of tacit knowledge to explicit knowledge was not adequately facilitated. The experts were not easily identifiable because information about them was not properly documented and shared amongst the staff.

### 5.4 Information Technology and Knowledge Management

The study examined the influence of information technology on knowledge management at KPLC. It was established that KPLC had embraced technology and most of the systems were automated. There was an Intranet portal where information was uploaded and made available. The majority (62.5%) of the respondents stated that all important information was easily accessible especially to new users on the KPLC Intranet or other similar platforms. The study established that Information Communications Technology (ICT) had broadened knowledge management and simplified work processes at KPLC. ICT also enhanced efficiency in service delivery and reduced the burden of paperwork and manual filing.

Nevertheless, the study findings revealed that improvement was needed to ensure that knowledge management was efficiently aided by ICT. It was established that KPLC had, to a moderate extent, implemented measures towards knowledge management. The measures included availability of ICT infrastructure for knowledge management; integration of knowledge management ICT infrastructure with other ICT platforms in the organisation; ensuring that content structure on ICT platforms are user friendly; training staff on the use of ICT infrastructure at KPLC; ensuring ease of access to ICT infrastructure for knowledge sharing and that knowledge management ICT infrastructure was responsive to organisational and staff need at KPLC.

## 6 Conclusion

The study concludes that the KPLC is not fully prepared to successfully implement its knowledge management initiatives. Knowledge management at KPLC is at the initial stages of implementation and the majority of the staff in the lower cadres were not aware of it. Despite the availability of ICT platforms for knowledge sharing, the flow of knowledge in the organisation was not properly embedded in the organisational structure which advanced a top-down approach to decision making. The top-down approach was a hindrance to successful implementation of the knowledge management systems due to insufficient participation by employees at lower levels.

The implementation of knowledge management at KPLC contends with challenges such as lack of feedback mechanisms; lack of awareness by employees; inadequate time allocated for knowledge sharing; the lack of a system to identify employees in need of specific knowledge; the employees lack an understanding of the importance of their participation in knowledge management; lack of collaboration among departments and divisions at KPLC; lack of a clearly defined system dedicated for knowledge management; lack of a strategic plan for knowledge management; lack of support by

management; lack of mentorship policy; and silo-working styles which hinder knowledge sharing across departments.

## 7 Recommendations

The study recommends that KPLC should design and implement a knowledge management policy framework. There is also a need for the company to come up with a training programme for knowledge management. The training should involve all employees and not a few selected members of staff who do not pass the knowledge to other employees. KPLC should also develop programmes to create awareness on knowledge management throughout the organisation. The knowledge management platform should be made more user-friendly to improve access to and dissemination of knowledge in the company.

The study recommends that KPLC should have clear mission, vision and objectives on knowledge management. KPLC must ensure that knowledge management processes are clearly defined and prioritised in the organisation. The employees at all levels should be prepared for change in order to allow knowledge management initiative to succeed at KPLC. Ensuring that people are ready for change is a vital factor that will improve knowledge management in the entire organisation.

It also recommended that KPLC should evaluate the its current state of knowledge management, establish needs assessment for knowledge management and build a knowledge management map for the organisation. The company should identify and document key information and knowledge from its experts in different areas for reuse. The company should encourage all staff to appreciate the importance of knowledge management. The management staff should be at the forefront in disseminating information on what constitutes knowledge management and the significance of its role in the organisation.

It is recommended that the ICT systems in the company be improved by shortening the response time. This will encourage knowledge management as more people interact with the available knowledge sharing platforms in the ICT system. KPLC should also come up with a good rewards system in order to promote and retain talent. The employees should also be motivated through individual recognition of exemplary performance.

In order to facilitate easy access to information, the study recommends good record keeping. The company should also have a good feedback mechanism and proper documentation and implementation of suggestions, comments and complaints raised by staff and customers. The study recommends the inclusion of knowledge management quizzes in performance appraisal. Knowledge management should be used as the basis for promotions and salary increments. KPLC should also put bare minimum standards of knowledge management for people who hold certain offices.

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# The Role of Nigerian University Libraries' Web Sites in Meeting Information Needs of Postgraduate Students

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## Abstract

*Modern students are digital natives since they are proficient in the digital language of computer and the web. They often use Information and Communication Technology (ICT) tools in accessing, creating and sharing text and videos on the web both for academic and leisure purposes. Underpinned by a quantitative approach, the study on which this chapter is based investigated the role of the web sites of Nigerian university libraries toward the attainment of information literate society. The findings reveal that the types of information resources and services provided by the university library web sites include books on specific topics, full text journal articles, journals in print or electronic formats, online encyclopaedia or dictionaries, Instant Messenger (IM) for asking librarians questions, library online tutorials, guides for compiling citations service transaction, course readings from electronic reserve, and online renewal of books using My Minerva. The findings also show that Google search engine was the major source of information resources for postgraduate students in the four universities studied. The findings reveal that students' research activities constitute the main reason for acquiring the information resources. It was found that the level of satisfaction derived from the web sites was low owing to poor interface and slow response to requests made. The majority of the respondents had not linked their academic success to the availability and accessibility of the library web sites. The study recommends that collaboration, cooperation and coordination should be fostered among relevant units of the universities in order to strengthen their ICT infrastructure. Increased budgetary allocation to the university libraries and deliberate policy centred on user training/education and awareness creation about the potentials of library web sites to their academic success is also recommended.*

**Keywords:** Information needs, University libraries, Postgraduate students, Web site, Information skills, Nigeria.

## 1 Introduction

The university library is an important academic unit in the university. A university is as good as its library. The library is the heart of the educational enterprise and is also the reservoir of knowledge communicated through information resources. Information is fast becoming a vital national resource that determines the direction of any nation. In recent years, information and communication technologies have grown quite rapidly. For higher education, it has made access easier, promoted equity and improved the quality of education. It is argued that the aim of using technology in education was to enhance access and flexibility while reducing costs and promoting quality.

Being information literate means that university postgraduate students should not only be able to recognise when information is needed but also be able to effectively identify, access, locate, evaluate and use information needed for decision making or fulfilling different goals irrespective of location, format, content and volume of the information resources. The idea of Information Literacy (IL) emerged with the advent of Information and Communication Technologies in the early 1970s. It has been transformed and strengthened to become recognised as the critical literacy for the twenty-first century education pursuit. Information Literacy is conceivably the foundation for learning in the contemporary environment of continuous technological change.

As information and communication technologies develop rapidly, and the information environment becomes increasingly complex, educators are recognising the need for learners to engage with the information environment as part of their formal learning processes. Information Literacy is generally seen as pivotal to the pursuit of lifelong learning and central to achieving both personal empowerment and economic development. Library instruction within the college and university setting has long been recognised as an important aspect of higher education (De Jager and Nassimbeni, 2001). Over the years, academic librarians have consistently discussed the important role they can play by partnering with discipline-based classroom faculty to integrate library instruction programmes into the university curriculum (Walker, 2001).

The significance of IL education in Nigerian Universities lies in its potential to encourage deep, rather than surface learning, and transform dependent learners into independent, self-directed, lifelong learners for sustainable development. Without information literacy, people are condemned to lack of information, dependence upon others for access to knowledge and information, and even to acute levels of information anxiety (Wurman, 2001). In other words, IL enables learners and information seekers to navigate the world of information resources to quench their knowledge and information thirst for effective learning and task accomplishment. The Society of College, National, and University



Libraries (SCONUL, 1999) in the UK articulated a Seven-Pillars Model of Information Literacy, which details the seven major information skills required by all students. Essentially, there seems to be an agreement that the information literate person is one who can: 1) Recognise the need for information; 2) Access information efficiently and effectively; 3) Evaluate information and its sources critically; 4) Incorporate selected information into one's knowledge base; 5) Use information effectively to accomplish a specific purpose; 6) Understand the economic, legal, and social issues surrounding the use of information; and 7) Access and use information ethically and legally.

Information literacy is essential to the future of democracy if citizens are to be intelligent shapers of the information society rather than its pawns, and to humanistic culture, if information is to be part of a meaningful existence rather than a routine of production and consumption. Abbas (2014) reported that in the Nigerian university system, the most popular practice of IL instruction is stand-alone courses or classes normally conducted by an independent unit of the universities known as General Studies Unit (GSU). This unit administers courses on IL independent of other academic departmental courses. These GSU courses are credit-bearing and core as they form part of the requirements for students' graduation from university. The courses offered include 1) Use of Library; and 2) Learning and Communication Skills.

Rader (2002) summed up IL to include the following competencies: 1) The ability to determine the nature and extent of the information needed; 2) The ability to assess the needed information effectively and efficiently; 3) The ability to evaluate information and its sources critically and to incorporate selected information into one's knowledge base; 4) The ability to use information effectively to accomplish a specific purpose; 5) The ability to understand many of the economic, legal, and social issues surrounding the use of information; and 6) The ability to access and use information ethically and legally.

Increased access to technology has altered the way that students study while the variety of electronic information resources has widened the potential resource-base for all students. These developments have reduced face-to-face teaching in the library and the need to visit the library building for help. It has also meant that librarians need to alter the way they plan and deliver IL instruction (Orr, Appleton and Wallin, 2001). User expectations regarding electronic access to information are increasing. Academic library collections are evolving from primarily print-based collections to growing electronic collections. Universities are offering more and more distance education courses. As a result, library services, including user education, must evolve to meet new user expectations in the virtual university environment. Bruce (2004) asserts that across the world, educators in primary, secondary, tertiary and professional education contexts have been developing strategies and policies for designing learning opportunities that will enable learners to take advantage of the information and communication infrastructures available to them. Learning opportunities that enhance IL not only make use of information and communication infrastructures but are designed to bring the information practices that are effective in professional, civic and personal life into curriculum. Such opportunities make it possible for learners of all ages to experience the power of effective information practices. When reflection on learning to be information literate is added to the experience of IL, students are helped to recognise the transferability of the processes involved to everyday life, community and workplace contexts.

## **2 Statement of the Problem**

The rapidly evolving information landscape has demonstrated the need for new education methods and practices. Information literacy is a key focus of educational institutions at all levels. In order to uphold this standard, institutions are promoting a commitment to lifelong learning and an ability to seek out and identify innovations that will be needed to keep pace with or outpace changes. Educational methods and practices within the increasingly information-centric society must facilitate and enhance a student's capacity to harness the power of information. Key to harnessing the power of information is the ability to evaluate information as well as to ascertain, among other things, its relevance, authenticity and modernity. According to Lankshear and Knobel (2003), what is needed in the education system is a new understanding of literacy, IL and literacy teaching. Educators need to learn to account for the context of the culturally and linguistically diverse and increasingly globalised societies. They also need to take account of the burgeoning variety of text forms associated with information and multimedia technologies.

The change from an economy based on labour and capital to the economy based on information requires information literate workers, faculty and students who know how to interpret information. This has also sparked serious concern among scholars across the globe. Shapiro and Hughes (1996) advocated a more holistic approach to IL education; one that encouraged not merely the addition of information technology courses as an adjunct to existing curricula, but rather a radically new conceptualisation of the entire educational curriculum in terms of information. Information literacy is essential to the future of democracy, if citizens are to be intelligent shapers of the information society rather than its pawns, and to humanistic culture, if information is to be part of a meaningful existence rather than a routine of production and consumption.

In Nigeria, researchers have observed that there is growing under-utilisation of electronic information resources

embedded in the university libraries' web sites infrastructure. This could be as a result of IL skills deficit among the students or lack of viable and updated university libraries web sites, hence, the need for an empirical study in order to establish the real cause.

The main objective of the study leading to this chapter was to investigate the role of Nigerian university library web sites toward the development of information literacy of postgraduate students. The specific objectives of the study were to identify the types of information resources provided by the Nigerian university library web sites; determine the students' perception about the university library web sites in their academic pursuit; identify the activities performed by postgraduate students using the university library web sites; and find out the extent of user satisfaction with the information provided by the Nigerian university library web sites.

### 3 Methodology

The approaches in social research are quantitative, qualitative (Babbie and Mouton, 2001; Sheppard, 2004; Durrheim, 2006), and mixed methods research (Creswell and Plano, 2007; Greene, 2008). The methodology used for this study was the quantitative technique. Quantitative research methodology has been described as a research strategy that emphasises numbers in the collection of data and statistical analysis (Bryman, 2004; Durrheim, 2006; Sapsford and Jupp, 2006). The objective of quantitative research is to provide facts that can be applied to predict, explain causality, and validate existing relationships among variables through translation of numerical data (Hair, Bush and Ortinau, 2003; Leedy and Ormrod, 2005). The quantitative method of research uses standardised measures and statistical techniques in measuring data that is collected.

The population of the study comprised of all the categories of postgraduate students across disciplines in the four study institutions, namely; Ahmadu Bello University, Zaria, Bayero University, Kano, Michael Opara University of Agriculture, Umudike and University of Ibadan. The total population was 13,286. According to Israel (2012), if the population is 13,286 at  $\pm 5\%$  precisions, the sample should be 385 at 95% confidence level. Simple random sampling technique was used to select the study sample.

The sample of each university was calculated proportionately, using a formula recommended by Krejcie and Morgan (1970) as represented below:

$$N \times S$$

$$TP$$

Where; **N** = Number (i.e. population of each university)

**S** = Sample T (total sample size)

**P** = Population

Based on this formula, the distribution of samples across the four universities was as below:

1. A.B.U. Zaria  $3,219 \times 385 = 93$   
13,286
2. U.I. Ibadan  $5,789 \times 385 = 168$   
13,286
3. M.O.U.A. Umudike  $1,366 \times 385 = 40$   
13,286
4. B.U.K. Kano  $2,912 \times 385 = 84$   
13,286

Data was collected using questionnaires which were administered on the sample of 385 respondents. The collected data was sorted, scrutinised, edited and analysed using the Statistical Package for Social Sciences (SPSS) version 20.0 for Windows 7 to generate descriptive statistics, including percentages and frequencies. The frequency and percentage displayed a number of occurrences side by side with the corresponding percentage, as well as relating this to the variables used in the research.

### 4 Results and Discussions

The findings of the study are presented and discussed in this section based on the objectives of the study.

#### 4.1 Profile of respondents

The results in Table 1 show the distribution of respondents by universities involved in the present study.

Table 1: Distribution of respondents per university

Name of University	Freq	%	Valid %	Cumulative %
Ahmadu Bello University, Zaria	93	24.2	24.2	24.2
Bayero University, Kano	84	21.8	21.8	46.0
Michael Opara University of Agriculture, Umudike	40	10.4	10.4	56.4
University of Ibadan	168	43.6	43.6	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

In this regard, 93(24.2%) were from Ahmadu Bello University, Zaria; 84(21.8%) from Bayero University, Kano; 40(10.4) from Michael Opara University of Agriculture, Umudike; while 168(43.6%) of the respondents were from the University of Ibadan. Based on the findings, it is evident that the highest number (43.6%) of the respondents was from the University of Ibadan followed by the Ahmadu Bello University, Zaria with 24.2%. This is largely due to the higher population of postgraduate students in the two universities.

Table 2: Academic discipline of respondents

Academic Discipline	Freq	%	Valid %	Cumulative %
Agriculture	82	21.3	21.3	21.3
Humanities/Social Sciences	205	53.2	53.2	74.5
Medical Sciences	16	4.2	4.2	78.7
Science/Technology	82	21.3	21.3	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

The results in Table 2 indicate that 82(21.3%) of the respondents were in the discipline of agriculture while 205(53.2%) were in the humanities and social sciences. The findings further revealed that 16(4.2%) of the respondents were studying medical sciences while 82(21.3%) were in the discipline of science and technology. The findings demonstrate that the majority 205(53.2%) of the respondents were from humanities and social sciences, followed by agriculture 82(21.3%) and science and technology 82(21.3%) disciplines respectively.

Table 3: Gender of Respondents

Gender				
Gender	Freq	%	Valid %	Cumulative %
Male	325	84.4	84.4	84.4
Female	60	15.6	15.6	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

The distribution of postgraduate students on the basis of gender revealed that 325(84.4%) were male while 60(15.6%) were female. The overall results show that the majority of the respondents were male.

#### 4.2 Types of information resources and services provided by the university library web sites

The research sought to know the tasks performed using the university libraries' web sites as indicated in Table 4.

Table 4: Types of information resources and services provided on university libraries web site

Find books on specific topic				
Response	Freq	%	Valid %	Cumulative %
Rarely	40	10.4	10.4	10.4
Occasionally	216	56.1	56.1	66.5
Often	125	32.5	32.5	99.0
Very Often	4	1.0	1.0	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
Find full-text journal article				
Rarely	110	28.6	28.6	28.6
Occasionally	185	48.1	48.1	76.6
Often	83	21.6	21.6	98.2
Very Often	7	1.8	1.8	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
Find journal in print or electronic format				
Rarely	55	14.3	14.3	14.3
Occasionally	193	50.1	50.1	64.4

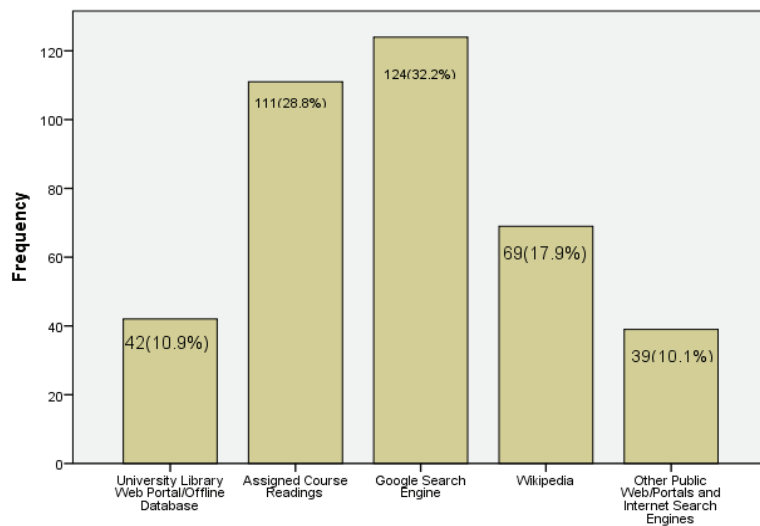
Often	119	30.9	30.9	95.3
Very often	18	4.7	4.7	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Look up an online encyclopaedia or dictionary</b>				
Rarely	80	20.8	20.8	20.8
Occasionally	231	60.0	60.0	80.8
Often	68	17.7	17.7	98.4
Very often	6	1.6	1.6	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Use Instant Messenger IM to ask librarians questions</b>				
Rarely	109	28.3	28.3	28.3
Occasionally	173	44.9	44.9	73.2
Often	86	22.3	22.3	95.6
Very often	17	4.4	4.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Use the library online tutorials</b>				
Rarely	137	35.6	35.6	35.6
Occasionally	144	37.4	37.4	73.0
Often	60	15.6	15.6	88.6
Very often	44	11.4	11.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Look up guides for compiling citations service transaction</b>				
Rarely	82	21.3	21.3	21.3
Occasionally	116	30.1	30.1	51.4
Often	142	36.9	36.9	88.3
Very often	45	11.7	11.7	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Retrieve course readings from electronic reserve</b>				
Rarely	83	21.6	21.6	21.6
Occasionally	81	21.0	21.0	42.6
Often	167	43.4	43.4	86.0
Very often	54	14.0	14.0	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Renew books online using My Minerva</b>				
Rarely	27	7.0	7.0	7.0
Occasionally	129	33.5	33.5	40.5
Often	178	46.2	46.2	86.8
Very often	51	13.2	13.2	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

The results in Table 4 identify the activities performed using the university libraries web site. These were: find books on specific topic was cited by 40(10.4%) as rarely, 216(56.1%) occasionally, 125(32.5%) said often, while 4(1.0%) very often; find full text journal article 110(28.6%) rarely, 185(48.1%) occasionally, 83(21.6%) often and 7(1.8%) very often; find journal in print or electronic format 55(14.3%) said rarely, 193(50.1%) occasionally, 119(30.9%) often, while 18(4.7%) claimed very often; look up online encyclopaedia or dictionary 80(20.8%) rarely, 231(60.0) occasionally, 68(17.7%) often and 6(1.6%) very often; use Instant Messenger (IM) to ask librarians question 109(28.3%) rarely, 173(44.9%) occasionally, 86(22.3%) often and 17(4.4%) very often; use the library online tutorials 137(35.6%) rarely, 144(37.4%) occasionally, 60(15.6%) often, 44(11.4%) very often; look up guides for compiling citations service transaction 82(21.3%) rarely, 116(30.1%) occasionally, 142(36.9%) often, 45(11.7%) very often; retrieve course readings from electronic reserve 83(21.6%) rarely, 81(21.0%) occasionally, 167(43.4%) often, 54(14.0%) very often; renew books online using My Minerva 27(7.0%) rarely, 129(33.5%), 178(46.2%) often and 51(13.2%) very often.

It is evident from the findings that the majority of the respondents used the web sites either rarely or occasionally.

#### 4.2.1 Source(s) of information

The researcher sought to know the sources from which the postgraduate students acquired information resources for their studies. The findings are encapsulated in Figure 1 below.



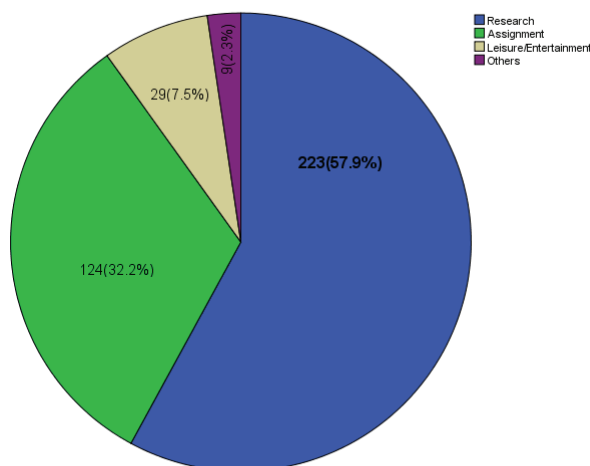
**Figure 1: Source(s) of information resources**

Figure 1 above shows the distribution of source of information resources for the postgraduate students in the four universities. Forty-two (10.9%) claimed that they got information resources from the university libraries web site, 111(28.8%) were getting information resources from the course reading assigned to them by the respective lecturers. The results also revealed that 124(32.2%) were getting the resources from Google search, 69(17.9%) from Wikipedia, while 39(10.1%) were getting the information resources from other sources.

Consistent with findings of the present study, Baro and Asaba (2010), in their study on Internet connectivity in university libraries in Nigeria, discovered poor service provision in the libraries and suggest that for university libraries to deliver effective information literacy programmes, they must have stable Internet connectivity in their libraries. Ajiboye and Tella (2007) are of the view that if quality in higher education is to be attained in Africa, a more radical and positive approach to the provision of Internet facilities in tertiary institutions must be adopted. As a sharp contrast to the findings of the present study, Chen and Chengular-Smith (2015), examined the factors influencing undergraduate use of a university library web portal at the mid-size research university, United States based on mixed method approach. The study found that user satisfaction and competing resources availability were the factors responsible for the continued use of the web portal.

#### 4.2.2 Purpose for using the information resources

The respondents were asked to indicate the purpose for which they acquire and use the information resources. The results are shown by Figure 2 below.



**Figure 2: Purpose for using the information resources**

The results typify the purpose for which information resource were acquired by the postgraduate students in the four universities. The responses show that 223(57.9%) were using the information resources acquired for research; 124(32.2%) were acquiring the resources for assignment given to them by their respective lecturers; 29(7.5%) for leisure and entertainment; while 9(2.3%) were using the resources for other reasons such as journal articles publication. For example, in terms of the ways in which digital literacy is acquired, PG students, in particular, engaged in a broad range of computerised activities, including doing homework, searching and gathering information on the Internet, using social media networks to communicate with friends, watching videos on YouTube, or playing first-person shooter video games (Appel, 2012).

### 4.3 Students' perception about the University library web sites

The researcher investigated the students' perception about the university library web sites in facilitating their academic activities. The results are stated in Table 5 below.

Table 5: Students' perception about the University libraries' web site

<b>UL web site provide with information that lead to produce better search/results</b>				
<b>Responses</b>	<b>Freq</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
Not available	245	63.6	63.6	63.6
Available	140	36.4	36.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Using the UL web site makes it easier to do assignment and prepare for seminars</b>				
Not available	284	73.8	73.8	73.8
Available	101	26.2	26.2	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Using the UL web site increase academic performance</b>				
Not available	308	80.0	80.0	80.0
Available	77	20.0	20.0	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>UL web site gives access to information that cannot be found elsewhere</b>				
Not available	265	68.8	68.8	68.8
Available	120	31.2	31.2	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>UL web site provides sufficient information to accomplish tasks</b>				
Not available	275	71.4	71.4	71.4
Available	110	28.6	28.6	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>UL web site is always available for research</b>				
Not available	272	70.6	70.6	70.6
Available	113	29.4	29.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Steps to complete a task in UL web site follows a logical sequence</b>				
Not available	182	47.3	47.3	47.3
Available	203	52.7	52.7	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>UL web site loads its pages quickly</b>				
Not available	261	67.8	67.8	67.8
Available	124	32.2	32.2	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

The results in Table 5 indicate the respondents' perception about the university libraries web site in their academic pursuit. Based on the perceptions: university libraries' web sites provided information that lead to the production of better search/results was cited by 140(36.4%) as available, while 245(63.6%) said was not available; using the university libraries we site makes it easier to do assignments and prepare for seminars 101(26.2%) available and 284(73.8%) not available; using the university libraries web site increase academic performance had 77(20.0%) as available, while 308(80.0%) not available; university libraries web site gives access to information that cannot be found elsewhere 120(31.2%) available and 265(68.8%) claimed not available; university libraries web site provide sufficient information to accomplish task 110(28.6%) believed available, while 275(71.4%) not available; university libraries web site is always available 113(29.4%) available and 272(70.6%) respondents viewed not available; steps to complete a task in the university libraries web site follows a logical sequence 203(52.7%) available, while 182(47.3%) not available; university libraries web site loads its pages quickly 124(32.2%) available and 261(67.8%) not available.

Generally, the findings show that with exception of the sequential flow and arrangement of operation of the university

library web sites, all other variables were not available or were perceived as not complementary to the academic pursuit of the respondents. Contrary to the findings of the present study, Bunz (2004) validated the instrument to assess people's fluency with the computer, e-mail and web navigation and web editing based on extensive research on information and communication technology literacy. The study revealed that the 4-factor solution accounted for more than 67% of the total variance.

#### 4.4 Level of satisfaction derive from the university library web sites

The respondents were asked to share their experience about the use of the university library web site in their academic activities. The findings are indicated in Table 6.

Table 6 Level of satisfaction derived from services provided by the university library web site

<b>The UL web site provide quick response to library request</b>				
<b>Response</b>	<b>Freq</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
Not satisfied	264	68.6	68.6	68.6
Satisfied	121	31.4	31.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>The UL web site has a good interface to interact with and make requests</b>				
Not satisfied	245	63.6	63.6	63.6
Satisfied	140	36.4	36.4	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Easy to get online assistance through Instant Messenger (IM) or email when there is a problem finding information using the UL web site</b>				
Not satisfied	287	74.5	74.5	74.5
Satisfied	98	25.5	25.5	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	
<b>Satisfied with the print e.g. handouts, and electronic support materials e.g. online tutorials, regarding the UL web site</b>				
Not satisfied	112	29.1	29.1	29.1
Satisfied	273	70.9	70.9	100.0
<b>Total</b>	<b>385</b>	<b>100.0</b>	<b>100.0</b>	

The Table 6 above shows the level of satisfaction derived from the university libraries web site by the respondents. The findings indicate that the university libraries web site provide quick response to the library request made 264(68.6%) not satisfied and 121(31.4%) satisfied; the university libraries web site has a good interface to interact and make request 245(63.6%) not satisfied, while 140(36.4%) satisfied; it is easy to get online assistance through Instant Messenger (IM) or email when encountered problem 287(74.5%) not satisfied, 98(25.5%) satisfied; satisfied with print such as hand-out, and electronic support materials such as online tutorials, regarding the university libraries web site 112(29.1%) not satisfied, while 273(70.9%) satisfied. The overall findings show that the level of satisfaction derived from the web site was low owing to poor interface and slow response to request made.

## 5 Conclusion and Recommendations

Living with the expectations of the present information and age has posed serious challenge to individuals, organisations and even countries in terms of harnessing the potential of information and communication technologies (ICTs) for overall societal development. The present study concludes that postgraduate students of the four universities relied heavily on Google search engine for their information resource acquisition; major tasks of literature search were carried out via other online tools other than the university library web sites. The overall conclusion of the study is that there were huge gaps between the information resource requirements of students and the ability and potential of the library web sites to meet up with them. The study recommends that:

1. There should be cooperation, collaboration and coordination among libraries in Nigerian universities (e.g. through resource sharing and networking) in order to strengthen the information resources base of the libraries for enhanced availability and utilization by the PG students
2. There is need for an aggressive programme of retrospective conversion of libraries' records for enhanced access and utilisation of electronic information resources.
3. There is need for an increased budgetary allocation to university libraries to enable subscription to relevant databases to stimulate research and development activities in the universities.
4. There should be a deliberate policy centred on user education/training and user awareness about the availability of information resources in the libraries to enhance patronage by the PG students.

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# Use of Information Communication Technologies in the Revitalisation of Disappearing Indigenous Languages through Knowledge Centres: Case of Suba

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## Abstract

*Suba is a Bantu language listed by UNESCO as endangered and being on the verge of extinction. It is currently only actively spoken by the older generation aged fifty years and above. The Suba language in Kenya has two distinct dialects; Olusuba (spoken by Abasuba who live on Mfangano Island) and Ekisuba spoken by those in Rusinga, Muburu Bay and Gwasi. The aim of this chapter is to demonstrate how various ICTs like YouTube, cellphones and web technologies are employed to revitalise the use of Suba language. The study employed a qualitative research method using focus group discussions. Data was collected using interviews, focus group discussions and observation. Additional data was captured using video cameras and computers from purposively sampled focus groups and key informants. As part of the outputs, the National Museums of Kenya and Goethe-Institut through Elimu Asilia programme have documented indigenous knowledge of the Abasuba using online technologies like website, YouTube, blog, cellphones, emails, exhibitions and cultural festivals. The research found that the Bible Translation Literacy centre promotes Suba language through YouTube, DVD and MP4 videos. Ekialo Kiona Suba radio station also promotes the use of Suba language; and the two enhance wider awareness, publicity and use of Suba language in speech by both young and old generation and change of attitude. The community hopes that through frequent usage, Suba language will be struck out from UNESCO's Red Book of Endangered Languages.*

**Keywords:** *Language revitalisation, Indigenous knowledge, Documentation, Suba.*

## 1 Introduction

Obiero (2010) observed that there is an alarming extinction rate of spoken languages in the world dating as far back to the 5<sup>th</sup> Century. Common languages such as Kiswahili and Arabic have replaced indigenous languages in countries such as Tanzania and the Maghreb region. Community elders believe that without language, their culture is lost since it is an essential way through which indigenous knowledge (IK) is communicated and preserved. This is particularly so for those that did not use written expressions. Adebayo and Adeyemo (2017) affirmed that IK and associated practices are usually unwritten and rely on oral transmission and human memory attainable through use of language.

Language is a communication tool and an important cultural characteristic that distinguishes one ethnic group from another. Ong (2002) affirms that language is an oral phenomenon and human beings communicate in various ways including through the use of senses such as touch, taste, smell, sight and hearing. He further pointed out that human beings use a language that is basically spoken and heard. Wamalwa and Oluoch (2013) asserted that UNESCO lists about 6,000 spoken languages in the world, yet only eight of them are currently used for wider communication. Additionally, they observed that, of the 417 endangered languages in the world, Kenya has over seven endangered languages among them are Terik, El Molo, Ogiek, Bong'om, Sogoo, Suba and Yaaku.

Wa Mberia (2004) argues that languages, just like libraries and archives, contain important information and knowledge. They hold a community's memory and worldview. It is a unique expression of a community's history, philosophy, fears and aspirations. Languages are like vehicles of memories, traditions, knowledge and skills. They convey messages; express emotions, intentions and values; confirm social relations; and transmit cultural and social expressions and practices in spoken, written form, or through gesture. Wa Mberia (2014) further states that language endangerment occurs when there are no new speakers, either adults or children, and its speakers use it in a reduced number of communicative domains, and/or cease to pass it on from one generation to the next. He argues that language endangerment is also as a result of the complexity of the language, bilingualism or multilingualism. People not only lose the language available to them for communication, they also stop using a language because there is an alternative for their communication needs. For example; Bong'om or Bong'omek language from which place name as "Bungoma" can be traced was spoken in Western Kenya. It is now claimed to be extinct. However, some community members, although only a minority still exists, can speak the language and are calling for its recognition by the Government of Kenya. According to Wa Mberia (2014) other languages spoken by very few people in Kenya include El Molo, Ogiek, Watwa and Hansa. Batibo (2005) observed that Kenya risks losing Boni, Dahalo, Burji, Daasanach, Digo, Konkani, Malakote (Ilwana), Nubi, Sagalla, Sanye, Suba, Chifundi and Vumba. These languages are not only spoken by few people but are also affected by low intergeneration transmission.

Language death entails replacement of one language by another. Bilingualism or multilingualism is a central phenomenon and the beginning point of language death. It is both a blessing and curse as it enables individuals, communities and nations to communicate but at the same time promotes language shift and language death. Monolinguals do not lose their language except through death of the speakers.

According to UNESCO (2003) parameters, Suba language endangerment may have been enhanced through the following factors:

- lack of intergenerational language transmission where the language is not passed from one generation to the next resulting in no new speakers emerging;
- A low absolute number of speakers (that is those who speak pure or unmixed or uncompromised language);
- Small proportion of speakers within the total community probably due to cessation by active speakers to use it resulting into reduced number of users;
- Shifts in domains of language use such as during communication; response to new domains and media may be by being compelled to use other languages perhaps through integration into mainstream society or community;
- Language education and literacy; governmental and institutional language attitudes and policies where it is declared that e.g. English and Kiswahili are the official languages; community members' attitudes towards their own language where some communities think their language is inferior compared to other languages like English; and type and quality of documentation.

## **2 Rationale of study**

The Suba language is listed by UNESCO, and considered by many, as endangered. This is due to reduced number of active users of the language and the decline of the remaining fluent speakers living on Mfangano Island (majorly people aged fifty years and above), which is deemed to threaten the survival of the language. Factors causing the under-utilisation of the language include intermarriage of Suba men with Luo women resulting into children born from such unions speaking Dholuo as their mother tongue. Contact of the Suba community with Luo led to their assimilation into the dominant Luo culture and customs resulting in a slow decline of the use of the language.

Penfield (2006) affirmed that the use and incorporation of technology into teaching a language using computer-assisted tools creates an interactive learning environment. The aim of this chapter is to demonstrate how various ICTs are used in the revitalisation of the disappearing Suba language through knowledge centres at the National Museums of Kenya's (NMK), Information Resource Centre, Elimu Asila (library project), which has created awareness and enhanced global knowledge of Suba language (Olusuba, Ekisuba) using available ICTs on the Internet.

## **3 Overview of literature**

In African communities, language is a major tool for the transfer and management of indigenous knowledge. The richness of a language is reflected in the number of songs, proverbs, riddles and tongue-twisters held by a community. Kenya has more than 42 ethnic communities, and Muhando (2008) reported that there are about 55 distinct languages with different dialects and cultures. Some ethnic languages are underutilised in daily communication. According to UNESCO (2003) a language is endangered when it is on the path to extinction. UNESCO has highlighted several disappearing languages, cultures and people globally. It is not clear how many languages have disappeared or have been assimilated into other languages before the writing culture was adopted. According to Wamalwa and Oluoch (2013) over eight languages which include Suba, Terik, El Molo, Ogiek, Omotik, Bong'om, Sogoo and Yakuu are endangered. Waata and Makonde are also under threat.

Suba is a Bantu language spoken by the Abasuba community living in Kenya, Uganda and Tanzania. It is listed by UNESCO as endangered and being on the verge of extinction. The language is referred to as Olusuba or Ekisuba/ or Ekisuba depending on the dialect and is actively spoken by older generation, aged fifty years and above. Suba language is considered to be under the threat of extinction since the population of the Abasuba during the last 2009 census was approximately 300,000; out of which Mattah (2000) observed that there were only about 119,000 Suba speakers spread across Kenya. Suba children hardly speak or use the language. The language is on the verge of extinction as a result of assimilation and intermarriage with the dominant Luo on the islands where the immigrant Suba community landed along Lake Victoria in Kenya in the mid-1700s.

The language has been classified as endangered partly because it was viewed as inferior since it was the only different language from the dominant Dholuo along the lakeshore in Homa Bay County. To make matters worse, education was introduced in English and Dholuo. Christianity was also introduced in Dholuo. Christian literature was published in Dholuo. Although the Suba speak both Olusuba and Dholuo, some of the Suba people have lost the ability to speak it especially among the youth in Mfangano and Muhuru Bay.

According to Mattah (2000), Suba language was spoken by about 119,000 people across Kenya, Uganda and Tanzania. The Suba language spoken in Kenya has six dialects comprising Olwivwang'ano, Ekikune, Ekingoe, Ekigase, Ekisuuna and Olumudu. These dialects are spoken on the islands and mainland where the Suba community occupy. Dholuo was used as the medium of education until mid-1990s. Suba people have made several attempts to preserve their culture and language. To make Suba a written language, Suba people persuaded the Government to introduce Suba language in public schools. At the same time, Scripture translation into the Suba language also began in order to strengthen the existing church by making the Bible available to people in the language they understand best. Like other African languages, Suba language uses many idiophones in oral speech to add flavour to the language as displayed in most folk stories which sound different when written down.

The Abasuba is not the only endangered community that is using technologies to revive their dying language. Many endangered language communities are beginning to adopt advanced audio, video and multiple technologies as a means of revitalising their languages (Penfield and Cash, 2006), particularly in the language teaching and language documentation.

#### 4 Methodology

The research was based on qualitative research method, and focus group discussions approach was employed for the study anchoring this chapter. Patton (2002) argues that in qualitative research, participants are selected because they are likely to generate useful data so as to avoid obvious limitations on age and gender. The research focus group included a youth, elderly women and clan elders. Qualitative data was collected through interviews using a discussion guide on outlined topics until saturation point was reached. In addition, observation and literature review were also used to collect, capture and document IK including the disappearing Suba language. The participants in the focus group discussions at Mbita were purposively sampled from the Suba Council of Elders drawn from Sindu, Kaksingri, Magunga, Gembe, Rusinga and Mfangano Islands, Muhuru Bay and Gwasi through a gate keeper. The study population was 14 participants who were the key informants, comprising seven (7) male elders, two (2) women representing the women wing and one (1) young man representing Suba youth. The additional 4 were informants involved in the Mfangano Island discussions at BTL. Patton (2002) states that FGDs typically have between 6 and 10 people to hold a discussion; below 6 may be insufficient, and above 10 may not be easy to control. Interviews at the Bible Translation Centre included 4 male informants comprised of the chief editor and 3 male assistants. The research team comprised of a librarian, 5 scientists (a botanist, anthropologists and IT expert). The various ICTs used to collect data from key informants included: microphone, video cameras, scanner, email, online searches and computers. Web camera and Video camera connected to a laptop computer as well as cellphones were also used to capture video clips. The study team also visited the Bible Translation Literacy (BTL) centre in Mfangano Island to validate the knowledge.

#### 5 findings

The research established that various ICTs and digital media tools can be used to create awareness about and revitalise the use of Suba language in daily social life and education. The technologies include voice and video recordings which are preserved on YouTube link accessible from Elimu Asilia website available at [www.elimuasilia.org](http://www.elimuasilia.org) or Google search. The knowledge can be searched and retrieved on the Internet using online technologies including Elimuasilia Android app available from Google Play Store using smartphones, website and blog accessible from [www.elimuasilia1.blogspot.com](http://www.elimuasilia1.blogspot.com). Galla (2009) observed that since 1990, the Internet has expanded rapidly enabling users to search for information, download readily available files such as documents, videos, music; as well as to communicate with each other using such tools as e-mail, Facebook and Twitter. Communities have embraced technologies such as audio, video, and multimedia technologies to revitalise their language. Although documentation of Suba language was first recorded in published books, they have since been uploaded online and are available on the Internet and databases purposely to reach a wider audience so as to revive the use of the language and provide data for continuous development of the language. *Elimu Asilia* project employed various technologies which include website available at [www.elimuasilia.org](http://www.elimuasilia.org) with links to platforms such as YouTube, email, Facebook, Twitter, email and blog.

##### 5.1 ICTs Used in the Revitalization and Preservation of Suba language

###### 5.1.1 Website

The Elimu Asilia website allows users to access information on indigenous knowledge of the Suba. It provides information categorized in four main broad subject areas comprising culture, history, health and environment. The website is used for digital preservation, awareness and as publicity platform. It was developed using Joomla version 3.0, which is a free open source Content Management System by global community of developers and volunteers for publishing web content. The virtual exhibition on the history of the Abasuba includes a panel on the Suba (Olusuba) language, digitally preserved on the website. The exhibition text was prepared in MS Word, a scanner was used to make JPEG copies of pictorial material collected from the community, exhibition panels were designed using MS Publisher,

and converted to PDF (A) ready for uploading. The website gives details of culture using Suba names on the items used in the exhibition such as “Ekiwaga” (traditional shrine), which features in Suba oral traditions. The website also gives a documentation of cultural activities that take place during cultural festivals which were captured using Suba dialects; Olusuba and Ekisuba.

The website acts as an online digital repository for the management and preservation of IK. The web presence affords an online platform to digitize, disseminate, share and preserve IK for as long as the website remains up. Stories collected from the community are brushed up, while retaining their originality from source. The stories are uploaded onto the respective categories and web pages. Images are prepared and minimized or made lighter for ease of access through the website. Statistics showed that some users or clients connect through mobile devices which have limited bandwidth. A Quick Reference Code was developed to ensure virtual experience and faster connectivity to the website by visitors with smartphones.

### **5.1.2 Social media**

The website also includes links to Facebook, YouTube and twitter to enables users to maintain share the content with family and friends. Social media also directs traffic to the website as well as provide an alternative means of sharing information. Videos uploaded on the YouTube includes a 25 minutes clip of the chief editor at BTL, encouraging the Suba community in Kenya and Diaspora to teach their children and other households how to pray in Suba Language. It highlights some cultural practices that enhance language excellence like teaching Suba language to a spouse from non-Suba community to maintain and revitalize Suba language. The Jesus film according to the Gospel of Luke, Suba-Simbiti / Kisuba / Kisimbiti language (Kenya) and other Bible stories are performed in Suba language and available on a YouTube channel. This finding concurs with Owiny, Mehta and Maretzki (2014) who affirmed that YouTube being multimedia-based can be employed by illiterate and literate users because it allows them to upload, share and view videos.

Twitter users access, receive and send brief content or comment from Elimu Asilia website, using their user names or Twitter handles, as a way of sharing their thoughts, ideas, events, news or simply sharing information among followers.

The email whose address is [info@elimuasilia.org](mailto:info@elimuasilia.org) is largely used for communication and promotion of Suba language to Kenya and the rest of the world. It allows users to chat and connect with other speakers and learners all over the world. It is embedded in the contacts page, and is the primary mode of communication that website visitors use to contact the secretariat.

### **5.1.2 Mobile platform (Android)**

Elimu Asilia, cognizant with the technologies available and trends in mobile devices leveraged on success stories and chose Android as a platform. The choice was based on the desire to reach and achieve a greater audience by diversifying from the traditional desktop based approach to providing a mobile solution which is trending and preferred, utilized and appreciated by most knowledge seekers and researchers. This led to the development of the ElimuAsilia Android based App, which is freely downloadable from the Google Play Store (Android Market).

### **5.1.3 Recording Devices (video camera and cellphone)**

Video camera connected to a laptop computer captured a 10-minutes clip including images and voices of informants during data collection. Cellphones were used as backup to capture both images and voices. The devices captured some of the dying cultures of the Abasuba community as explained by the informants.



Using cellphone, webcam, laptop, external hard drive

In addition, the voice of Mr. Msaswa, the chief editor at BTL including his assistants was captured when explaining the

efforts being made towards the revitalization of Suba language, and culture to the Suba around the world. The voices of some of the Suba elders are like priceless knowledge and wisdom gift to future Abasuba generations.

#### 5.1.4 Radio

The researchers found that Ekialo Kiona Suba Youth Radio station (EK-F) is a for–youth by-youth community radio station. Its production and broadcasts are in Suba language. It was established and launched in December 2012 with the support of OHR and Inveneo. The station operates through a wireless Internet connection over water from Kisumu to the top of Soklo Mountain, down to the Ekialo Kiona Centre in Kitawi Beach, on Mfangano Island. The radio station was Africa’s first broadcast wind & solar-powered 500 watt FM transmitter 80-km into Lake Victoria. EK FM – 88.3 offers a unique channel which targets health crisis and marginalization of the Abasuba people through expression, solidarity, and revitalization of heritage and culture. The station disseminates valuable information in a timely manner which is necessary for sustainability of people living in the rural community. In addition, Mfangano Island was found to be one of the Abasuba areas where Suba was the first spoken language (mother tongue). The Island had been hit hardest by HIV / AIDS which was fast spreading, thus the future of the Abasuba depended on the promotion of community and youth discussions in Olusuba language as part of sustainable approach to treatment and prevention of the pandemic. Most of EK FM program activities cover health, sustainable agriculture and fishing, Suba culture and language, as well as youth empowerment programmes. Effort towards reviving diminishing culture like language includes the station broadcasting 12 hours a day every week. The EK FM team gathers Suba histories from across the region, records interviews and oral stories with elders, including original music by local Suba artists. The EK FM radio in collaboration with Kilimo international use “Farmer voice Radio” model to link local farmers with District Agricultural Officers to develop short 30-seconds audio clips which are aired with educational information during a particular growing season and crop.

On the role of ICTs in revitalizing Suba language, Wa Mberia (2014) stated that a radio station broadcasting in the language enhanced the efforts of reversing the language loss. In concurrence Fox (2014) puts emphasis on the use of ICTs and adds that Ekialo Kiona Suba Youth Radio Station 99 FM (EK-FM) is based in a small community centre; the radio station services are broadcast from 1.pm – 6.00 pm, and not throughout the day. The programmes include Olusuba lessons which alternate with Suba music and discussion with Suba elders. The radio station acts as a major medium in revitalizing the Suba language, giving it new and modern domains consequently raising vitality.

#### 5.1.5 Bible Translation Literacy Centre

The researchers found that the Bible Translation Literacy Centre (BTL) located on Mfangano Island promotes Suba language through use of YouTube, DVD and MP4 videos. This confirms the sentiments of Wa Mberia (2004) that there are a number of organisations involved in activities which assist in boosting language vitality.

The focus group discussion with the Suba elders also revealed that BTL worked with the former Kenya Institute of Education and the Ministry of Education, and produced various Suba primers for integration in the school curriculum so as to teach Suba language, some of which are on DVD and MP4 videos formats. This finding concurs with the sentiments of Wamalwa and Oluoch (2013) that a language can be maintained through increased usage either in education, media of instruction, language literacy and use in broadcast.

The Bible Translation and Literacy developed and facilitated the translation of the Bible into Olusuba. The translation exercise started in 1988 at BTL in Mfangano Island. And currently the “Endagano Empia” New Testament is available online at: <https://www.bible.com/versions/484-sxbnt-endagano-empia>, <https://www.bible.com/languages/sxb> and also at <https://www.bible.com.SXBNT>. The translated bible is in use in churches. Additionally, the sermons are preached in Olusuba language, with hopes that frequent interaction with the Bible will enhance language usage by community members, especially on Mfangano Island where the language is actively spoken,

BTL has also developed Suba language primers for teaching, writing and basic reading. They are used in teaching in schools and adult education. A 58-page Suba translation primer is available online for anyone interested in learning simple Suba terminologies and construction of sentences. In addition, BTL has organised activities in Suba language within the local communities thereby facilitating new communicative domains that boost language vitality. Suba speakers are able to read in their language thereby posing a positive impact on Suba language because it has gained some respect among its speakers. Writing literature in Suba language has raised the prestige of the speakers thereby enhancing the vitality of Olusuba.

#### 5.1.6 Cultural Festivals

The Chula Cultural Foundation organises the Rusinga Cultural Festival in December every year. The event is documented using video and camera and disseminated through a website, stakeholder’s emails and radio. Publicity through electronic and print media to create awareness and learning about Suba community including their culture and language, traditional songs and dances, cuisine, fashion among others. Activities are presented in Suba language with a standby translator into English, while at the same time the recordings are broadcast in local radio station and on YouTube.

## 6 Conclusions

The findings of the study show that ICTs and other digital media technologies has proved to be useful tools in teaching, preserving and reviving endangered languages. The information and knowledge is easily available on the web with files which are downloadable such as the New Testament Bible “Endagano Empia”, and music among others. Suba community including children have changed their attitude, accepted and recognised their role in supporting the revitalisation process of the Suba language and this has made revival successful.

There is a notable change of attitude among community members. People greet each other in Olusuba language; some youth are also able to speak the language. Community members make calls to the radio station, they respond to quizzes and questions posed in the radio station in Suba language, including death announcements. It is hoped that Suba language shall be deregistered from UNESCO’s Red Book of Endangered Languages.

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# Technologies Used to Document and Disseminate Indigenous Knowledge on Food Preservation among the Kalenjins of Kenya

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## Abstract

*Food preservation is critical in ensuring food security in any community. Indigenous communities preserved their foodstuff in innovative ways to enhance their longevity. To this end, they used indigenous knowledge. This knowledge is difficult to document or disseminate because it is tacit knowledge that is passed orally and once the originator dies without passing it to someone else, the knowledge perishes. The aim of the study on which this chapter is based was to investigate the technologies used in documenting and disseminating indigenous knowledge on food preservation among the Kalenjins in Kenya. The study was conducted in Soin Ward in Kampi ya Moto Location, Rongai Constituency, Nakuru County. Purposive sampling was used to identify the respondents. Survey method was used to collect data from the identified respondents. This was done through structured interviews using schedules. The findings of the study indicate that indigenous knowledge on food preservation was held by adults in the community who included women and men. There was no formal documentation of this tacit knowledge which could only be held in the owners' minds. Dissemination of the indigenous knowledge on food preservation was oral and practical. The authors recommend the establishment of indigenous knowledge resource centres to document and disseminate the knowledge. They also suggest that the County government should take initiatives to provide platforms for showcasing indigenous knowledge through community cultural practices.*

**Keywords:** *Indigenous Knowledge, UNESCO, Kalenjin, Food Preservation, Technology*

## 1 Introduction

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2017), indigenous knowledge is local knowledge that is unique to a culture or society. This knowledge is not acquired formally but has been passed on orally or through cultural practices. Indigenous knowledge is preserved through memories of individuals acknowledged by given community and is acquired through experience, rituals or authorities. Indigenous knowledge has been used from time immemorial in communities for survival for example in food preservation.

Chapter 2, article 11 of the Kenya Constitution (2010) on culture, states that the state shall among other things recognise the role of science and indigenous technologies in the development of the nation. Notably, indigenous knowledge is predominantly tacit or embedded in the experiences and/or local knowledge of the community. This knowledge is commonly exchanged through personal communication and demonstration and gets transmitted from master to apprentice; from parents to children; and from one neighbour to the other, and so on. Indigenous knowledge is expressed in the form of stories, songs, dances, myths, cultural values, beliefs, rituals, community law, language and taxonomy, agricultural practices, equipment, materials, plant species and animal breeds to mention but a few. On their part, Adeniyi and Subair (2013) state that this knowledge comprises of culture, religion, mythologies, economy, governance, medicine and agriculture to taboos, poetry, art and craft and many more.

Anyira, Oniode and Nwabueze (2010) argue that indigenous people, including farmers, landless labourers, women, rural artisans, and cattle keepers are the custodians of indigenous knowledge systems. These people are well informed about their own situations, their resources as well as what works and what does not work for them.

It is widely acknowledged that tacit indigenous knowledge can be managed through the application of information and communication technology (ICT) tools (Ngulube & Ngulube, 2017). Ngulube and Ngulube give examples of the use of audio-visual digital recording using mobile phones, video recording camera, tape recording devices, and computers. The recorded content is shared through the Internet on platforms such as YouTube, Facebook, Twitter and Google documents. This sharing enables oral stories, songs, dances, ceremonies, healing, farming, carving and other indigenous knowledge practices to be captured and stored in original indigenous languages.

The aim of the study on which this chapter is based was to investigate the technologies used to document and disseminate indigenous knowledge on food preservation among the Kalenjins of Kampi Ya Moto, Nakuru County in Kenya. The specific objectives were to establish the technologies used in documenting on food preservation; technologies used in disseminating indigenous knowledge; and the challenges faced in documenting and disseminating indigenous knowledge on food preservation.

## 2 Literature Review

The emergence of ICTs has brought tools and or devices for capturing and accessing important information like indigenous knowledge. These include video tapes, USBs, CD-ROMs, DVDs, and VCDs among others. It is believed that these ICT tools are able to store large volumes of still and moving images. Nakata and Langton (2009) indicate that digital technologies offer avenues for preserving indigenous astronomical knowledge and making it accessible to future generations of indigenous people. These technologies facilitate the discovery and retrieval of documented indigenous knowledge held in various collecting institutions, such as libraries, museums and archives. Since indigenous practices, like all forms of Indigenous knowledge, are dynamic, they are constantly being renewed. Therefore, any attempt to manage, represent, or restore this knowledge requires on-going collaboration between indigenous knowledge holders, collecting institutions, and researchers.

Nakata and Langton (2009) recommend that librarians should consider indigenous knowledge, not only as archives, but as part of contemporary knowledge. Abioye *et al.* (2014) suggest some of the ways to document indigenous knowledge include video recording, photos, slide documentaries, reports, maps, written documents, audio-visual documents and museums. Owiny *et al.* (2014), in an article on the use of social media technologies to create, preserve, and disseminate indigenous knowledge and skills to communities in East Africa, recommends that libraries can work with local communities to document and disseminate indigenous knowledge, for example, by recording videos and sharing the same through YouTube, Facebook and Google docs, among other channels. Owiny *et al.* (2014) further point out that there are already libraries like eThekweni Public Library in Durban South Africa which online indigenous knowledge resources as part of their services. This implies that such libraries have created or documented the information and are now disseminating it to a wider audience.

Nickerson (2005) suggests the use of visual technologies, such as video conferencing which can relay facial expressions of a storyteller and the intentions of his or her words. Karbo (2005) states that indigenous knowledge systems such as folklore, customs, etiquette, and music can be recorded on tapes. Both authors agree that technology can be used in capturing and disseminating indigenous knowledge. Documented indigenous knowledge can also be stored in MP4 devices, mobile phones and computers. In other words, computers are used as major equipment to access storage devices like CD-ROM, VCD audio tapes, and digital databases. All these depend on computers and wired equipment for accessibility. He argues that mobile phones with recording ability are used to record music, stories, tales and idioms all of which constitute an integral part of indigenous knowledge. These recordings play pivotal roles in facilitating the documentation and dissemination of indigenous knowledge widely.

Mobile phones use either audio or camera to record or capture, store, and disseminate information. Mobile phones are able to capture knowledge in the place where it is generated. Having both audio and video capability enriches the knowledge sharing experience. The main use of ICT for promoting indigenous knowledge involves capturing, storing, and disseminating indigenous knowledge so that traditional knowledge is preserved for the future generation. Technology is also used to promote cost-effective dissemination of indigenous knowledge; create easily accessible indigenous knowledge systems; promote the integration of indigenous knowledge into formal and non-formal training and education; provide a platform for advocating for the preservation and use of indigenous knowledge; and optimise the benefits of indigenous knowledge systems to the poor. In some cases, modern tools could be used, while in other circumstances it may be appropriate to rely on more traditional methods such as taped narration and drawings.

## 3 Methodology

The study leading to this chapter was conducted as a survey. The study was conducted in Soin Ward in Kampi ya Moto Location, Rongai Constituency, Nakuru County. Data was collected through structured interviews using interview schedules. The respondents were selected through information oriented purposive sampling. Neuman (2011) explains that purposive sampling is applied to select unique cases that are especially informative. Etikan *et al.* (2016) agree with Neuman that purposive sampling involves identifying and selecting of individuals or groups of individuals that are proficient with and well-informed on a phenomenon of interest. Kumar (2014) describes purposive sampling as the researcher's judgement as to who can provide the best information to achieve the objectives of the study. In this study, the researchers consulted the local leaders who included the Assistant Chief and church leaders to help identify the people who have knowledge on indigenous knowledge on the preservation of foodstuff. A total of five people above 55 years were interviewed, four females and one male; all speakers of Kalenjin dialect. Face to face interviews were conducted to collect data.

## 4 Findings and Discussions

The findings of the study are presented in this section according to the objectives of the study.

#### **4.1 Documentation of indigenous knowledge**

All the respondents agreed that there was no formal documentation of the indigenous knowledge on diverse aspects of the community and specifically on food preservation. They acknowledged that indigenous knowledge is stored on people's minds and applied when or where required. An example was when food was preserved to be used during war time or when there was drought or famine. The respondents further said they are not aware of any attempt by individuals or formal groups to document indigenous ways of preserving food among the Kalenjins. Two female respondents were of the view that documenting indigenous knowledge on food preservation was important as it would enhance the sharing of the same to a wider audience. It would also preserve the culture which future generations may refer to as a means of alleviating food shortage especially in the wake of climate change.

#### **4.2 Dissemination of indigenous knowledge**

The respondents stated that the common ways that indigenous knowledge on food preservation was disseminated was through observation, practice, and interaction. Thus, the knowledge was transmitted orally during events such as initiation ceremonies, cultural weddings, planting and harvest time, and during leisure time. It was noted that initiation of boys and girls was done at different times. The male respondent stated that circumcision of boys, for example, was transition from childhood to manhood or maturity. The period also served as training on social, cultural as well as economic issues of families and community at large. Therefore, boys would be taught by their mentor's responsibilities such as hunting wild game, types of edible meat, and how to preserve foods. Girls would also be trained on a wide range of issues such as hygiene, sexuality, and marriage as well as the responsibilities that come along with that.

#### **4.3 Challenges**

One of the challenges faced in documenting and disseminating indigenous knowledge on food preservation was the use of unfamiliar terminology. Three female respondents stated that to document the indigenous knowledge on food preservation may be a challenge since few people currently practise it. The emergence of modern ways of food preservation has eroded the indigenous ways of food preservation. For example, with modern ways of farming, the production of milk and cereals have increased hence modern technology is used in food preservation. For instance, most families now preserve food through refrigeration.

### **5 Conclusion**

Indigenous knowledge is transferrable from generation to generation through storytelling, initiations, rituals, and observations. Notably, due to westernisation, and large scale migration of community members to different parts of the world, this mode of knowledge transfer has been rendered minimally relevant as a result of reduced interactions. In light of this, there is need to preserve culturally unique knowledge on food preservation for future generations through technology. Mosoti & Masheka (2010) sum up the drive to manage knowledge in African culture with an old African proverb that "in Africa, when an old man dies, the entire library is burnt". Maina (2012) indicates that in the light of the prevalent loss and threatened future of traditional knowledge and cultures, it is now a common practice for communities to document their knowledge. There is need to document the indigenous knowledge as it is part of cultural heritage among the Kalenjins. Though it may be difficult for the younger generation to go back and practise it in its entirety, there are aspects that may be adapted as research and learning advances. Therefore, modern ways of documenting knowledge through ICTs, libraries and organised forums may be helpful.

### **6 Recommendations**

The research carried out in Kampi Ya Moto among the sampled population revealed that indigenous knowledge is stored in the minds of its holders and manifested through actions. Therefore, adoption of new technological devices would enable Kalenjins to contribute to global information resources by translating indigenous knowledge on food preservation into digital format. These formats would make indigenous knowledge available to a wider audience.

The county governments should ensure that locals are supported with sufficient tools for documenting and disseminating indigenous on food preservation. They should also establish indigenous knowledge resource centres and libraries managed by county librarians. County governments should also take initiatives to provide platforms for showcasing community cultural practices which include indigenous knowledge on food preservation and promote the integration of indigenous knowledge into formal education systems. The National Museums of Kenya should also take initiative to collect, organise, store and disseminate indigenous knowledge.

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# Use of Mobile Technologies in Dissemination of Traditional Medical Knowledge in Kenya: Case Study of Kenya Resource Centre for Indigenous Knowledge

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## Abstract

*Traditional medical knowledge involves local knowledge created and used over time by local communities. Currently, there are few databases that contain indigenous knowledge on health matters like medicinal games and ecological knowledge; which are not generally readily accessible to the public. Mobile technologies offer instant access to information through messages, pictures, links and databases as well as different forms of information presentation that can be accessible anywhere, anytime specifically on a 24-hour basis. This chapter explores the use of mobile technologies in the dissemination of traditional medical knowledge to the public. The objectives of the study were to investigate how mobile devices can be used in the dissemination of medical indigenous knowledge; the extent to which mobile technologies are used in the dissemination of traditional medical knowledge; and the challenges encountered by Kenya Resource Centre for Indigenous Knowledge (KENRIK) in the dissemination of traditional medical knowledge. The study was a qualitative research. The data collected was analysed using Strauss' grounded theory approach. The findings indicate that KENRIK has embraced the use of mobile phone technologies; mobile technologies offer efficient, and scalable method of providing outreach services for a wide array of health issues including traditional medical knowledge; and that there are diverse platforms that can be used to provide traditional medical information. The findings of this study can be used by KENRIK to scale up the use of mobile phone technologies to enhance dissemination of traditional medical information.*

**Keywords:** *Mobile technologies, Indigenous knowledge, Traditional medical knowledge, Kenya.*

## 1 Introduction

Evolving mobile technology platforms provides new opportunities for traditional medical knowledge dissemination. They can place timely information in the hands of those who need it most. There are roughly four billion cell phone subscribers in the world, with the most rapid growth in the use of mobile phones occurring in the developing countries (Maliehe and Sharp, 2018). According to World Bank (2018) almost two thirds of Kenya's population earning less than two dollars a day have access to mobile phones. Mobile phone penetration in Kenya has increased significantly with 42 million reported subscribers in 2018. This translates to 90.4 percent according to the Communications Authority of Kenya's 2017/2018 report. The incredible progress in Kenya's mobile technology has led to knowledge and information dissemination revolution that address global sustainable goals of good health and wellbeing. This is one of the country's top four development agenda of the government (KIPPRA, 2018).

In Kenya, more than two thirds of the population live below poverty line. When people are unable to access the conventional medicine in remote areas, they mostly resort to traditional medicine thus the importance of traditional medicine knowledge. Despite great progress witnessed in conventional treatment remedies, traditional medicine has been encouraged by the World Health Organization (WHO, 2013) partly because some conventional drugs have failed to prove effective (Kareru *et al.*, 2007). Traditional medicine is the sum total of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health, as well as to prevent, diagnose, improve or treat physical and mental illnesses (Seth and Sharma, 2004).

Kasilo *et al.* (2010) assert that in various third world countries, traditional medicine is still the central source of health care for approximately 80% of the population because of its cultural acceptability, affordability and accessibility. In Kenya, traditional medicines have become increasingly desirable and indeed popular especially where conventional drugs have failed (Wachira, 2017). This view concurs with a study by World Health Organization (2010) which established that there was an upsurge of attentiveness in the use of traditional medicine in third world countries where it is usually referred to as complementary and alternative medicine.

Traditional medical knowledge may be lost forever if not appropriately recognised, analysed and disseminated. Knowledge that is gained but is unavailable to others is wasted (Adebayo *et al.*, 2017). The Kenya Resource Centre for Indigenous Knowledge (KENRIK) which administratively now falls under the Department of Cultural Heritage was initially a section under the Centre for Biological Diversity (CBD) department at the National Museums of Kenya. The section's mandate is to disseminate traditional knowledge including traditional medicine knowledge through various means and platforms like mobile technologies.

## 2 Statement of the problem

The revolution in ICT has affected the way people undertake their day to day activities. Mobile phones, for example, have various benefits that can enhance their adoption. This technology has simplified the way people conduct their business. This is because they are owned by many people; knowledge managers are no exemption. Companies have come up with smart phones with applications that are more sophisticated and can perform many functions. These phones are affordable and are easy to use. There are regulatory regimes that favour the use of these gadgets. For instance, in Kenya, the person making a call is the one who pays for the communication time. Given the scenario, two fundamental issues emerge with oral dissemination of traditional medical knowledge; the precision of data and the information disseminated in this way. Occasionally, traditional medicine needs to go through preliminary clinical tests before being used for standard therapeutic treatments. Oral dissemination of traditional medical knowledge has no records of accomplishments or disappointments as risks are ignored (Downs *et al.*, 2004).

Kenya is also experiencing the issue of imposition of traditional medicine frauds in the general population. This is done by charlatans who represent a considerable authority in deception and misrepresentation of facts to swindle individuals with the aim of making profit. These fraudsters are found in most African countries. There may also be instances of offenses of fake traditional medics or medical knowledge owners who act like conventional medicinal professionals that go unreported. It is important to document and disseminate traditional medical knowledge to the public to avoid being deceived.

## 3 Objectives

The aim of this study was to explore the use of mobile technologies in the dissemination of traditional medical knowledge in Kenya. The specific objectives were to:

1. Investigate how mobile devices are used in the dissemination of traditional medical knowledge;
2. Determine the extent to which mobile technologies are used in the **dissemination of** traditional medical knowledge;
3. Explore the challenges encountered in use of mobile technologies in the dissemination of traditional medical knowledge; and
4. Make appropriate recommendations to the challenges encountered while using mobile technologies in the dissemination of traditional medical knowledge

## 4 Research Questions

1. How are mobile devices used in the **dissemination** of traditional medical knowledge in Kenya?
2. To what extent are mobile technologies being used in the **dissemination of** traditional medical knowledge in Kenya?
3. What are the challenges encountered in the dissemination of traditional medical knowledge in Kenya?
4. What are the appropriate solutions to challenges encountered while using mobile technologies in the dissemination of traditional medical knowledge in Kenya?

## 5 Methodology

This study employed a qualitative research approach. The study was informed by a case study method because it is an empirical inquiry that investigates a contemporary phenomenon within its real-life context. The design was chosen because it allows in-depth study and gives distinction and complexity of the issues of study. Data was collected using interviews and documentary analysis. The setting for the study was at KENRIK which is based at the National Museums of Kenya. Interviews were conducted with 5 employees of KENRIK who constituted the whole population. The interviews were conducted through cell phones. Each Interview lasted between 15-20 minutes.

## 6 Research Findings

The findings of the study on which this chapter is extracted are presented and discussed here according to the objectives of the study.

### 6.1 Use of mobile devices in the dissemination of traditional medical knowledge

Mobile technologies offer communities the opportunity to document, disseminate, and raise awareness about traditional medical knowledge. They allow users to create documents such as spreadsheets, forms, and presentations within the applications itself or to import them through a Web interface (Owiny *et al.*, 2014). Cell phones for example are becoming progressively well received and used among all communities. Numerous individuals depend on their cell

phones and technologies on a day to day basis to remain connected or be in contact with different people in their informal communities. Most of the study participants explained that their cell phones have become part of their lives. A participant aged 25 years old said:

*"I cannot leave my house without my cell phone. If by any chance I forget it in the house I will be forced to go back for it."*

Another participant aged 40 years said:

*"I expect to receive calls, text, photos or audio-videos in my phone any time so I have to be with my phone all the time. My phone is like a part of my body"*

Respondents clarified that they encounter a solid connection to their cell phones with many saying that;

*"I dependably carry in wherever I go"*

The findings indicate that mobile technologies have turned out to be popular especially among youthful generation. In particular, WhatsApp which can be used to disseminate, collaborate and share traditional medical knowledge. Furthermore, people claim to see these technologies as agreeable, simple and powerful methods for communication for youthful individuals (Thompson and Cupples, 2008).

### 6.2 Extent to which mobile technologies are used in the dissemination of traditional medical knowledge

The researchers established that cell phone users consult indigenous knowledge managers at *KENRIK* for different remedies to confirm information obtained from other sources like traditional knowledge owner and vendor within their location. The respondents noted that:

*"They sometimes ask about specific remedies to confirm what they have been told by a village doctor"*.

When asked whether they know the traditional medical knowledge used for treating different types of diseases among different communities in Kenya: The response was as follows:

*"One of our users called the Centre from Taita County to ask how the Luo community treat evil spirits using a mobile phone. A mobile phone is a very important tool. It helps us a lot to disseminate what we have and know. Mobile phone is the best when compared with radio and television. Even if you don't know someone so long as you have their mobile phone number, you can use the phone to communicate"*.

In general, mobile technologies offer powerful methods of conveying traditional medicinal knowledge to Kenyans through calls and messages at different stages. Numerous individuals who customary had no access to this knowledge can presently utilize cell phone devices to pass knowledge from one source to another on a daily basis. The application of mobile handsets and the penetration of their technologies countrywide offer an alternative platform for dissemination of traditional medical knowledge with little effort.

The benefit of these technologies is that they are accessible on many cell phone models. In addition, the cost is moderately low, its utilization is far reaching, it does not require expertise to impart usage skills, and it is generally appropriate to disseminate private messages.

Mobile technologies offer effective and versatile strategy for giving traditional knowledge managers a wide cluster of medical problems solutions. This investigation established that several clients effectively use cell phones because the cost of an individual messaging is low (somewhere between US\$.02 and US\$.05 in Kenya), as well as the cost of making phone calls. Another attribution is the structured cost of messaging, especially WhatsApp which is extensively more affordable than standard voice communication. For this reason, majority of Kenyans are comfortable using WhatsApp to communicate. Additionally, mobile technologies are exceptionally basic in the dissemination of ideas on traditional medical knowledge to many users at the same time.

### 6.3 Challenges encountered when using mobile technologies in the dissemination of traditional medical knowledge

Some of the challenges stated by the respondents include trust issues, fear of change where users did not want to rely on mobile technologies for traditional medical knowledge. This is because they consider traditional medical knowledge as useless and inflexible on issues to do with copyright and licensing.

According to Lwoga *et al.* (2008) poor attitudes, learning society and individual attributes (age, sexual orientation, status, riches, political impact et cetera) likewise influence recognitions, activities and access to information within networks. Meyer (2009) observed that information streaming in an oral setting is controlled by states of mind, observations, standards, qualities and conviction frameworks inborn to indigenous individuals. For instance, when individuals encounter information they require, they will approach a proficient individual whom they trust.

Mobile technologies users have in the recent past experienced cases of disinformation that are western driven portraying that traditional knowledge systems are misshaped (Obiora and Emeka, 2015). According to Msuya (2007) youthful generation engulfed in the 'modern' way of life are less keen on traditional medical knowledge.

#### 6.4 Suggestions to the challenges encountered while using mobile technologies in the dissemination of traditional medical knowledge

The respondents suggested that there is need for a simplified messaging system which can empower users with low literacy abilities in order to use mobile technologies effectively. This will enhance their access to traditional medical knowledge.

Emphasis was made that because researchers and practitioners are also beneficiaries of mobile technologies in the dissemination of traditional medical knowledge to the public, there was need to use suitable modes of disseminating traditional medical knowledge to the consumers.

### 7 Conclusion

Based on the findings of the study, mobile technologies are not stand-alone models in the dissemination of traditional medical knowledge; rather they act as a tool through which several awareness techniques can be administered. In order to achieve effective and measurable results in the dissemination of traditional medical knowledge, which is still in its infancy, the implementation of mobile technologies and programs are best done alongside the existing pre-tested mechanisms. They should be rolled out in major platforms for the dissemination of specific traditional medical knowledge, such as KENRIK which already knows who their users and clients are and what services suit them. Mobile technologies have value to both researchers and practitioners, and their adoption can facilitate more active collaboration between research and practice. From the research findings, the increasing uptake of mobile technologies through applications like text messaging may improve existing practices and interventions.

### 8 Recommendations

This study recommends that:

1. Mobile technologies should address issues such as the use of client's local language in the provision of traditional medical knowledge.
2. A system for the collection of traditional medical knowledge should be development and also the collection structured to provide insight into indigenous knowledge systems. The system should be capable of producing media in various forms, such as photographs, documents, videos and web pages.
3. To have a long-term success, mobile technologies should be adopted by indigenous users because they provide low-cost and user-friendly option to capture and renew their knowledge.
4. Simplify messaging system which can empower users with low literacy abilities to use mobile technologies effectively to access traditional medical knowledge

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# Indigenous Knowledge and Identity: An Inside-Outside Perspective

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## Abstract

*We write at a time of intensive introspection among Kenyans. Everyone we see, hear and read about is aware and distressed about certain negative developments in Kenyan culture and society that seem to be coming to a head in our daily and national lives. It is with this distress in mind that we try, here, to shed some light on a few of the major self-harming attitudes and behaviours that Kenyans may or may not be aware of as part of Indigenous Knowledge but that people use to define their actions and to construct their own identities. Our purpose is to verbalise a body of mobilised, tacit, indigenous knowledge (MTIK) and to bring it to the attention of our heroes in Information and Knowledge Management in order to inform their on-going research efforts. In so doing, we hope to stimulate their interest in indigenous knowledge and its position and future in the digital age. We note that, for the most part the knowledge models we describe here were once useful but are now harmful to the overall body of Kenyan thought and action. While we would like to believe that the younger generations can modify harmful patterns in their culture in constructive and positive ways, we are relying on others to discover this through research. We begin by describing our rationale and methodology and by introducing ourselves. We then describe eight indigenous thought and action/behaviour paradigms some of which are unique to Kenya, some to East Africa and some to our entire species. For each of these, we try to identify, mostly through retroactive speculation, their historical economic and social origins by way of explaining how they work and how they affect Kenyans now. Finally, stepping out of our professional depth, we look briefly at the revolution in communication brought by social media and pose questions about how it can or will affect the use, continuity and possible change in indigenous self-defeating and self-enhancing thought/knowledge.*

**Keywords:** *Indigenous Knowledge, Identity, Culture, Maasai, Acholi, Kenya, East Africa*

## 1 Background and Methodology

This study began on December 1, 1967 and is continuing into the future. It is not time bound. It includes historical documentation of personal experience and report from a great many people. Our three individual and collective experiences in Kenya began in the early years of independence. We have witnessed the multifaceted struggle to assert and establish a Kenyan identity and to promote indigenous knowledge and lifestyles while grappling with class formation and drastic demographic and socio-economic change. For all three of us, the main methodological tool has been participant observation now called up through memory and occasional reference to print materials for stimulation and verification.

In the 1960s and 70s, the Pidos saw Kenyans' bright optimism while Khamala, our colleague and co-author, was learning the basics of a culturally conflicted world, an experience that began in England, and grew in Kenya through the 70s. The bright optimism dulled and withered in the 80s and, by the early 90s, Khamala, now returned home, had emerged into adulthood while the older authors saw a kind of desperation enter the Kenyan scene. By 1992, in spite of encouraging political change, the salaried workers in the cities could no longer afford to send cash to their relatives in the rural areas, and the rural dwellers no longer had enough food to send to the cities.

This was at about the time when Khamala, who could have been our son, entered his professional life. We did not know him then but, in retrospect, we are aware that his entry was fraught with complications that he would have taken as normal, not knowing anything different. By the mid-1990s we realised that people who had been furnishing their homes and making their living by producing hand-crafted products could no longer survive without electrification. National transportation had greatly improved, and rural electrification was spreading apace. Cell phones appeared as a novelty for the rich and we were still using film in our cameras. This was at the same time that Khamala's digital/manual animation business began to flourish. It had taken the Pidos ten good years to adjust to the computer; Khamala was of a generation that stumbled upon it in its early stages. We were all hurtling toward the digital transformation of human life.

This study is not time bound. It is based on over fifty years of participant observation in Kenyan life as outsiders with some insider understanding and knowhow. Each of the Pidos has been in Kenya longer than over 80% of Kenyans have been alive including Khamala who now, along with his elders looks to his son's generation as new and almost inexplicable.

For over five decades, the authors have been outsider participant observers, one from near, one from far, and one with an early childhood history abroad. The Pidos hail from two other former British colonies, Uganda and the United States of America. While Ugandans possess a healthy dose of design humility, Americans have nothing of the kind. For Khamala, early life was defined in part by his parents' efforts to remain African/Kenyan while adjusting to British culture and

society in the name of ‘modernity’ and ‘civilisation.’ He is a Kenyan to the core but not without mitigation. To a large degree all three of us share an outsider perspective while being immersed inside.

To compound all of this, everyone in Kenya functions in a post-colonial world where detailed analysis of the historical record and contemporary criticism overwhelmingly damn the whole colonial enterprise of all colonisers going back five centuries and more. Considering a documented history at least 3500 years long of outsiders entering, plundering and leaving East Africa, widespread xenophobia is hardly surprising. A large mural, now in the Sudan National Museum in Khartoum and reproduced full size in the Metropolitan Museum of Art in New York depicts a procession of black people of obvious Eastern African appearance bearing offerings to an Egyptian official. Herodotus, in *The Histories* describes travellers’ accounts of the East African region between the snow covered mountains and ‘Ethiopia’ (Herodotus, 1992). In the seventh century, a maritime historian describes people in the East African interior and gives tips for dealing with them. Much of what Kenyans do and make reflects their long history of interaction with hostile or acquisitive foreigners and their struggles to survive in fickle, marginal environments.

Several millennia of self-protection from assault by outsiders cannot be overcome in a few years, maybe, not even a few centuries. Damnable as it was, the colonial period has been over for more than half a century, having left behind a very bitter taste along with some very positive additions. We need not enumerate all the horrors of the colonial period here as they are covered elsewhere in the history literature. Among the positives are parliamentary democracy, paved roads, internationally-controlled currency, and literacy through schooling. However, these have been gained or imposed at the enormous cost of vast bodies of knowledge lost through deliberate, unintentional and later voluntary epistemicide and sui-epistemicide. One aftermath of the 19<sup>th</sup> and 20<sup>th</sup> Century epistemicide is the continuity of indigenous knowledge that coped with the depredations of capture and enslavement by peoples from the North and East. While this knowledge had an important role in dealing with foreign predators and survival in a harsh environment, much of it is no longer useful and some is downright destructive in contemporary Kenya. All human communities have undergone drastic change in the last 100 or so years and all that we know of persist in behaviours that have become less than self-enhancing. Kenyans are no exception to this.

Our work is firmly grounded in the methodologies of both academic and professional Anthropology and Design. It amounts to historical documentation of the early stages of a revolution in the elucidation, dissemination, generation and utilisation of ‘indigenous’ knowledge. As that revolution expands, we must recognise, describe and analyse its complex processes for our own and future benefit (Pido, Khamala & Pido, 2017; Pido, 2018). This study is dynamic, continuous and cumulative, growing and changing every day. Indigenous knowledge has dimensions and dynamics that have not been clearly identified or articulated in the past. Our main finding is that Kenyans are continuously re-inventing themselves as a nation of communities and individuals both consciously and sub-consciously. Long experience in the face-to-face generation of identity is giving way to the accelerated negotiation of identity through social media by young people whose conscious knowledge of their own ‘traditions’ is often limited. The younger generation now often just does what it does without intellectually connecting their actions to ancient or pre-colonial history. Everyone, especially the young generation, can now access enormous volumes of information at their fingertips. They can observe, study, and learn everything from jet engine maintenance to biochemistry to lace making, all on the Internet through social media. No one is ethnicity or nationality bound anymore.

## **2 Manifestations of Indigenous Knowledge**

All too often we tend to think of ‘indigenous knowledge as a body of information about climate, plants, and animals or about secrets of the universe that enables peoples to survive. Scholars and lay people seldom identify the tacit indigenous knowledge that governs individual and group actions. Neither do any of us consider or recognise the generation of indigenous knowledge in the form of creative interpretation of ever changing surroundings and economic realities locally, nationally and globally. Throughout human history, younger generations have seldom been credited with the creation of new ideas but are often dubbed ‘rebellious.’ We know of young people who have been sent back from the diaspora to rehabilitation centres for religious ‘rehab.’ Though there are many kinds of negative understanding and self-defeating behaviours based in indigenous knowledge, we examine the following 8 that contribute to Kenyan identity.

1. The Zero Sum
2. Hongo
3. Deflection of blame
4. Defiance of risk
5. Obstruction
6. Infantile identity
7. Incomplete communication
8. Negative Evaluation of Difference

The data presented here are largely exemplary, explanatory and anecdotal. Most are based in memory and insightful connection of witnessed or lived moments in time. The reader is reminded that Herodotus (1992), Socrates (Rachels, 2017), Charles Darwin (2011) and Sigmund Freud (1955) relied heavily on anecdotal data as did Mathew, Mark, Luke and John whose collections of anecdotes we call the gospels. Our anecdotal accounts of behaviours are mere illustrations picked from a sea of experience. This is in keeping with a growing trend in the academic literature to defend the use of so called ‘non-scientific’ methodologies and data (Baker, 2013; Rogers, 2018; McDermott & Hall, 2007). The behaviours we note are manifestations of indigenous knowledge, most of which is tacit and rarely articulated or explained. Some of our stories below illustrate this. In our experience and observation, two major ideologies permeate human life in East Africa in general and Kenya in particular. These are the “Zero Sum Mentality” and what we are calling the “Hongo Mentality”. There are many others that are connected to these two, as follows.

### 2.1 The Zero Sum

Overarching all is the “Zero Sum” or the notion that there is a fixed amount of good or benefit in the universe and that if one person gets something it must be at the expense of others. Intellectually, we can connect the “Zero Sum” mentality to the East African climate and environment which have been unpredictable for many thousands of years. The sustained production of surplus is impossible here, and even subsistence bases are subject to unforeseen calamities that can kill off many people in a short time along with crops, livestock and wild animals.

Cattle raiding is one product of this environmental unpredictability. People aspire to stock ownership in excess of the land’s carrying capacity so they circulate animals through theft. While this has negative consequences in terms of loss of human life and the spread of animal diseases, it also has the effect of shoring up communities whose very existence is never quite assured. This aspiration and the efforts to satisfy it can be likened to gambling by buying a lottery ticket because it offers temporary moments of hope and the fantasy that all will be well. By way of lived example of the zero sum mentality, we relate several experiences:

1. A group of four compound mates, three nurses and a student, met for tea several times a week. One day when one was absent, Rachel (not her real name) came at teatime and flopped in a chair. She explained that she was exhausted from all her efforts of the day. She had been to every government office and every wholesaler in Narok town doing whatever she could to prevent the fourth member of the group from being able to open a bread, milk, tea, sugar, and soap kiosk as she was planning. She narrated her efforts of the day without a hint of self-recrimination but with great certainty that she had done the right thing. She was confident that her efforts were the best that could have been made. The others asked if she was planning to open a competing kiosk but she was not. She was just preventing their other friend from having one. She did not mention that the kiosk would have increased the other friend’s income or standing in the community.
2. Two families lived side by side in a Nairobi housing estate. One family had in their garden some beautiful trees including a loquat and a mango tree. One day when that family was away, the next-door neighbour came across the fence and chopped down all the trees. The reason? He did not want the other family to have those nice trees. He didn’t plant any for himself and didn’t want any. In fact, he chopped down his own guava bearing tree and threw the logs into the neighbours’ compound. He just didn’t want them to have nice trees. At the time, the family attributed his anti-social behaviour to his overtly tribalistic and racialistic attitude. They later came to realise that underlying his behaviour was the tacit knowledge that their good fortune was his misfortune.
3. One reason that Kenyan students seldom engage in classroom debate is that they fear incurring the wrath of others who will undermine them for excelling. Why? Because if you participate well and I do not, it will be because you took my opportunity away from me. Two families who were friends sent their daughters to the same boarding school. The parents of one of the girls kept monitoring the other to make sure she wasn’t doing as well as their daughter. She was doing much better, and that caused them great anxiety.
4. Several years ago, one of our students attended a tree planting event at his little brother’s school. The children had to go through an obstacle course with their seedlings before planting them. It was a sort of a race with prizes for the winners at the end. Our student was appalled when some children openly cheated by skipping some of the obstacles in the course. Even more shocking were the parents who cheered their little cheaters on and encouraged them to succeed by cheating.
5. It has become the order of the day for various people to manipulate the system to siphon money out. A number of strategies are used from tenderpreneurship to cartelism. In one example of tenderpreneurship, a government agency in education was uniquely placed to implement a government programme aligned to the ruling party of the day’s manifesto. It goes without saying that the programme was well funded. The implementers in question, however, saw this as a ‘chance to eat’ and what we observed was an intricately crafted tendering procedure tactically positioned to the advantage of the eventual tender winner. Unexpectedly, the tender sum was highly inflated, and the quoted sum expeditiously released. The officers responsible are regarded as astute heroes rather than criminal fraudsters. Despite the aversion and awareness

of the downside of corruption, tenderpreneurship is rampant in Kenya's high offices. If the collapse of the US and European economies in the 2008 financial crisis taught us anything, it should be that government coffers are finite. The crisis showed how a country's private sector and its government are inextricably intertwined. In Kenya, the government's budgetary expenses amount to about half the country's GDP. So, when the state struggles with debt, for lack of liquidity, the entire economy is dragged down. In the long term, it is a "lose-lose" situation.

6. When the young are co-opted into the 'our turn to eat' food fest, the zero sum mentality experiences a multiplier effect. In one incident, we were addressing a local national public secondary school on their career day. In the address, Khamala explained the usual pathways to a successful professional life from the Sciences to the Arts. In the questions and answers section that ensued, it was worth noting the Kenyan students were acutely aware that the formula to being a success involved the least effort and yielded the maximum returns. The students openly admonished Khamala for appearing to mislead them by talking about a professional career leading to a successful life. The general consensus was that a moneyed lifestyle was a successful one, and its torch-bearers were role models worth emulating. The students gave examples of politicians, pastors and lawyers who, in the majority of cases, had reportedly stolen billions of shillings as brilliant exponents of success. This zero sum has planted its roots generationally to potentially devastating effect.

## 2.2 Hongo Mentality

In Swahili dictionaries, *bongo* means bribery (East African Language Commission, 1930) but it is a bit more complicated than that historically and culturally. The word predates the colonial incursion and includes reasonable charges and gratuities for services and access for travellers along with a complex system of trickery, chicanery and extortion from locals and foreigners alike. The arrangements and payment of *bongo* can be friendly, mutual and facilitative. Or they can be hostile, manipulative and deliberately put into place to inconvenience or even harm a victim. Few Kenyans are aware that the word '*Hongerera*' comes from *bongo* and actually means 'may you succeed with your scam.' In many cases, *bongo* is exacted after an agreement has been put into place but before it is completed. Kenyans often do not see any problem with changing the ground rules after an agreement is made and is being enacted. People in other nations have put in place specific constitutional and legislative preventive measures against what the legal profession calls '*ex post facto*' legislation which simply means changing the law 'after the fact.'

An early recorded example of *bongo* comes to us from Joseph Thomson who wrote of his experiences travelling through Maasailand and back to Mombasa in the 1880s (Thomson, 1885). Thomson was a geographer sent to East Africa by the Royal Geographical Society in 1883 at the age of about 25. He was a bit of an arrogant swaggering misogynist who later promoted himself as the first 'white' man to traverse Maasai territory and survive. Knowing that he would have to pay 'gratuities' for safe passage wherever he wanted to go, he brought with him a number of trinkets and 60,000 strands of glass beads, a commodity that was in high demand everywhere. These he used as gifts and as payment to local leaders on his way. After about 9 months travelling northwest, he arrived in the area near Bungoma. All along the way, everybody who saw Thomson and his entourage could see that he was removing strands of beads from boxes until they were empty. When he ran out of beads near Bungoma, nobody would believe that he didn't have any more. He was threatened and harassed, practically running all the way to Mombasa. Local people continued to demand that he pay them in glass beads and refused to believe that he had none. That was in the 1880s. In the 1980s one of us authors were threatened with a beating on the spot for inability to immediately hand over a video that had been shot by a visitor and taken back to California. The person demanding it could clearly see that there was no videotape but kept up his demand.

There is no need, in this chapter, to tell East Africans how the *bongo* mentality plays itself out today so only one small example will suffice. The authors, in collaboration with the traditional leader of a Maasai age set, organised a project in 2003 to promote AIDS and orphan care awareness among new elders and incipient warriors in Kajiado District. Two years later our team was invited to attend a ceremony as a continuation of the project. We went, carrying with us a *kebanga* for each of the mothers in the warriors' *boma*. When we arrived and told the elders what we had brought, they demanded two *kebangas* for each mother. Along with our Maasai colleagues, we decided that the elders were being unreasonable in their increased demand and we knew from experience that their demands would only increase if we stayed. So we left and did not go back. Several years later, our collaborators did something similar and we ended our four-decade long association with the Maasai community.

## 2.3 Miscalculation/Defiance of Risk

East African societies are built on features and mechanisms that enable people to survive by coping with a fickle environment and limited resources. These structural and intellectual measures are designed to share, disperse and avoid risk to individuals, their families, communities and livestock. It is baffling that, in spite of these built in preventions, many Kenyans, in today's society, routinely miscalculate or defy risk in their daily lives. The closest we can come to an explanation for this phenomenon is to look at the connection between the need for extreme stoicism and overtly reckless bravery in the face of threat.

In the traditional initiation process, young men and women are taught to endure severe pain and hardship and to defy risk to their own safety in order to protect their families and communities. Warriors have to cultivate the extreme bravery that drives them to do battle with human and animal threats. Women have to defy the risk of harm to themselves in order to rear their children and support their husbands. The contexts of bravery and defiance have shifted in recent decades from endurance of famine or confrontation with wild animals and hostile humans.

Defying risk by stepping into a busy street without checking the oncoming traffic, a very common behaviour in Nairobi, has nothing to do with the earlier need to be able to defy risk. Drivers who defy risk on our roads end up dead, or injured while inflicting harm on others. We can see evidence of this in the many dented and damaged vehicles on Nairobi's roads that have very recent number plates indicating that they have been damaged by driver's disregard of the risk of colliding with other vehicles. Our favourite taxi driver identifies careless *matatu* drivers on the road by pointing out the many dents and repairs to their very new vehicles. Their carelessness and the high percentage of traffic deaths, especially to pedestrians, are connected to defiance of risk on the road by both drivers and walkers.

In Acholi culture, beyond winning-over a spouse for life, is to *kayo lak* (bite teeth), which is to persevere pains and not to be cowed by threats. To *chamo choo* (eat manhood) is to behave in a manly way or to psych oneself to bravery, enough to dare anything even if death were its consequence. The wish to be brave may be as irrational as confronting a wild animal. And to *cyo too* (is to dare death) even if doing so is without any gain. One example of daring death may be seen in some men's refusal to use condoms and risk death simply because to fear death is not a manly engagement. The expression 'a bull dies eating grass' is a testimony of the determination to remain brave at all costs. It is the way some men responded to the information that the use of condom reduces risks of HIV-AIDS infection and death. So, as far as the men were concerned, they would rather die than not be brave or manly.

During the late 1980s and throughout the 1990s, the authors checked the obituary pages in the newspaper every day to find out whose funerals they would be going to. Why? Because many university lecturers, health care workers and government officials felt that they were not at risk of contracting HIV and AIDS. Some of our university colleagues killed themselves and their wives and other partners through their defiance of risk and refusal to take prophylactic measures against infection. During the 1990s, we were engaged in several studies in the public health field. Their objectives were to find out why people defy the risk of infection and why they sometimes act contrary to their own best interests in seeking appropriate care. We often heard stories to the effect that AIDS was a hoax perpetrated by Wazungu or Caucasians, as defined by Bhopal and Donaldson (1998) in clinical and epidemiological discourse in their effort to exterminate Africans. Later, in the 2000s, we worked with some of the many orphans of those people.

In many cultures outside of East Africa, identified risk is to be avoided, reduced or eliminated. In Kenya, according to our observation, risk is to be defied. Many of our students have told us that they don't use condoms because they are only 98% effective. The 2% risk was considered justification for rejecting condoms entirely and accepting a risk level of 100%. We see that as a miscalculation and failure to assess risk accurately in spite of inputs from religious leaders. Far from Kenya, a famous American actress had a much publicised double mastectomy. She made the choice to have both her breasts removed because several of her female relatives had died of breast cancer. She herself had been assessed at very high risk (87.5%) of developing the disease. Many Kenyans remarked that there was still a 12.5% chance that she would not get sick and die and that, therefore, she should not have had the surgery. She is still alive, looking good and busy raising her 6 children.

#### 2.4 Displacement of responsibility

Blaming supernatural forces, invoking divine authority, ancestors or various kinds of spirits is common everywhere. Likewise pointing to other people is very widespread among all humans. We know people who have claimed that their 48<sup>th</sup> place in a class of 50 students was the fault of bad teachers. A late politician we knew had a problem with bees nesting in his chimney. His brother and assistant went up to the roof and smoked the bees out. They left the smoker on the roof, the fire smouldered and spread, and late that night, the house burst into flames. Knowing this, the politician blamed his 'political enemies' for burning down his house. Some communities in Western Kenya do not recognise any natural causes of human death. Even incurable disease or road accidents are blamed on witchcraft by neighbours or relatives and revenge is taken.

We have witnessed parents stomping on the ground to punish the place where an over exuberant three-year old tripped and fell while running too fast for his size. The child was neither gentled nor reprimanded but, instead, was assured that the wrongdoing root or pebble or other obstacle on the ground had been duly taken to task for his injury. Carried to a higher level, we often see headlines after major accidents that condemn a killer bridge, road or damn. We hear that the recent damn disaster was caused by the neighbours in the area irresponsibly clearing the land and a host of other wrongdoings by way of excusing the owner of the dam that was not properly maintained. Back in the 1980s, a high official at the University of Nairobi died suddenly while having a beer with some colleagues. His widow had his internal organs sent to UK for analysis because she was certain that his companions had poisoned him. No evidence of poison

was found. Blaming the colonial powers is a national sport in Kenya that needs no elaboration here. We all remember the blame that was heaped on the British for the very low standard of staff housing that prevailed in some government institutions within the last 20 years, more than 30 years after the British had left.

It is in the context of displacing responsibility for disasters to mystical or supernatural powers that one hears about a killer road, bridge or bus. The question to answer is why do humans and especially East Africans prefer to displace responsibility for our mistakes to the supernatural or other people? Why do we say *alii ber ki ninyo* (disaster befits birds)? To answer this question, we ought to remember that no one likes the damages disaster brings. Hatred towards disaster-related damages is the most likely reason why we humans do not like to take responsibility. Unless it is war, it is very difficult to take responsibility for the death of another human. Unwillingness to take responsibility is why we prefer to remove disaster from human realm and place it in the realm of the supernatural. Even when we are unsure of goings-on in supernatural worlds, it is in it where we prefer to displace disasters, misfortunes and mistakes. This is also why we blame other people or something else for our failures, mistakes or inabilities. Does doing so give us peace of mind? The authors are unable to connect this seemingly universal human phenomenon to the East African climate and environment. Neither can we connect it to the colonial past.

## 2.5 Obstruction and Obstacles

As design educators, we are constantly beating the drum of user friendliness. That means making things easy for the user or participant. There is now a sub-field of the design profession called UX or User Experience design. User friendliness is particularly important to consider in Kenya because of the cultural preoccupation with making things challenging or difficult and with placing obstacles and obstructions. The process of initiation is a case in point. In most Kenyan communities' children transiting to adulthood are subjected to painful and traumatic physical and psychological ordeals in order to prove their worthiness. Preparation for adulthood and transition to adulthood through physical ordeal is intended to harden the initiate against all adversity. All of this used to be good but it has lost its efficacy in the 21<sup>st</sup> century. Nowadays the traumatic ordeal practice is carried over into the schooling system in the form of exams designed to eliminate rather to include. It also appears in the way university entry requirements are set in order to make entry impossible for many candidates who would otherwise be well qualified. Many Kenyans seem to believe that if it isn't difficult, it doesn't count. Ironically, Kenyans were colonised by a nation which confuses comfort with pleasure and pleasure with excess. The British tend to place obstacles in people's paths primarily to reinforce rigidly established social hierarchy. Other than the past difficulties in obtaining telephone service and the need to have a letter of introduction in order to open a bank account, this has little to do with Kenyan's placement of obstacles and infliction of hardship.

A now successful Kenyan painter told us early in her career that she wanted the viewer to have to work to understand her paintings. At that time, she was turning out dark and dreary looking work in dull colours. She was trying to send a message but expected her consumers to be willing to struggle to figure out what she was trying to say. That lasted about two years before she changed her style and became successful in selling her work. All too frequently we find students with the same attitude. One of our students designed a roadside billboard that was supposed to be advertising a cultural festival. He produced a low contrast design with the main message written vertically in a way that was extremely difficult to read. He did not take into account that a roadside billboard has to be readable in a second or two. He stated that he wanted people to have to study his work to appreciate it. We now see a plethora of roadside billboards that are designed to be 'studied' rather than read quickly and absorbed.

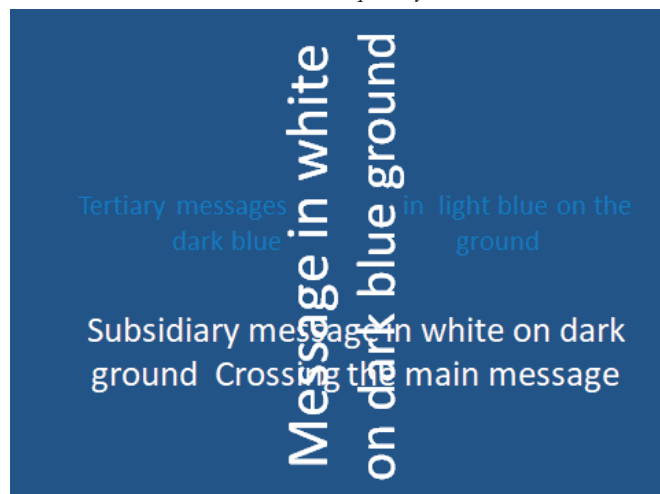


Figure 1: The Authors' reproduction of a student's design for a roadside billboard showing a deliberate effort to make it hard to read.

As a further example of making things difficult, we need only mention the new road system that the Chinese built throughout the Nairobi area. Going into detail would be superfluous considering our audience's universal experience of its difficulties. Even readers a century from now will be able to see the results of the engineered but not designed system of Nairobi roads. It is most unfortunate that families, neighbourhoods and business areas have been cut off or made difficult to access. There are many places in Nairobi now where drivers have to go a kilometre or so out of their way just to make a simple turn.

## 2.6 Infantile Identity

Kenyans often identify their nation state as child of diminished responsibility. Our observation of this phenomenon is clarified through one author's American identity. For over two centuries, Americans identified with an image of their country as a young man taking control of his birth-right. This was tacit, indigenous knowledge and it was played out in cinema, novels, daily life and international diplomacy in the form of American 'exceptionalism' explained as justifiable. Mothers often told their children that their country was the best because it was the youngest country. Children who pointed out that the US was pushing 200 years of age were reprimanded. The imaginary, unstated 'young man' was competent, strong, well-motivated and justified in his actions. It wasn't until the late 1960s that average Americans began to realise that their self-image was contradicted by their aggressive actions and that they should be seeing their nation state as a global bully.

Upon attaining independence in 1963, Kenyans also identified their country as young but as an infant. An infant is a person who needs and deserves indulgent, loving care by adults. An infant can mess up Mommy and Daddy's house, poop in its nappies and throw food against the wall and still receive loving parental care and support. By as recently as 2016, the authors heard and saw repeated reference to Kenya as 'a young country' in order to justify doing childish or incompetent things. In the early 2000s the banking industry in Kenya hosted an international conference of banking organisations. They took out a full page advert in a local newspaper showing a drawing of a 7-year-old child. The text was directed at the visitors from the global banking community. It stated that the Kenyan organisation was welcoming them just as a child would welcome a guest to its parents' home. This is the only time we have ever seen banks and bankers personified as juvenile. Portraying themselves and their industry as a person of diminished responsibility was, in the authors' opinion, not a good idea.



**Figure 2: Image of an advert placed by a local banking industry organisation in the Daily Nation, early 2000s.**

In many East African cultures, there is a sharp differentiation between children and adults marked by initiation. Initiated youngsters abandon the activities of their childhood never to return to them. A case in point is a friend who was told during his initiation that ice cream was only for children. Now in his late 60s, he has never eaten ice cream since. While we can observe this differentiation between adults and children, we can also note that in Acholi and other cultures very young children have a series of descriptive ranks starting with *'lukuhe iburu'* those who play in ash, and moving upwards in size and age through *onongo an lalingaling*, meaning I was still small and tiny; *porotino* faking teenage; and *tidi ka dako pe*, there is no smallness of a female. Once the child reaches his/her teens a different progression kicks in leading to marriage and adulthood. Each informal rank has its known rights and responsibilities. Growing children are censured or punished for failing of refusing to move on with their age and development. Why then does a whole nation state persist in self-definition as a child at age 56?

## 2.7 Incomplete Communication

Kenyans are fond of obscuring meaning, withholding information until the last minute, omitting crucial details, and/or forcing the recipient to come back again and again for the next bit of information or procedural instruction. A typical Kenyan signature is undecipherable. Students in secondary school make practice sheets of highly complex utterly unreadable signatures that they use for the rest of their lives. Most forms in this country have a line for the signatory's name and another for the signature.

Back in the 1980s one author was made to travel back and forth from Athi River to Nairobi to receive the instructions for each new step in the registration process at the University of Nairobi. When she asked for a list of all the steps she would have to fulfil, she was rebuffed. It should come as no surprise to the reader that people in other countries give out printed sets of instructions with a list of steps for processes like registration.

While preparing for an international scientific conference in Nairobi, we wanted to find out where it was to be held. This information did not appear on the "Call for Papers" or any other document regarding the conference. It also did



not appear on the conference webpage except in the instructions to delegates arriving by air who could direct their taxi drivers to a certain parking lot.

Kenyans who have not lived in other countries may not realise that this can be a problem. One frustrated foreigner was complaining to her local spouse when he explained that during slave times, you didn't tell anybody where you were going or when for fear that your neighbours or relatives would waylay you and kill, injure or sell you. This was usually because of competition for scarce land and other resources. That explanation triggered the memory of a young American traveller who was walking from Nairobi to Addis Ababa. Somewhere not far north of Marsabit town he met and quarrelled with some local people. He returned to Marsabit for a few days and let it be known that he was going to walk to Addis anyway. That was in 1971. No trace of him has yet been found.

## 2.8 Negative Evaluation of Difference

Ethnic, 'racial' and religious communities everywhere throughout history have drawn lines of difference among themselves. Most often, these lines are drawn by negation or derision of the 'other'. We cannot say that Kenyans are different from any other peoples in this regard. We have seen Christian clergy in Kenya, the US and Uganda speaking harshly of other religions in order to justify their own ideologies. This is the only explanation we can find for antisemitism in Kenya. On one market day in the early 1990s, a Kenyan vendor from Narok approached one of us and asked if she had ever seen a Jew. She asked why he wanted to know, and he replied that he wanted to meet at least one Jew because he wanted 'to help them.' At that moment there were at least 30 members of a tour group who were browsing the goods and conversing with each other in Hebrew. Knowing that there was only one possibility for their ethnic/national/religious identity the author kept quiet.

We know many negative ethnic and racial jokes from the White community in the US and from several communities in Kenya and Uganda. To say that these jokes and forms of derision are just funny and non-political would be exceptionally naïve. In Kenya, ethnic rivalry, negation and derision have always been present. The Internet and social media have given Kenyans a not so unique opportunity to spew their venom at one another electronically. If this absorbs the inter-communal hatred, that may be a good thing unless anyone acts upon the hate speech that is now a feature of social media. In the US, the public and government are witnessing the emboldening and empowering of haters with the support of the Trump White House. Since 2016 people have died because of this. We can only hope that web-based hate speech serves only as a vent for Kenyans and not a force for action. The story of interethnic and interreligious hatred in Uganda has seen our own communities harmed and tormented over several decades because of ethnic arrogance and sense of superiority by others. Having looked at and surveyed a number of Kenyan hate speech websites, we have decided to let more expert Kenyans do the commenting and analysis. We note, however, that use of electronic devices and social media in Kenya is largely a phenomenon of the young who are not necessarily occupied with exchanging or disseminating what some people would call 'indigenous knowledge' they are, however generating indigenous knowledge that will eventually come to be understood as earlier indigenous knowledge fades, is overwhelmed and disappears. The most likely platforms for transmission of this new indigenous knowledge would be Pinterest, YouTube and Facebook. The people posting material on these platforms are seldom if ever occupied with topical indigenous knowledge. We are told by colleagues that Kenyans watch YouTube mostly for traditional music. We academics now assign YouTube and Pinterest sites to our students. We also stand in awe of people like Julius Yego for bringing together his own knowledge of spear throwing with the internationally defined techniques of javelin throwing competition and became an Olympic champion. We are witnessing the globalization of access to indigenous knowledge by people who have posted *Nyatiti* lessons online so that anybody, anywhere can learn to play that instrument.

Twenty-two years ago, we thought it was cute that a grandma in Western Province got her grandson's email address in California and sent him a request for money – that he could not turn down. In the early 2000s we chuckled on learning that teenagers at the Coast were going to cyber cafes separately, going to their respective washrooms, undressing and taking naked selfies. Then they were going to adjacent computers, uploading and sending their images to their partners sitting next to them at separate computers. When we heard that the teenagers we saw standing in small groups many meters apart were actually trash talking each other on their phones, we opined that that might be good if youngsters could achieve orgasm on the phone thus sparing themselves from social disgrace and possible infection. Shortly thereafter we heard of 'cybersex' as the new fad in the more developed countries. Humans do manage to figure out how to use the affordances of social media and digital communication to accomplish their goals.

## 3 Conclusion

The ultimate aim of this chapter is to bring to light the continuities, shifts and drastic changes in East African response to the new, ever changing digital world and the use of knowledge to define identity. We are using identity, in part, as a euphemism for ethnic communalism. Our effort is stimulated and enhanced by the on-going debate on identity in the post-colonial, postmodern era. In recent years, digital media has greatly accelerated the pace of highly mutable identity

formation through high-speed communication and global access to how other peoples think and use their information. Finally, the authors examine aspects of the digital revolution in East Africa and their influence on the formation of identity and understanding of oneself through Social Networking. We are all fish in a different kind of water now. While we barely noticed, global digitisation has taken us all over. We now refer to a time in history we call BBC – Born Before Computers. As we all swirl around in the high speed transformation of civilisations what are Kenyans doing and what will Kenyans do?

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### About the Authors

**Martin Khamala** spent his early childhood in England. He completed primary and secondary school in Kenya and earned a degree in Civil Engineering at the University of Nairobi. He taught himself animation and opened his own company, Mank and Tank, gaining success in production of animated cartoons. Since 2011 he has taught animation and interactive media design, in the Department of Design, Technical University of Kenya (TUK). Martin pioneered virtual classrooms in Kenya, developing a platform of digital multimedia content delivery. He has experimented with Virtual Reality completing his Master's Degree at the University of Augsburg, Germany in 2017. He is enrolled in a split site PhD degree program at the University of Manchester, England and the Technical University of Kenya and is conducting field research on classroom culture in Western Kenya.

**Odoch Pido** is the Eminence Grise of design education in Kenya having taught and influenced over 1000 Kenyan designers over the last 50 years. His profession work has focused on exhibition, product and graphic design. He is also a noted voice in the elucidation and analysis of East African culture. Many of his writings are critical looks at his own Acholi culture in the face of war and upheaval. Professor Odoch completed all his degrees at the University of Nairobi where he also taught until 2012. He is now the Director of the School of Creative Arts and Technologies at the Technical University of Kenya.

**Donna Pido** is an American anthropologist with five decades of professional experience in jewelry and product design. She holds a PhD in applied Anthropology from Columbia University in New York. She has assembled and deposited several collections of Kenyan material culture in American and European museums and has written extensively on Maasai art among other topics related to esthetic production in Kenya. She has been teaching design at the Technical University of Kenya since 2012 and is also the former chair of the College of Arms in the Office of the Attorney General. Dr. Pido is an active member of the Kenya Quilt Guild and the Kenya Embroiderers Guild.



**I**nformation overload is real. People's capacity to create, collect and share information has grown tremendously. This is exemplified by what happens on the Internet in one minute. Latest estimates indicate that in one minute in cyberspace, 3.7 million searches are initiated on Google; 2.4 million snaps are created; 38 million text messages are exchanged on WhatsApp; 481,000 tweets are sent; 973,000 logins are executed on Facebook; 187 million email messages are sent; while 4.3 million videos are viewed from YouTube. Unfortunately, as people's capacity to create and share information increases, their capacity to use that information effectively decreases. People's brains are unable to process these vast and diverse volumes of information unaided. This is the point where digital technologies and media come in.

This book is a collection of chapters on various aspects of digital technologies and media which have been or can be used to manage information and knowledge in this networked era. The 62 chapters have been contributed by information and knowledge management scholars and practitioners from valuable experience. The chapters are categorised into the following eight (8) themes:

- Digital Libraries and Information Repositories;
- Citizen Media and Technologies;
- Big Data Systems;
- Learning Media and Technologies;
- Internet of Things and Emerging Technologies;
- Technology and Information Ethics;
- Management of Electronic Records; and
- Information and Knowledge Organisation.

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