CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

The aim of the study as discussed in the previous chapter is to investigate the issues surrounding availability and utilization of information and communication technologies for health information access by medical professionals in a Kenyan hospital.

This chapter reviews the relevant literature as it relates to the proposed research study. The chapter is organized into two sections. In the first section, discusses the issues pertaining to health information access and the use of ICT among the medical professionals in developing countries in Africa. It also provides a theoretical framework with particular emphasis on Actor Network Theory (ANT). In the second section, an overview of the literature on the context of information seeking, and user studies is presented. The chapter summary serves to provide a synopsis of the literature that gives the context of the study.

2.2   Role of ICT in Healthcare delivery services

Information and communication technology has become indispensable to health care workers, as the volume and complexity of knowledge and information have outstripped the ability of health professionals to function optimally without the support of information management tools. In the areas of health research for example, the volume of new information is enough to stretch even ICT assisted decision making systems: on an average day, there

are 1260 articles indexed in MEDLINE and 5000 papers published in the biomedical sciences with an annual growth rate of 30% (Layman and Varian 2003). There is a need for ICT tools that can aggregate information from multiple sources to give an overall understanding of human health and well-being.

ICTs can improve access to information, thus increasing awareness of what is known in the health sciences, while selective dissemination by electronic means can facilitate targeting of information on those who either request it or are most likely to use it. The most effective way of bridging the 'digital divide' or the 'know-do-gap' as it is becoming commonly known in health is to provide reliable, just-in-time, high quality relevant information to health professionals and to the general public at large.

At the level of individual practice ICT systems can support the minds limited capacity to sift through large quantities of health facts and identify those items that bear directly on a given situation. All decision-making in health would be supported by an ICT mediated system that builds on Weed's (1997) vision and ensures that all relevant options known to the medical sciences are available for consideration.

E-health networks can remove distance and time barriers to the flow of information and knowledge for health; they can help to ensure that collective knowledge is brought to bear effectively on health problems individual countries as well as globally. Advances in telemedicine will enable healthcare

professionals at different localities to use video conferencing for patients' diagnosis and treatment thus providing economic solutions to support healthcare in remote areas (Fraser and McGrath 2000).

Another area in which e-health systems can be utilized is in building capacity. Traditional educational methods are inadequate to meet the needs of the health sector in many countries particularly in the developing countries. There is an increasing view among medical educators and practitioners that ICT in general and the Internet in particular have the potential to revolutionize the way medicine is learned by students and healthcare professionals (Mooney and Bligh 1997).

Internet-based medical education also offers a partial solution to the so called 'brain drain' of health care workers from developing countries because higher-level educational opportunities are not always available locally; training is often undertaken in other countries and trainees do not always return in their own countries. To alleviate this problem, World Health Organization suggested that centers of excellence for training and education should be set up in developing countries (WHO 2004). For example, in the e-health model the Internet offers promise as an alternative provider of local training (Fraser and McGrath 2000).

Information and communication technology can contribute to promoting knowledge for better health through the creation of specialized e-health networks to support the development of language-specific knowledge

communities by: building communities of practice around a given language for improved sharing of health information and knowledge as well as for facilitating the development of new knowledge by removing barriers to understanding, improving access to the wealth of health-relevant information available in a language and building on the concept of a virtual health library, and promoting the growth of health-relevant transactions in different languages on the internet. E-health systems are a way of keeping pace with the exponential growth of health-relevant information and applying more of what is known individually and collectively in resolving the health problems of the world.

The appeal for ICT is derived from their inherent characteristics as well as the changes that are already being observed with the introduction of the Internet and improvements in telecommunications as well as the breaking down of government monopolies (Digital Opportunity Initiative, 2001; Misra et al., 2005; Wootton, 2008). There are however limitations to potential integration of ICT into the service delivery or daily life particularly in poor countries including inadequate infrastructures, politics and economics (Nwagwu, 2006; McGowan, 2008). Among the barriers is lack of training as well as difficulties in achieving sustainability. As Mullaney, Executive Director of SatelLife states "we ought to not simply assume that wiring the developing world will close the information gap and thereby the gap between the haves of the developed world and the have-nots of the developing world. Indeed, unless we are careful to choose affordable locally appropriate technologies and couple them with information services that serve real needs and are responsive to local

communities, we could easily end up with a huge white elephant." He further notes that, "if we focus on bringing expensive, high-tech communication technologies to the developing world, the information and economic gaps between the elites of the private sector and those who labour in public sector, which in developing world is most of the population will grow even larger" (http://www.healthnet.org/whoeare.phd). These are some of the negative side effects of ICT including the provision of medical information that does not take into consideration the capabilities of local health services and daily living conditions in multiple contexts. Indeed the starting point for considering the adoption of ICT should be a broad based assessment of local health needs and information priorities and not simply a desire to use technology.

A major criticism for the new interest of policy makers and funding agencies in ICT is the displacement of older innovations such as print materials. With the integration of the Internet in medical and academic institutions in Kenya, financial support for books and journal subscriptions declined. As the Internet is not universally accessible or functional, this severely inhibited access to valuable information. Books, journals and other technologies should be considered alongside the use of CD-ROM, the Internet, mobile phones, radios and television. Each has a role in addressing health information needs. Funding agencies are currently re-evaluating their ICT policies to support an overall improvement in access to information to meet health objectives (World Health Organization, 2004; World Summit on the Information Society, 2003).

Two major concerns in the transfer of technology from one country to another are applicability and adaptability. In the developed world, the health information systems are highly developed and are created in the context in which they are used. There is much that is now being transferred to the developing countries, and the results are mixed-some have ended up being white elephants. Another concern is the absorptive capacity within the host environment. The pertinent issues that should be addressed are: once health professionals have access to the ICTs, how is their work facilitated and/or hindered by such access? What sort of training do they receive to fully appreciate the access that they now have? How are they equipped to maintain the hardware? While ICT applications can play an important role in improving access and sharing health information in developing countries, their impact whether positive or negative will depend on how much it costs to access, how well people are trained in its use, how carefully they are chosen from among the many types and perceptions that accompany their introduction into the life of people in developing countries. If their potential is harnessed in locally appropriate ways at a cost that is affordable to the people then they are likely to have a positive impact.

2.2.1 Internet-Based Interactive Health Information

The growing area of Interactive Health Communication (IHC) is defined as "the interaction of an individual consumer, patient, care-giver, or professional, with or through an electronic device or communication technology to access or transmit health information or to receive guidance and support on a health-related issue" (Robinson et al, 1998). Advance in telecommunications,

computer applications, and user interfaces are changing the nature of interaction between medical professionals, the population, and the ubiquitous World Wide Web (internet) global communication network. The positive health impact of these technologies is seen in informed decision-making, the promotion of healthy behaviour, the facilitation of information exchange between peers, self-care and the management of the demand for health services.

The "old" media, including radio, television and print have effectively contributed to knowledge dissemination and health promotion. The Internet-based IHC applications expand those functions and create new alternatives by changing the very nature of health communications and health practice. They are accelerating the empowerment of health care providers and patients, and making it easier for consolidated entities to operate within increasingly large and complex organizations. The new opportunities offered by Internet-based IHC dramatically expand possibilities in areas such as the following (Robinson et al, 1998):

- Access to health information and support on demand in any site via a plain telephone line or any variety of wireless communication options;
- Opportunity for interactions among users of electronic messaging;
- Capacity for wide dissemination and for keeping contents and functions up to date;
- Opportunity to tailor information to the specific needs of individuals or user groups;

- Multimedia resources, combining text, audio and visual;

- Opportunity for users to remain anonymous, thus facilitating access to sensitive information and frank discussions about health status, behavioural risks, and fears and uncertainties.

The only main health concern about the widespread use of interactive Web-based technology is the volume of unendorsed, non-validated, misleading, fraudulent, and potentially harmful health information that is available on the Internet (Health Summit Working Group, 1998).

2.2.2 Telemedicine

Patients living in rural and remote areas struggle to access timely, quality medical care. Residents of these areas and particularly in developing countries often have substandard access to specialized health care, primarily due to specialists and services that are available are likely to be concentrated in cities. The innovations in computing and telecommunications technologies have made health care provision to be geographically separated from the health care providers. Broadly defined, Ferguson et al. (1995) suggest that telemedicine is the delivery of healthcare and the exchange of healthcare information across distances using telecommunications technology. It includes the transfer of basic patient information over computer networks; the transfer of images such as radiographs, Computerized Tomography scan (CT scans), Magnetic Resonance Imaging (MRI), ultrasounds, video images of endoscopes or other procedures, patient interviews and examinations, consultations and healthcare educational activities.

Telemedicine tools enable the communication and sharing of medical information in electronic form, and thus facilitating access to remote locations. These tools make remote areas more accessible by giving them immediate access to up-to-date information and specialists for consultative purposes. By reducing the need for referrals, it helps patients remain in their communities, provide faster, more convenient treatment and minimizes the disruption of the patient's life. The potential of these tools is particularly significant in sub-Saharan Africa where medical specialists are few and where distances and the quality of infrastructure hinder the movement of health care providers or patients (WHO 1999; Mohga 1999).

In summary, ICT can play a substantial role in the following six major areas:

- Improving access to health services in rural areas and primary health care;

- Underpinning public education campaigns to promote health behaviour in critical areas such as AIDS;

- Transferring diagnostic information to specialized centres;

- Strengthening the basis for decision making;

- Promoting information exchange among researchers and students; and

- Enhancing the effectiveness of health institutions.

2.2.3 Current State of Healthcare Adoption and Use of ICTs

The healthcare systems are undergoing substantial change and access, adoption and use of ICTs is gaining increasing importance with advances of

information systems and e-health technologies. These technologies will change healthcare practice and will alter the nature and practice of therapeutic relationships, presenting new challenges for the profession (May, et al, 2001). To prepare for these changes, medical professionals need to be able to utilize existing and emerging information and communication technologies.

Although lagging behind other sector (UNECA, 2001), the use of ICT in health has increased; and the administration of many hospitals and other healthcare facilities are now computerized. Clinical information systems, the Internet, telemedicine, personal digital assistant, electronic patient records and other applications will inevitably become commonplace in health. However, the key players, medical professionals have not fully embraced the valuable resources of ICT (Chismar &Wiley-Patton, 2003; Murray, 2002).

Although research has catalogued the reasons for the barriers to using ICTs within health sector (Kaplan & Shaw, 2002), however, there is scarcity of scientifically rigorous research on adoption and utilization of ICTs within medical profession.

In an increasingly information-based society, hospitals need a variety of information for multiple purposes: direct patient care, staff development and training, continuing professional education, patient and community education and administrative decision support. Hospital library and information services play a crucial role in providing broad-based information support within the

hospital system, whose main mission is providing high quality information for patient care to health care professionals and others who need relevant information for complex decision-making (Gilbert 1991). Since much of the medical information is continuously being delivered electronically, it is increasingly becoming important to understand the dynamics of adoption and use of ICTs in the delivery of health information in developing countries such as Kenya.

2.3   Theoretical Framework.

2.3.1   Introduction

In social sciences, theories provide a basis for understanding and possibly changing society. "Theory is both a way of seeing and a way of not seeing" (Walsham, 1993). In other words, it helps to highlight certain perspectives but at the same time blinds us to other perspectives. In recognizing that ICTs are composed of technical and social systems that interact with and influence each other it is necessary to adopt an appropriate theoretical framework or research perspective that can effectively deal with these elements and their dynamics.

The domain of this research involves an investigation into the use of ICTs in health information access by medical professionals in a developing country. These practices are related to social and technological phenomena, which determine the adoption, use and effects of information systems in organizations and the society at large.

Over the years information systems researchers have expanded social systems perspectives to include aspects of context, processes around design, implementation and use of systems (Sahay 1998) and the mutually shaping linkages that exist between content, context and processes of information systems (Walsham 1993). The content may include data collection tools, reports, computer hardware, software, operating systems etc. The social context includes social relations among human actors (e.g. health care professionals, health managers, planners etc) related to information systems, the social infrastructure and routines for its support (e.g. the administrative hierarchy for the information flows), and the history of previous commitments made in relation with the existing information systems and services.

The social process considers the social cultural and political aspects that draw from and recreate their life world, e.g. language, tradition values and political structure (Walsham 1993). Therefore, this social systems perspective is especially relevant in the case of developing countries, which often have very unique contextual conditions as compared to those that exist in the developed world. For example, many developing countries experience a combination of multiple and complex constraining factors including high vulnerability and dependency on political rather than organizational power (Heek 1998), a high degree of external donor dependency (UNDP 2004), constraints of human capacity (Martinez and Martineau 2002) and high cultural diversity (Atkinson 2002). These conditions and many others contribute to high fragmented information systems and services, which are described by Godlee (2004) as not well understood, unmanaged and under- resourced.

This perspective helps to see these relationships as being complex and being shaped by multiple processes including those related to history, culture, infrastructure and people. It also helps us develop deeper insights to understand the challenges of adoption and integration of new information and communication technologies in our work places and culture.

This study draws upon a theoretical approach as provided by Actor Network Theory (ANT). In this theory, technological innovation is viewed as an attempt to build and stabilize a diffuse system of allies composed of human and non-human entities. It enables one to circumvent technological determinism in which technical projects and innovations proceed naturally unless they are stopped, and replace it with the idea that things do not happen unless human and non-human actors make them happen. The next sections that follow provides an overview of ANT and demonstrates its applicability in this study. It uses in Information Systems studies and its critiques will also be discussed.

2.3.2   Actor-Network Theory (ANT).

ANT is an approach to structuring and explaining the links between society and technology. One of the main motivations for using actor network in this study is the fact that it offers explanations of how technology becomes acceptable and is taken up by groups in society. It provides a fine-grained approach to analyzing the mechanism by which social action shapes technology and technology shapes social action. It is argued that ICTs have both technical and social merits at the same time and therefore it might be appropriate to try to overcome the distinction between the technical and the

social for better understanding. It is also argued that it is neither the inherent properties of the innovation nor some properties of the (social) context (including potential adopters and other actors) that drives the innovation, but rather the associations that exist and are created between the innovations and its surrounding actors - actors that are both technical and social. The primary focus is on stakeholders (actors) and how they are involved in the shaping of technology.

Actor-network theory, or 'sociology of translations' (Callon, 1986a), is concerned with studying the construction and transformation of the heterogeneous networks (Law, 1992) that are made up of people, organizations, agents, machines and many other objects; studying the networks that constitute the world, consisting of both humans and non-humans. It explores the ways that the networks of relations are composed, how they emerge and come into being, how they are constructed and maintained, how they compete with other networks and how they are made more durable over time (Tatnall and Gilding, 1999). ANT examines how actors enlist other actors into their world and how they bestow qualities, desires, visions and motivations on these actors (Latour, 1996a).

The essence of ANT is a perspective of the world that shows it to comprise heterogeneous networks that form actors. All phenomena are the effect or the product of heterogeneous networks (Law, 1992). Even persons are made up out of a heterogeneous network, as Law describes:

> *"However, I will press the argument in another way by saying that, analytically, what counts as a person is an*

effect generated by a network of heterogeneous, interacting materials. This is much the same argument as the one I have already made about both scientific knowledge and the social world as a whole. But converted into a claim about humans, it says that people are who they are because; they are a patterned network of heterogeneous materials. If you took away my computer, my colleagues, my office, my books, my desk, my telephone I wouldn't be a sociologist writing papers, delivering lectures, and producing 'knowledge'. I'd be something quite other – and the same is true for all of us. So the analytical question is this: Is an agent an agent primarily because he or she inhibits a body that carries knowledge, skills, values, and all the rest? Or is an agent an agent because he or she inhibits a set of elements (including, of course a body) that stretches out into the network of materials, somatic and otherwise, that surrounds each body?"(Law, 1992)

To understand the phenomena (such as acts, events and actors) these networks, these actors, need to be studied without imposing on them *a priori* definitions or expectations; to avoid *a priori* distinctions between the technical and the social. Or to put it in another way, ANT argues avoiding both technological determinism and social reductionism (Monteiro, 2000). ANT does not accept any form of reductionism (neither technological nor social) that splits up the technical from the social and supposes that one drives the other. It states that there is no reason to assume, *a priori*, that either objects or people in general determine the character of social change or stability (Law, 1992). As such, ANT supports analytically treating objects and peoples the same: humans and non-humans together form the heterogeneous networks.

To illustrate this thinking with an example, of how ordinary life is influenced by a wide range of factors, including social and technical, but also political and

historical factors. For example, when driving a car we are influenced by traffic regulations, previous driving experience, and the car's maneuverability (Monteiro, 2000). To understand the phenomena of driving a car, we should consider all these influencing factors together. In ANT, the actor-network that makes up this event should be analyzed. The actor-network is those elements in a context that shape action.

The idea of an actor-network centers on the notion that the development of technology involves building of networks of alliances between human and non-human actors. This corresponds to a breakdown of the clear division between science and society, and it argues that there is no such a thing as a social problem that does not have technological components nor is there a technological problem that does not have social components. No project is purely technical nor is it purely social. Actor-Network Theory proposes the use of networks of interrelated humans and non-human actors who shape the way things are as 'actor networks'. This renders possible the circumvention of technological determinism in which technical projects and innovations proceed naturally unless they are actively stopped, and replaces it with the idea that things do not happen unless humans and non-human actors make them happen. As Walsham (1997) asserts, the principle focus of ANT lies upon "…the creation and maintenance of coexistence networks of humans and non-human elements which in case of IT include people, organizations, software, computers and communication hard wares and infrastructure standards".

To address the need to treat both human and non-human actors fairly and in the same way, ANT is based upon three methodological principles (Callon, 1986a): generalized agnosticism, generalized symmetry and free association. In *general agnosticism*, the researcher abstains from censoring or judging the actors, whether they are human or non-human. In *generalized symmetry*, researchers are required to use a single repertoire when human and non-human, social or natural elements are described. The rule is not to change registers when moving from the technical to the social aspects of the problem studied, or to give either of them special explanatory status. In *free association*, the researcher must abandon all previous distinctions between natural and social events. There can be no boundary between the two; they might be separated later, only as a result of analysis and understood as outcomes or effects, but cannot be divided *a priori*, assuming it is the give order of things (Law, 1999).

What is an actor? Actors are those elements in a context that shape action while pursuing their interests. An actor is something that acts or to which activity is granted by others. It implies no special motivation of human individual actors or of humans in general. An actor can literally be anything provided it is granted to be the source of an action (Latour, 1996b). But as Law argues, actors are also "an effect generated by a network of heterogeneous, interacting materials" (Law, 1992). He demonstrates as an example that for a researcher to be a researcher, he has to be aligned with surrounding actors such as books, a computer, an office, colleagues, etc. Social agents are never located in bodies alone, but are patterned networks of

heterogeneous relations. By punctualisation or black-boxing, actor-networks themselves "make up an actor". Thus each actor is made up out of actors and at the same time is part of an actor. Or, in the vocabulary of actor-network, each actor is itself an (simplified) actor-network and is at the same time part of other networks. As Latour (1999) argues, actor and network designate two faces of the same phenomenon – the social phenomenon called actor-network; that is "a certain type of circulation that travels endlessly without ever encountering either the micro-level or the macro-level". Law states that all attributes we normally associate with human beings, such as thinking, acting, writing, loving and earning, are generated in networks that exist beyond the body. An actor is also always a network (Law, 1999).

What is a network and what is an actor-network? By being aligned with each other, actors form an actor-network. This alignment is achieved through the translation of interests and the enrolment of actors into the network. Translating involves showing how an actor's non-aligned interests may become aligned. Alignment is established in inscriptions that give a particular precedence in terms of a viewpoint. Inscriptions refer to the way technical artifacts embody patterns of use (Monteiro, 2000), or how certain viewpoints, values, opinions and rhetoric are converted into devices or materials (such as reports, documents and scientific papers), or frozen into codes or computer applications (Callon, 1986a). Latour uses the term 'immutable mobile' to describe such network elements that when they are moved in time and space, they remain stable and unchanged (Singleton and Michael, 1993; Mol and

Law, 1994). Such a network displays properties of irreversibility (Walsham, 1997).

According to Law (1992) the core of the actor-network approach is " a concern with how actors and organizations mobilize, juxtapose and hold together the bits and pieces out of which they are composed; how they are sometimes able to prevent those bits and pieces from following their own inclinations and making off; and how they manage, as a result, to conceal for a time the process of translation itself and so turn a network from a heterogeneous set of bits and pieces each with its own inclinations, into something that passes as a punctualised actor". In this quote, Law talks about 'for a time' because once a network is formed; it is not formed once and for all. It can always become unstable since new actors; the desertion of existing actors or changes in alliances can cause the 'black-boxes' of networked actors to be opened and their contents reconsidered (Callon, 1986b). A black-box is "a way of talking of the simplified points that are linked together in an actor-network" (Callon, 1986b), which is also a network in its own right. Law (1992) speaks of a 'punctualised actor'. A network recursively generates and reproduces itself and relies on the active maintenance of its simplifications for its continued existence. A network becomes durable because it is itself composed of durable and simplified networks. The solidity results from a structure where each point is at the intersection of two networks: "one that it simplifies and another that simplifies it" (Callon, 1987, p.97).

The sociology of translation: The sociology of translation is based on Latour's (1991) alternative to technological determinism; in which things do not happen unless other actors make them happen. It implies that each actor who takes the project further may take it in a different direction than that intended by the previous actors. Latour uses the term 'translation' to describe this effect, playing on both its meaning: " the innovation is translated or carried from one position to another in a mathematical manipulation; the innovation is also interpreted or transposed from one position to another in the linguistic sense of the word 'translation'. Translation operates between actors: an actor gives definition to another actor, imputes him/her/it/them with interests, projects, desires, strategies, reflexes and afterthoughts" (Latour, 1991). According to Callon (1986b), a translation is "the methods by which an actor enrolls others. These methods involve:(a) the definition of the roles, their distribution, and the delineation of a scenario; (b) the strategies in which a [future state actor-network] renders itself indispensable to others by creating a geography of obligatory passage points; and (c) the displacement imposed upon others as they are forced to follow the itinerary that has been imposed"(Callon, 1986b).

Within the concept of translation and actor-network theory four moments of translation are characterized: problematization, interessement, enrolment and mobilization (Callon, 1986b, Latour, 1987). During *problematization* certain actors or initiators attempt to impose definition of the situation on others. During this stage the actor tries to demonstrate their quality of being indispensable to the solution of the problem (McMaster, Vidgen et al, 1997). The problem is re-defined (translated) in terms of solution offered by this

actor, who attempts to establish themselves as an 'obligatory passage point' which must be negotiated as part of its solution. To pass through the obligatory passage point, the other actors must accept a set of specific conventions, rules assumptions and ways of operating laid down by the first actor (Tatnall, 2000). It is a stage in the process of network building where certain actors are concerned with defining their identity and other actors' identities in the network. During *interessement* an attempt is made to impose the identities and roles defined in the problematization on the other actors, thereby locking other actors in the roles proposed for them. The initiator achieves this by making himself indispensable to the actors and indispensable to the solution for the problem. *Enrolment* occurs when a stable network of alliances is formed and the actors' yield to their defined roles and definitions (Singleton and Michael, 1993). Successful networks of aligned interests are created through enrolment of a sufficient body of allies, and the translation of their interests so that they are willing to participate in a particular way of thinking and acting that networks maintain. Enrolment can be seen as a successful outcome of problematization and the 'interessement' process. Finally, during *mobilization* the proposed solution gains wide acceptance. During this stage, the initiators use a set of methods to ensure that spokespersons for relevant collectives are able to represent those collectives properly, so that the initiators are not betrayed by the spokespersons.

Translation can be seen as to re-interpret, represent, or appropriate others' interests to one's own. Translation is necessary for stability in the network, since actors from the outset have a diverse set of interests. Aligning these

interests causes a network to become stable and durable (Monteiro, 2000). In fact, translation can be seen to create new relationships between actors to form an actor-network: 'translation is a process in which sets of relations […] are proposed and brought into being' (Callon and Law, 1989). The goal of translation can be seen as to bring together complex entities into a single object or idea that can be mobilized and circulated like a branded commodity or a taken-for-granted fact (Clarke, 2001).

As Monteiro (2000) puts it: "In ANT terms, [information system] design is translation: users' and others' interests may, according to the typical ideal models, be translated into specific 'needs'; the specific needs are further translated into more general and unified needs, so that these needs can be translated into one and the same solution. When the solution (system) is running, it will be adopted by the users who translated the system into the context of their specific tasks and situations" (Monteiro, 2000).

2.3.3   ANT in information systems research

ANT has been used in many different cases to investigate successes and failures of information systems. Callon (1986a) used it to explain the failure of the domestication of the scallops of St Brieuc Bay and the development of the electric vehicle by the Electricite de France (Callon, 1986b). Latour has used actor-network theory to analyse the development of a revolutionary public transportation system known as Aramis (Latour, 1996a). Monteiro and Hanseth (1996) studied the role of standards in EDI systems and information infrastructure. Vidgen and McMaster (1996) applied ANT in their study of

adoption of a particular car-parking system. Silva and Backhouse (1997) used the concepts of ANT to explain the failure to institutionalize the London Ambulance Service information system. Mitev (2000) has employed ANT to study the problematic introduction of an American computerized reservation system.

Some researchers have found that 'only a rich integrative view of IS implementation does justice to the complex realities of social life in an organization' (Myers, 1994) and that implementation can only be understood in terms of its wider social and historical context. Furthermore, Harvey and Myers (1995) argue that 'generalisable knowledge is often neither relevant nor meaningful, in which case we are better off understanding specific context', and what is needed is 'a rigorous approach to the analysis of the institutional context of IS practices, with the notion of context being one of the social construction of meaning framework'.

As a constructivist theory ANT is according to Monteiro and Hanseth (1996), an effective way to describe how minute technical designs solutions are interwoven with organizational issues, and as Walsham (1997) claims, 'ANT can be used to illuminate the results of the field study'. In the overall ANT is beginning to gain firm ground within IS research.

2.3.4 Critiques on and limitations of ANT

ANT has its critics and limitations as any theory does. Walsham (1997) criticizes ANT and its disregard for social structures, its lack of political

analysis and its descriptive power as opposed to its capacity for explanations. Also, the discussion between humans and non-humans, and which explanatory power is given to each, is a subject of debate. These critiques are discussed below.

Social structures: ANT has been criticized for neglecting macro social structures and focusing only on local contingencies without taking into account macro-social structures which influence the local ones. Different researchers (Law, 1994; Walshalm, 1997) have raised this criticism. In response to these criticisms, Latour argues that macro levels can be investigated with the same methodological tools as the micro-levels – "the macro-structure of society is made of the same stuff as the micro-structure" (Latour, 1991, p.118). He further reiterates that ANT allows movement between levels of analysis; it actually denies a difference between macro structures and micro interactions – differences between network and actors; they "are two faces of the same phenomenon" (Latour 1999, p. 19). Moreover, ANT argues for keeping the same framework of analysis for tracking both a "macro-actor or a micro-actor" (Callon and Latour, 1981) and for making the notion of an actor-network scalable: one element of an actor-network may be expanded into a complete actor-network, and vice versa, a whole actor-network may be collapsed into one element of another actor-network (Monteiro, 2000). Impacts on the micro or respectively the macro level can thereby be analyzed to show its effect on either of these levels.

Moral and political analysis: The amoral stance of ANT and its lack of insights concerning political viewpoints is also a subject of criticism. ANT does not give specific guidelines for examining the ethical and moral implications of IT. Treating the actors as equals is problematic: not all actors are equal; some exert a stronger influence than others (Walsham, 1997). In a similar way, Knight and Murray (1994) criticize ANT for the way in which it gives little or no attention to the broader powers and inequalities that are both the condition and consequence of network formation.

Latour (1991) responded to these criticisms of political analysis and moral relativism:

> *Refusing to explain the closure of a controversy by its consequences does not mean that we are indifferent to the possibility of judgments that transcend the situation. For network analysis does not prevent differentiation, Efficiency, truth, profitability and interests are simply properties of networks, not of statements. Domination is an effect not a cause. In order to make a diagnosis or a decision about the absurdity, the danger, the amorality, or the unrealism of an innovation one must first describe the network."*(Latour, 1991, p.130)

It is argued that there is no reason to assume, *a priori*, that either objects or people in general determine the character of social change or stability. Indeed, in particular cases, social relations may shape machines, or machine relations shape their social counterparts. But this is an empirical question and usually matters are more complex (Law, 1992). Both (through inscriptions) can have an impact in the resulting inequalities between actors. Finally, Walsham (1997) takes a fairly political stance and suggests: "Moral and political issues should be debated from a solid empirical base, and actor-

network theory offers a contribution to the latter if not directly to the former"
(Walsham, 1997, p.475).

Poor capacity for explanations: ANT is argued to be much more a method for
describing rather than explaining. However, Latour argues that ANT never
was intended to be "a theory of the social or even worse an explanation of
what makes society exert pressure on actors [but a] very crude method to
learn from actors without imposing on them *a priori* definition of their world-
building capacities. […] ANT does not claim to explain the actor's behaviours
and reasons, but only to find the procedures, which render actors able to
negotiate their ways through one another's world-building activity" (Latour,
1999). In other words, it was never intended to explain the behaviour of social
actors, but in a much more ethnographic sense a way for researchers to study
what, how and why actors behave the way they do – not claiming to explain
this by all kinds of exterior forces unknown to the actors themselves.

Humans and non-humans: ANT is debated for its notion of symmetry between
human and non-human actors. The main criticism is that people have been
reduced to the same status of things and machines. Moreover, with the notion
of inscriptions, technology seems to have been granted some deterministic
property. But ANT does not claim humans and machines are the same – it
merely states that one should first attempt to discover the influential elements
that actually determine action, be it technical or non-technical (Monteiro,
2000).

2.4   The Context of Information Seeking

Medical informatics research has long studied the information needs and information seeking behaviours of medical professionals. Most of these studies were based on the models of information seeking, focusing on the information seeking, needs and behaviours of the individual information seeker (Kuhlthau, 1991), and primarily examining the information needs and information sources. These studies have been carried out to assist in the design of better and efficient information systems and services that meet the needs of the users.

Early user studies were generally exploratory in that the desired results were descriptions in general terms of the information gathering habits and needs. They thus had a shallow and poor conceptualization with poor theories and methodologies. However, it was not until the early 1980s when the environment in which information use was considered and a distinction was made between cognitive and social aspects of information. Since then several user studies have been carried out in different fields in various parts of the world. Knowledge of users' information needs is a major prerequisite for establishing information requirements of the user. The idea behind the user studies is to enable information systems to adjust their services to meet specific needs of individual groups of users rather than the users trying to adapt to the information systems (Odini, 1993). User studies help to demystify the uncertainties that surround the actual and perceived needs of the information seekers.

Leckie et al. (1996) have developed a model of information seeking by professionals. This model organizes information seeking process into a set of components that offer a framework for discussing what occurs in the search for information by the medical professionals.

Figure 2.1: Model of the information seeking of professionals
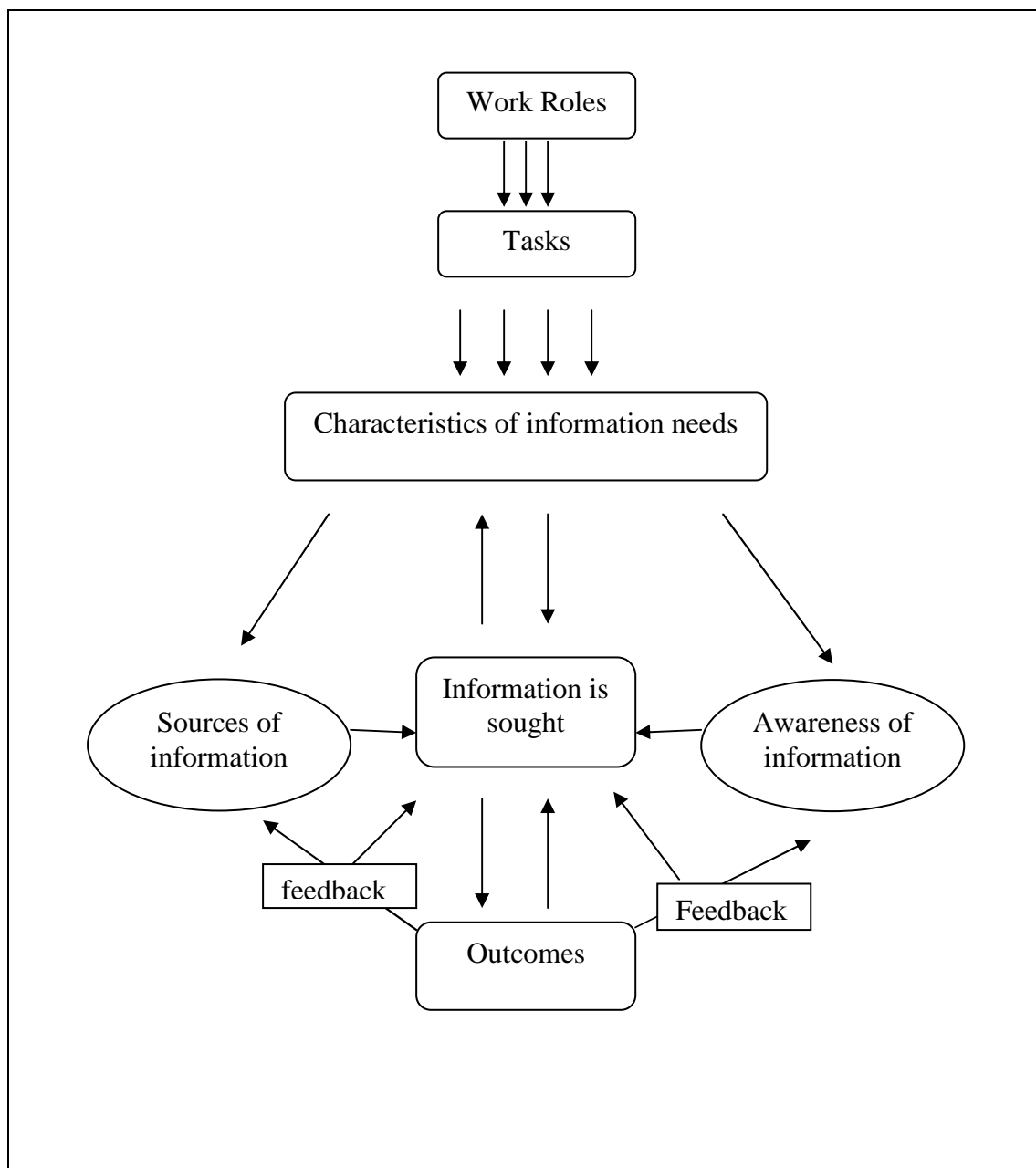
Source: Leckie GJ, Pettigrew KE, and Sylvain C, 1996

The work roles and tasks: Medical professionals have several roles and related tasks from which their information needs originate: service providers, researchers, learners and teachers. Medical practitioners spend majority of their time in role of direct service provider. The tasks associated with patient care create their greatest needs for information – information mainly for treatment and diagnosis (Williamson et al. 1989). The medical professional also has a role of learner or student within which the specific tasks are the professional reading or attending conferences and meetings to stay abreast with new developments. Tasks associated with the role of researcher involve writing publications and speaking at conferences. The role of researcher needs the use of many and complex information sources including electronic sources (Crandall, 1997). In their role as educators, medical professionals need information to teach the medical students and the interns. Finally, the medical practitioner must also be an administrator and manager of his/her own practice.

The characteristics of the information needs of medical professionals are mainly determined by work roles and tasks. The variables that influence the information needs of medical professionals include demographics (age, career stage, geographic location), context of the situation that prompts the information needs, frequency of need, predictability (expected or unexpected) and complexity (Leckie, 1996). The perceived information needs of the medical professionals give rise to information seeking behaviour. Connelly et al. (1990) distinguished two forms of information seeking: information seeking behaviour which fulfilled an immediate need and knowledge gathering

behaviour which added to the practice knowledge base for future use (continuing medical education).

The factors that affect information seeking are the *information sources*, *awareness of information,* and *the outcomes of the information seeking*. The information sources widely used by medical professionals are human based information sources; that is, personal communication and private books (Cullen, 1997; Haug, 1997; Thompson, 1997). Electronic sources were rarely used. The problems with using electronic sources from the World Wide Web (WWW) are a lack of time and an efficient use of a new vocabulary (Klercker and Zetraeus, 1998). Direct or indirect knowledge of various information sources and perceptions about the process or about the information retrieved play a crucial role in the overall information seeking process. Familiarity, timeliness, cost, quality and relevance of information are also considered as factors influencing information seeking (Leckie et al. 1996). The other factor is the outcome of the information seeking. The optimal result is that the information need is met. If the need is not satisfied, further information seeking is required, and through feedback the definition of the information need may be sharpened or changed. It is also possible that an outcome from one task associated with a particular role may quite unexpectedly benefit the professional in another role.

2.4.1 Information needs of medical professionals

The literature review has revealed little empirical research into information needs and barriers to the use of information among medical professionals in

developing countries in Africa. Njongmeta and Ehikhamenor (1998) in their study of health information needs and services in the Cameroon concluded that health professionals had much the same need for information to keep abreast with development in their profession as needed by their counterparts in other parts of the world. The study revealed that the professionals depend very much on personal contacts as a source of information. However the usefulness of the printed sources especially journals and books were 'indispensable'. In Malawi a study of 57 healthcare professionals indicated that professionals mostly use clinical handover meetings, seminars and workshops as sources of information and particularly for their continued professional development (Adamson et al. 2003). The study also revealed that only 5.3% had access to the Internet facilities and as such there was a need to explore other ICTs such as radio and television as vehicles for transmission of healthcare information in Malawi.

In a review article, Smith (1996) argues that one of the reasons why clinical information systems have failed to penetrate routine practice is because they have been designed without any close study of the needs of doctors. The article identified thirteen studies that were based on original data on information needs and wants of doctors using different methods, all from developed countries. According to Smith none of the studies had defined or categorized the needs thus giving an explanation as to why they had arrived at different results (Smith, 1996). Getting in touch with the user groups, identifying and defining their information needs is absolutely essential for sustainability of an effective information service.

When discussing the information needs of physicians, Gorman (1995) explained four states of information needs – unrecognized (not aware of an information need), recognized (aware of an information need), pursued (needed information is sought), and satisfied (needed information is found). Covell et al. (1985) in their classic investigation into the information needs of individual physicians in office practice explained that physicians often recognized the need for further information in order to provide proper care for their patients. Similarly, Brown et al. (2004) conducted a study of physicians in the Neonatal Intensive Care Unit and their utilization of written and verbal sources of patient information. Again physicians recognized a need existed for information in order to provide proper care for their patients.

Coiera and Tombs (1998) took a slightly different approach in their study. They looked at the information needs of health care workers by studying their communication behaviours. These communication behaviours uncovered needs ranging from the need for patient specific information to questions about plan of care. Obviously these medical professionals recognized an information need, and then pursued it via communicating with each other.

Gruppen (1990) in a study on physician information seeking notes that for health sciences libraries to be more accessible to the practitioners on a routine day to day basis, there is need to be more aware of how, when and why professionals look for information in the context of practical problems. He suggests that health science libraries in an effort to be accessible should consider market research to determine the needs, preferences and use

patterns of the library targeted users while exploring alternative methods of improving access to their resources.

2.4.2 Information Sources and Barriers

Information can come from many sources including formal (textbooks, journals etc) and informal sources (professional colleagues and other medical specialists). Yet in the literature reviewed, many studies of medical professionals' information seeking came to similar conclusions concerning information sources – informal sources were frequently used.

Covell el al. (1985) found that physicians accessed both formal and informal sources based on the perceived quality and accessibility of the information. Yet these physicians had their information needs met only 30% of the time. Barriers that prevented physicians from obtaining needed information included lack of time to search, cost and poor organization of information. In an attempt to overcome these barriers, physicians turned most often to human sources for information.

Lundean, et al. (1994) carried out a study of information needs of rural health care practitioners in Hawaii. The major barriers to information access were identified as lack of funds, inadequate hardware, infrastructure problems, insufficient knowledge about information sources and how to use them. Most physicians reported that journals were sources that best met their needs and that personal files or colleagues' collections were the most common places for accessing needed information.

A further study by Lomax et al (1999), investigated the information seeking behaviour of medical oncologists in the support of clinical decision-making. It was found that oncologists used formal sources of information (files, textbooks, journal articles etc) about 23% of the time. In addition, oncologists used MEDLINE frequently. Similarly to most of the other findings, when oncologists used informal sources of information, they most often consulted a fellow physician.

Dawes and Sampson (2003) reviewed nineteen studies describing the information seeking behaviour of physicians, most of which took a quantitative rather than a qualitative approach. The results showed that individual clinicians satisfied their information needs most frequently by using formal sources such as textbooks. Physicians second frequently used source of information was fellow colleagues. What led to these sources were first their availability and applicability, then their reliability, high quality and speed of use. In addition, physicians consulted colleagues for two main reasons – "reassurance as well as the need for tacit knowledge" (Dawes and Sampson, 2003). The hindrances to information seeking of physicians included limited time to search volumes of materials, forgetfulness, lack of urgency and the belief that there is no answer available.

Additionally, Brown et al. (2004), in their study of physicians in the Neonatal Intensive Care Unit found the bedside flow sheet to be an important source of information, because of its accessibility. Conversations with both resident physicians and nurses were also important sources of information, as verbal

communication was often a convenient and quick way to access patient information.

Coiera and Tombs (1998) study in a hospital setting also showed that some information was obtained from formal sources (patient notes, laboratory results etc), but most often the information was obtained from human sources which lead to an interruptive workplace. The tendency towards synchronous communication and the need to deal with tasks and questions as they arose led to those sources setting aside what they were doing in order to assist the information seeker. The ideal information source will therefore be directly relevant, contain valid information and be accessible with a minimum amount of work at the point of care regardless of the form or format.

2.4.3 Information needs and user studies in Kenya.

Literature search has indicated that very little research work has been done in the area of health information needs and health information systems and services in Kenya. According to Odini (1995), the prevailing information systems in Kenya have been designed without a proper analysis of the needs of users. The approach in user studies have been piece-meal and fragmented and as a result there is neither a clear picture of information needs nor a complete systematic understanding of the communication process for any group of users'.

Kaane (1995, 1997), Amoth (2000), and Bii and Otike (2003) studied the provision and dissemination of various facets of health information to diverse

residents of rural communities in Kenya. These studies established that rural communities obtain health information through various sources including personal contacts, radio, television, books, magazines, newspapers, posters and pamphlets. Studies such as Ngimwa (1996); Mwaro (1996); Waswa (1998) have health information appearing just as an aspect of the information needs. However, these studies identify barriers to access and effective dissemination of health information to the rural communities as lack of coordination among the providers of information, low levels of literacy amongst the rural community, use of wrong languages, and under-developed infrastructure among others. Some of these barriers can significantly be reduced by properly defining the user groups - who all have differing health information needs because of their diverse characteristics.

Kimbwarata (2002) carried out a study on information needs and information seeking behaviors of medical research scientists at Kenya medical Research Institute (KEMRI), Kenya. The findings of the study indicated that the information needs of medical research scientists were not being fully satisfied by the information systems and services that were accessible to them. The study cites inadequate funding as one of the obstacles to effective delivery of information services to research scientists.

It is evident from the foregoing review that there are knowledge gaps with regard to information seeking and access to information by medical professionals in Kenya. This is critical since much of the medical information and knowledge is continuously being delivered electronically, and as new

technologies slowly and systematically replace the traditional paper-based operations in the delivery of health care services. To address these knowledge gaps, a research study was conducted to investigate the availability and utilization of information and communication technologies for improved access to health care information among medical professionals in a Kenyan hospital.

2.5   Access to health information in developing countries

There is a lack of research into access to healthcare information resources by healthcare professionals in developing countries, despite the continued calls for an increase in research in these areas (WHO 2004; Godlee et al 2004). The literature presented in this section will therefore be drawn from general studies in this area in Africa.

The role of information in the delivery of healthcare services has been repeatedly emphasized (Kale 1994; Pakenham-Walsh et al 1997; Murphy 2000). Since the communication of medical information is a crucial factor in the delivery of quality medical care, health information should form an integral part of the national health system. In spite of its importance much of research information and scientific knowledge remains largely out of the reach of many countries in Africa.

Pakenham-Walsh (2000) attributes the situation to some of the many fundamental problems of access such as poor literacy rate, the lack of appropriate reading materials and reading culture, lack of information

professionals and low status when they do exist, lack of access to libraries by healthcare professionals, as well as lack of resources in those libraries, and the lack of recognition and priority given by most governments to the provision of health information services.

In an editorial in the Lancet, Horton (2003) stated that research papers of developing world problems were much unlikely to get published. A survey of five leading general medical journals in 2001 found that the frequency of research articles relevant to tropical diseases in developing countries was low: zero for *Annals of Internal Medicine*, 2% for *Journal of the American Medical Association (JAMA)*, 4% for the *New England Journal of Medicine*, 6% for the *British Medical Journal* and 16% for *The Lancet.* This systematic bias in research publication also tends to widen further the knowledge gap. Access to local, regional and international journals is especially important for researchers and healthcare professionals. Healthcare professionals and researchers in developed countries enjoy relatively easy access to information, but for many researchers in resource-poor environments, access to available research is not easy (Langer et al 2004).

Important steps to deal with some of the causes of this unequal representation have been implemented or suggested and outlined by Langer et al. (2004) as follows:

- WHO initiatives to expand developing countries access to primary biomedical information constitutes key effort to engage wider audiences that are currently unable to afford paid subscriptions to

journals. For example the WHO Reproductive Health Library has been implemented as a source of up-to-date information for reproductive health care in developing countries.

- Collaboration between researchers from industrialized and developing countries has been proposed as a way to improve the quality of manuscripts and increase the likelihood of publication.

- Increasingly active regional representation on editorial boards and the assignment of special reviewers to papers submitted from developing settings could also improve acceptance rates.

- Expanding access to the scientific literature through free electronic journals and workshops and translation of articles into languages spoken in developing regions would contribute to easing the scientific isolation in which researchers from poor countries often work.

- Special issues of international journals and call for papers with a regional focus would also help encourage submission from developing countries.

However, if these interventions are going to succeed in resources-poor settings in the developing countries, a comprehensive and defined knowledge of the current situation is required.

ICTs have also been central to efforts to bridging the knowledge gap. The expansion in the availability of electronic healthcare information has given access to a wealth of resources. There are more and better resources on the Internet available to the growing number of people especially those in referral

hospitals, academic institutions and urban settings. The effective use of these new technologies can enhance the flow of scientific knowledge and contribute to the improvement of the conduct and sharing of health research, formulation of sound health policies and the advancement of health services.

However, there remains a discrepancy between those who do and those who do not have access to the appropriate technologies to exploit these resources. There are also issues that arise concerning the appropriateness of much of the available information to the needs of health care researchers and professionals in developing countries. Health information is essential in health care and health promotion because it provides both direction and rationale for guiding strategic health behaviours, treatments and decisions. The digital divide has been identified as a special problem in healthcare that can lead to significant disparities in care (Chen et al., 2004).

There is evidence that access to ICTs themselves remain a problem. Ondari-Okemwa (2004) carried out a survey of 46 countries in sub-Saharan Africa to discover the impediments to providing access to global knowledge in sub-Saharan Africa. Respondents suggested that unreliable electricity supply and high cost of ICTs were significant barriers to accessing online information. Similarly in a study of access to electronic information resources in Nigerian libraries, Ashcroft and Watts (2005) found that unreliable electricity supplies and prohibitively high cost of Internet Services Providers (ISPs), hardware and software were barriers to ICT provisions. In a discussion about ICTs in

African universities, Karbo (2002) also identifies the problem of the cost of providing ICTs as well as suitable infrastructure to house them.

Lack of ICT skills and training causes difficulties, both among staff providing access to ICTs and their users (Ashcroft and Watts 2005; Karbo 2002). This is compounded in some countries by low basic literacy levels amongst the population (Ondari-Okemwa 2004). Bello (2004) carried out a study of the utilization of IT among healthcare professionals and students in Ile-ife, Nigeria. The study found out that only 27% of the doctors demonstrated good knowledge and 54% showed good utilization habits. Among the medical student population, 25% demonstrated good knowledge while 40% showed good utilization patterns. The author attributes the poor utilization patterns to lack of structured training and accessibility and suggests introduction of ICT literacy programs and establishment of adequate computer laboratories. Ogunyade and Oyibo (2003) examined the use of MEDLINE - the database of biomedical and the life sciences bibliographic information - by medical students at the College of Medicine, University of Lagos. The study found that the use of database was poor, due to lack of awareness, lack of access to computers, insufficient training and the high cost of provision.

To gain an understanding of the status of development in the adoption and use of electronic tools and resources, INASP undertook a survey of the current status of library digitization of publicly funded university libraries in sub-Saharan Anglophone Africa. (www.inasp.info/pubs). The survey found that Internet connectivity was uneven with only 35% of the libraries having

more than three quarters of their computers connected to the Internet. Half of the libraries that were connected reported slow speed and reliability as the major barriers to the use of e – resources. Electronic journal support programmes were reported to be available in all countries. But provisions of e-books were only available in 28% of the surveyed libraries. The survey reports some key achievements of libraries in terms of provision of e-resources, the raising of Internet awareness and provision of ICT facilities and connectivity. Lack of funds for the purchase and maintenance of hardware and e-resources together with lack of or retention of trained library staffs were identified as the main challenges, followed by the low levels of ICT literacy and e-resources use among users. This is in agreement with the findings of other researchers, elsewhere in Africa (Bello et al, 2004; Ogunyande and Oyibo, 2003).

The survey concludes by calling for increased support for the instigation and completion of library automation projects as the building blocks of a digital library, sufficient ICT facilities and adequate connectivity. The needs of different libraries must be taken into account if the programmes are to be successful (INASP, 2005).

2.5.1   The 'Digital Divide' or 'Know-do-gap'

The United Nations Development Program (UNDP) defines ICT to include the full range of electronic technologies used to manage information and knowledge. ICTs are the core tools through which information is captured, processed, stored, manipulated and exchanged in the information age

(Kebede, 2004). Fueling the use of ICTs is digitization, which enables the convergence of different media. Digital technology has made it possible for the integration of communications, computing and content of information to be collected, stored, processed, analyzed and transmitted via same medium (Nulens et al., 2001).

The key to digital technology is the computer, a tool that has ushered in the use of the internet as the basis for collecting and disseminating information. As the main medium for information acquisition, the computer is regarded as an agent of division between those who do have access to information and those who do not. However, just having access to computer does not translate to its usage in the acquisition of information if other essentials like infrastructure for electricity and telephone lines, appropriate content of information and literacy of users are not addressed.

Digital technologies have been integrated into virtually every facet of education, commerce, health, governance and civic activities, and have become critical factors in creating wealth worldwide (Opoku, 2004). Notwithstanding the importance of information and communication technologies to national development, disparities exist between nations in terms of access and use of these technologies. The term 'digital divide' has become well established in describing this disparity between those people who do or do not have access to information and communication technologies. Norris (2001) provides an interesting analysis of this division, describing the multi-dimensional 'digital divide' that exists globally, socially

and democratically. The global digital divide is the difference in access to ICTs between countries, the social digital divide is the difference in access to ICTs between the citizens of a country; the democratic digital divide is the difference between those who are or are not able to use ICTs to participate in public life. Although to some degree the digital divide is present everywhere, it is more pronounced in Sub-Saharan African countries than elsewhere in the world.

The Leland initiative (2002) attributes these gaps to the problems of telecommunications infrastructure investments and regulations; poor countries also face additional barriers including costs and unfamiliarity of using and maintaining equipments and software. In addition, the real needs of the users, which vary greatly due to educational, social and cultural differences, are often overlooked and not taken into consideration.

The gap is rather pronounced in the health sector. According to the United Nations Economic Commission for Africa (UNECA), the health sector is about fifteen years behind other sectors in application of information and communication technologies. At the same time the gap between Africa and developed world in the health sector is widening. In the mid-1990s, for example, there was an average of one doctor for every 400 people in high-income economies while there was only one doctor for every 1000 people in low-income economies like Zimbabwe. In some African countries, including Kenya, the ratio goes up to one doctor for every 7000 people and in some rural areas it goes as high as one for every 20000 people. The number of

doctors in African countries is simply not adequate to meet the overwhelming health needs. This shortage is becoming increasingly critical as African countries face unprecedented health breakdown attributable to the spreading HIV/AIDS pandemic (UNECA, 2001).

The mounting health crisis in Africa relates in part to the lack of adequate information systems (Osiobe, 1989). Ironically, therefore it is Africa that should have implemented information and communication technology application to bridge the technology gap and mitigate the shortage of healthcare workers. Investment in ICTs could complement basic health services provision by integrating the traditional paper-based operations with flexible electronic means, new technologies could bring significant cost reduction and effectiveness in terms of timely delivery of healthcare services.

The multi-dimensional digital divide described by Norris (2001) has a clear impact on the provision of electronic healthcare information in the developing countries, both between countries and within them. Electronic healthcare information resources emerging from the developed world may not necessarily be relevant or appropriate to the needs of those living in developing countries. It may be that knowledge no longer functions accurately when disconnected from its environment (Jimba, 2000), that information is perceived as having little local relevance (Carter, 2005), or there is a lack of evidence-based research that is applicable for healthcare practitioners in developing countries (Chinnock et al, 2005).

Although there is evidence for increased access to ICTs and online facilities in the developing countries, physical access to suitable ICTs and reliable connections to the Internet remain challenging and costly for many. Results from a study of Nigerian Libraries suggested that the high cost of hardware, software and particularly Internet Service Providers (ISPs) were a significant barrier to the provision of electronic information resources (Ashcroft and Watts, 2005). This problem is exacerbated by the scarcity of useful information for healthcare practitioners in the developing countries. While there are thousands of World Wide Web Sites containing information on cancer or heart diseases, there exist very few sources of information on diseases like malaria, cholera, tuberculosis or leprosy that have major consequences outside of the industrialized world. Even sites that deal with tropical diseases are often cursory and unhelpful to clinicians dealing with the diseases in hospitals and clinics in the field (Horton, 2003; Chinnock, et al, 2005).

A new expression has also emerged in the health sector that refers to some of the issues previously covered by the term digital divide. The 'know-do-gap' describes the discrepancy between having access to knowledge and translating that knowledge into practice. In the 'World Report on Knowledge for Better Health: Strengthening Health Systems,' the Director-General of the World Health Organization states that "there is a gap between today's scientific advances and their application: between what we know and what is actually being done" (World Health Organization, 2004). Lack of access to

knowledge resources makes it difficult to link research to healthcare decision-making, resulting in the 'know-do gap'.

Haines et al. (2004) further argue that despite a growing body of evidence on ways to improve the utilization of research findings, both developed and developing countries fail to implement health interventions that have shown to be cost-effective in high quality studies. Poor countries face additional challenges to using research evidence including: the weakness of their health systems, the lack of professional regulation and lack of access to evidence. They conclude that researchers, health practitioners and policy-makers should do more to promote the uptake of research and to translate this into evidence-based interventions. The challenge now is how to transform that knowledge into effective practice (Haines et al., 2004).

2.5.2   Global health information initiatives

Issues arising from the digital divide or know-do-gap have been acknowledged by the international communities and as a result there are a number of initiatives that are attempting to understand and address them. The World Health Organization report: *World Report on Knowledge for Better Health: Strengthening Health System* calls for health research systems to promote mutual learning, problem solving and innovation. In the report WHO urges that "knowledge must be accessible to all in a form which is useful and can be acted upon by different people and groups". It advocates robust national health research systems providing equitable access to research

information, which should be open to all countries and include all stakeholders: health service providers, policy makers and civil society.

Global Review on Access to Health Information in Developing Countries was launched in 2004 by representatives of leading health organizations worldwide such as the World Health Organization, Global forum for Health Research, British Medical Journal, International Network for the Availability of Scientific Publications (INASP) and the Lancet. The initiative was a review of lessons learned, progress and ways forward in providing access to relevant health care information for professionals in developing countries (Pakenham-Walsh and Bukachi, 2004). A discussion paper published in The Lancet entitled accompanied the launch of the review: *Can We Achieve Health Information for All by 2015*? (Godlee et al, 2004). In this paper Godlee presented a comprehensive overview of the progress; and argued that access to health information is increasingly becoming a key international development issue. Godlee(2004) was concerned that despite growing understanding of the need for exchange of knowledge between countries and within regions, there is a continuing tendency to push information out to people rather than strengthening and responding to the pull of their information needs. It is important that information flows take into account user needs rather than simply pushing information to them. Key to the sustainability of many development projects is working through building local capacity. This belief is shared by a number of organizations such as SatelLife (http://www.healthnet.org/whoweare.php) and the Global Forum for Health Research (http://www.globalforumhealth.org/pages/index.asp). Sustainable

information cycles are those in which the users/readers are also contributors/writers. Therefore developing countries need prioritized content development so that local health information that is currently unavailable electronically is given special attention. The information cycles can be established between researchers, scientific publishers, and editors, systematic reviewers, funding agencies, health professionals, policy makers and patients.

Bertrand and Certain (2000) point out that in a continent such as Africa, the traditional knowledge (now qualified as indigenous) has always existed, but was rarely consigned to papers. Oral transmission of knowledge remains the norm and only minorities of health care workers in Africa have a reading culture and even smaller groups have access to a pool of health and medical knowledge through libraries, books, journals and the internet. They suggest that health information professionals must be prepared to work not only at the level of medical practitioners, researchers and students, but also at the low level of the health system ladder, targeting the health workers in the field in order to develop a reading culture to gain knowledge, which in turn will benefit the communities (Bertrand and Certain, 2000). These local information cycles have the potential to greatly increase the relevance and reliability of information about healthcare and to build skills, understanding and ownership that will help to increase the use of that information.

Godlee et al. concluded by suggesting four broad areas for the future activity: first is improved access to essential information for heath professionals,

through strengthening of local and regional publishers, libraries and information systems; second is improved connectivity for efficient information flow among librarians, publishers and all other responsible for developing and distributing materials. Internet has a potential to deliver universal access to up-to-date healthcare information. E-mail provides new possibilities for publishing and distributing practical healthcare information and for networking with other health professional as evidenced by the success of such networks as AFRO-Nets (http://www.afronets.org) and HIF-Net at WHO, a multidisciplinary health-information development network; third is identification and understanding barriers to using information in different setting; and fourth, improving quality of healthcare information in terms of its reliability, relevance and usability. (Godlee et al, 2004).

The World Summit on the Information Society took place in two phases, the first one was held in Geneva in December 2003, and the second in Tunis in November 2004. An introduction to the purpose of the summit states:

> *Paradoxically, while the digital revolution has extended the frontiers of the global, the vast majority of the world remains unhooked from this unfolding phenomenon.*
> (World Summit of the Information Society, 2004)

The summit produced both a Plan of Action and a Declaration of Principles which among other issues discusses facilitating access to medical knowledge and locally-relevant content, promoting international standard for data exchange and encouraging the expansion of ICTs to remote and underserved areas and vulnerable populations (WSIS, 2003). From the G8 Summit which took place at Gleneagles, Scotland in July 2005, a Joint Science Academies

Statement on science and technology for African development sets out a series of recommendations (Joint Science Academies, 2005). The document suggests that there must be recognition of the role of science, technology and innovation in the success of development in Africa, including solutions appropriate to local needs. African countries require the methods and infrastructure to exploit their knowledge and African universities need to be supported and developed as centers of excellence in this field. The New Partnership for Africa Development (NEPAD) health strategy also advocates building capacity for health research relevant to the challenges and needs of the continent and its health systems .(http://www.afro.who.intl/dsd/nepad_health_strategy).

2.5.3   International initiatives pioneering information access in Africa

To overcome the health problems associated with information poverty and to bridge the digital-divide or the know-do-gap in the developing world, a number of initiatives have been launched by the international communities under the principle of ensuring equitable access to health information. The overall aim is to improve public health by facilitating the flow of relevant timely and appropriate information. The following are an indication of such initiatives:

- The WHO Blue Trunk Library project was initiated in 1996 as an effort to provide access to essential health information to district health care workers in developing countries in Africa. The Blue Trunk Library provides a collection of manuals and textbooks on medicine and public health to the district health centers, packed in a blue metal trunk, which

acts as a mini library. Through the Blue Trunk Library project, it has been possible to establish a network to disseminate medical and health information that reaches out beyond academic and university circle (Certain, 2002).

- Health InterNetwork Access to Research Initiatives (HINARI) provides free or very low cost online access to over 2000 full text journals in bio-medical and associated social sciences. The initiative began in July 2001 with six major publishers-Blackwell, Elsevier Sciences, Harcourt Worldwide STM Group, Kluwer International, Springer, Verlag and John Wiley signing up a statement of intent. (Health InterNetwork Access to Research Initiative, 2001). Twenty-two other publishers joined the initiative in May 2002, and the list of publishers and access to their journals continues to grow. Eligibility is based on GNP per capita according to the World Bank figures, and public institutions and non-profit organizations in Kenya are entitled to free access to HINARI resources (Health InterNetwork Access to Research Initiative, 2005).

- The International Network for the Availability of Scientific Publications (INASP), launched in 1996 is a co-operative network of partners aiming to improve worldwide access to information. INASP–Health promotes 'access to reliable information for health professionals' as a key to development issue, as potentially the most cost-effective approach to sustainable improvement in health care in developing and transitional countries (INASP–Health Directory, 1999). It links with the HIF-net @ WHO, an interactive forum whose aim is to strengthen debate and exchange of ideas with related sectors and networks, including health

practitioners, communication experts and information professionals (Pakenham – Walsh, 2000).

- SatelLife, well known for its medical information-sharing network, HealthNet was launched in 1991, provides access to information on clinical research, clinical practice and public health for doctors, researchers and other health professionals in Africa, Asia and Latin America.   HealthNet service enables users to receive electronic publications such as *HealthNet News* which provides current abstracts for leading peer-reviewed medical journal as well as current abstracts from the *Journal of the American Public Health Association,* the *World Health Organization's Library Digest for Africa*, the *WHO/AFRO Info digest*, the *AIDS Bulletin* and access to several other international medical databases (Groves, 1996).

- The Programme for the Enhancement of Research Information (PERI) works to support equitable access to and dissemination of learned information in the following areas:

    o Provision of international scientific and technical information,

    o Strengthening and development of journals from developing countries,

    o Enhancing awareness and providing training in the use of ICTs,

    o Enhancing skills in preparation, production, and management of scholarly publications.

2.6   Summary

Healthcare systems are undergoing substantial change and access, adoption and use of ICT is gaining increasing importance with advances of information systems and e-health technologies. The appeal for ICTs is derived from their inherent characteristics as well as changes that are already being observed with the introduction of the internet and improvements in telecommunication. However, limitations to potential integration of ICT into service delivery or daily life in developing countries include inadequate infrastructures, lack of training as well as difficulties in achieving sustainability. However, a number of programs and activities have been initiated by international communities aimed at improving worldwide access to information and knowledge in developing countries in Africa.

Literature review has indicated that very little research work has been done in the areas of health information systems and services, and in particularly the information needs of healthcare professionals in Kenya. User studies are critical; they enable information systems to adjust their services to meet specific needs of the individual groups of users rather than users trying to adapt to the information systems. This study was conducted to address these knowledge gaps.

Industry and specifically multinational enterprises as well as international agencies (NGOs and donors) play a particularly important role in the introduction and dissemination of ICTs and their integration into societies in developing countries. The integration process requires data resources or a

pool of knowledge and information to be processed and disseminated, financial resources to invest in the technological machinery, motivation and knowledge to access, assess and apply the information and resources to act on the information generated (Heeks, 2002). It also requires careful needs assessments, strategic planning with defined expectations and indicators that can easily be evaluated. Health information must be seen as an element set within the culture and capabilities of the recipient country, which can have a profound effect on the entire systems.