**DEVELOPING ICT-ENABLED SERVICE DELIVERY SYSTEM FOR
MUNICIPAL COUNCIL OF ELDORET**

By

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DECLARATION

Declaration by Candidate

This research is my original work and has not been presented for any award in any other university. No part of this research may be reproduced without the permission of the author and/or Moi University.

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Declaration by supervisors

This research has been submitted for examination with our approval as university supervisors.

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Dedication

This work is dedicated to all my siblings

and,

My Mum, Margaret *nyar japuonj* and my late Dad, Micah Ochieng'

ABSTRACT

Although Kenyan local authorities can benefit from ICTs in improving efficiency and effectiveness of their management and operations, this is not currently happening. Successful implementation of ICTs could go a long way in improving public service delivery in Kenyan local authorities. The development of e-services in local authorities in Kenya should be scaled from being merely informational or interactive to being truly transactional and eventually to being fully collaborative at the highest level of maturity. This may be achieved despite the challenges faced by local authorities in Kenya. This study investigated the current public services offered by Municipal Council of Eldoret (MCE) with a view to designing and developing an ICT-enabled service delivery system for increased efficiency and effectiveness. The specific objectives of the study were to: establish the current public services offered by MCE and their significance; determine the challenges affecting the quality of services in MCE; ascertain the efforts and measures taken by the MCE in developing ICT-enabled service delivery systems; establish the level of skills required by the public and MCE to support the development and effective use of ICT-enabled services; and develop a prototype for ICT-enabled service delivery system in MCE. This study was based on the concept of user acceptance of ICTs as a requisite condition for the successful implementation of any IT project, derived from the *Unified Theory of Acceptance and use of Technology (UTAUT)*. Data was collected from thirty one key respondents from MCE. The data collection instruments used included interview schedules and document analysis. Data collected was analyzed using qualitative data analysis technique. The research established that MCE offers a range of important public services in a multi-stakeholder environment. The significance of these public services places a high premium on MCE to improve the efficiency and effectiveness of the council's service delivery systems. However, there are important challenges affecting public service delivery in the council including financial, human resource and technical challenges among others. Because of these challenges, the council has only achieved the first two levels of e-service hierarchy namely information and interactive levels. The study further revealed that there was a great deal of enthusiasm for the development of higher levels of e-service delivery systems. To this end, the study proposed and developed a prototype for Online Transaction Service System (OTSS) towards effective and efficient public service delivery in the council.

Keywords: ICT-enabled services, online transaction service system, e-government, e-service.

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LIST OF ABBREVIATIONS

ALGAK	Association of Local Government Authorities of Kenya
CAVI project	Catarroja Virtual Town Hall
GOK	Government of Kenya
ICT	Information and Communications Technology
IDeA	Improvement and Development Agency
IFG	Institute for eGovernance
IFMS	Integrated Financial Management System
ISP	Internet Service Provider
KLGRP	Kenya Local Government Reform Programme
LA	Local Authority
LAIFOMS	Local Authorities Integrated Financial Operations Management System
LASDAP	Local Authority Service Delivery Action Plan
LASPs	Local Authority Service Plans
LATF	Local Authority Transfer Fund
MCE	Municipal Council of Eldoret
MoLG	Ministry of Local Government
M-Pesa	Mobile *Pesa*
NGO	Non Governmental Organisation
OTSS	Online Transaction Service System
SAP	Structural Adjustment Programmes
SBP	Single Business Permit
SOCITM	Society of IT Management
SPs	Strategic Plans
UNPAN	United Nations Public Administration Network
WAN	Wide Area Network
WITSA	World Information Technology and Services Alliance
W3C	World Wide Web Consortium

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CHAPTER ONE

INTRODUCTION

1.1 Preamble

Although Kenyan local authorities can benefit from ICTs in improving efficiency and effectiveness of their management and operations, this is not currently happening. According to the *Institute for eGovernment* (2008), there is need for local authorities to improve public service delivery through appropriate and successful implementation of ICT-enabled systems.

Technology in service delivery is crucial and ICT can transform local government by promoting good governance through an increased capacity to deliver. This allows for greater involvement on the part of clients, and even permits them to monitor what the municipality is doing. According to *IfG* (2008), not only does ICT assist in speeding up and improving delivery of services, it encourages transparency and accountability. The *IfG* (2008) further states that the deployment of ICT systems can enhance management of local government, as well as streamlining of processes and flow of information. Citizens and business community transacting online to pay for goods and services like utility bills, renew vehicle registrations and engage in other e-commerce activities. Citizens can also use e-enabled communication channels to enable them to transact and participate in the decision-making process of local government. WITSA (2003) concurs that ICT offers increased opportunities for improved service delivery in local authorities. ICT allows local government authorities to talk, listen, relate and continuously communicate with its citizens thereby supporting accountability, democracy and improved public service.

ICT may be uncharted territory for many a Kenyan local government, but technology clearly holds potential for improving the operations and outreach of local government (*IfG* 2008). Local and county governments should try to realize this potential by finding the best way to implement technology. Indeed, Mitullah and Muema (2007) concur that there is clear evidence that investments in such technologies could bring major economic benefits to local authorities.

1.2 Background information

In this section, the researcher presents the context of this study by drawing from experiences in ICT implementation in local authorities from both the developed and developing world. Generally, local authorities in the developed world have recorded substantial progress in using ICT in governance and service delivery whereas their counterparts in the less developed world are yet to record substantial progress. It is against this background that the researcher presents the following scenarios drawn from various parts of the world.

1.2.1 Local authorities in the developed world

In the developed world, local authorities have recorded tremendous steps in developing ICT-enabled service delivery. WITSA (2003) observes that Local authorities in the developed world have embraced ICTs to serve a variety of different ends: better delivery of services to citizens, citizen empowerment via access to information, more efficient local authority management, etc. The resulting benefits have been less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.

In 2002, the *Improvement and Development Agency* (IDeA) and *Society of IT Management* (SOCITM) study titled' *"Local E-Government Now: A Worldwide View,"* examined local municipalities in fourteen countries in Europe, Asia and South America. They noted that these municipalities were engaged in the establishment of best practices in efficient and effective e-government. However, it was revealed that the local governments were facing common challenges and similar objectives around the globe and that local authorities could learn from other governments that had already faced the challenge of introducing e-government. From the IDeA and SOCITM study (2002), the researcher selected the following local government success stories to highlight local e-government developments: local e-government in Japan and local e-government in Spain. This choice was made because local authorities in these two countries have made substantial progress in embracing e-government particularly in customer service, internal efficiency, citizen engagement and empowerment, revenue growth, cost reduction, reporting and transparency.

Local governments in Japan have embraced e-government with varying levels of success. Kubo and Shimada (2007) state that Japan came to the realization that it had not kept pace with the other developed nations with respect to its development into an IT nation. Further, they argue that the formulation of the concept of an e-government merited praise, considering that it was formulated as a national strategy and overcame the lack of a comprehensive IT approach by the government until that time. According to the *Council of Local Authorities for International Relations* (CLAIR) (2008), notable examples of successful e-government implementation are Gifu Prefecture, which was very fast off the mark in tackling the realization of local e-government, Hokkaido, which has made efforts

to establish an information network infrastructure linking municipalities across the prefecture, and Nagasaki Prefecture, which is enthusiastically re-assessing IT procurement aimed at training IT human resources. However, Kubo and Shimada (2007) note that in spite of the successes so far made in Japan, there are still several issues concerning e-government in local authorities in Japan, including digital readiness, digitalization of governmental administration, services to residents, information security among others.

IDeA and SOCITM study (2002), reported that in 1997, the City of Catarroja in Valencia, Spain, created and promoted change by offering citizens access to the data that local government holds. The study reported that The CAVI project (Catarroja Virtual Town Hall) consisted of a wide range of services that allows Catarroja's citizens to carry out transactions with a 24-hour online service, all the year round. According to the study, CAVI offers the following services to citizens: individual or family query, legal residence, salary and personal details in the payroll of the town hall (if a public officer), up-to-date data on the municipal register, historical report of changes in the municipal register, digital registration certificates with full legal validity, validation of electronic certificates for registration, up-to-date data on the electoral register, new and/or removed taxable items.

1.2.2 Local authorities in Africa

Gianluca (2006) argues that in Africa the prospect for ICT to complement effective government remains uncharted and unexploited in academic research. In his study, he reconciles this state by drawing together case studies from Ghana, South Africa, and Uganda to describe various local governance or ICT projects executed by civil society organizations, academic institutions and government authorities. According to the

Government of Ghana (2001), one of the main points of ICT deployment and exploitation policy was to promote the mechanism through which ICTs can lead to e-governance and better government services at all levels from the local to the national levels of governance. Indeed, Gianluca (2006), supposes that traditional leaders, who still retain a powerful authority in the Ghanaian society, need to grasp a better working knowledge of modern instruments of public administration, such as ICT, to secure the benefits of the trust that people have in traditional institutions.

Batungi (2005) states that e-government was already established in a few districts, ministry of lands, national educational institutions and other private and public institutions; and that e-government would lead to convenience and satisfaction, integration and efficiency, and participation of the local communities. Misuraca (2006) reported that there was plain evidence that the implementation of ICT in the selected agencies resulted in savings in administrative expenditure; freeing funds to be used for other more pressing economic activities, and complementing central government's poverty eradication action plan.

In South Africa, the Cape Town "smart city" project has been hailed as a success story. Baumann (2007) stated that the success of the project was based on Cape Town committing itself to a holistic and comprehensive "smart city" strategy, the IT department initiating a number of projects to address the standardization of Information and Communications Technology (ICT) architecture and connection of constituent parts to enable a better flow of information among the departments and more efficient services for its residents. Misuraca (2006) also noted that the Cape town project was one of the most ambitious local government or ICT-enabled projects undertaken anywhere in the world, merging seven

municipal authorities into a single administration with 28,000 employees serving a population of 3.2 million citizens.

Separately, IfG (2008) recognized Kinondoni Municipal Council (KMC) in Tanzania as one of the regional pace setters in initiating an e-government service. The KMC project established a pilot Management Information Systems for the top administration. Databases for various services and records, such as health, education, birth, marriage and death, had been computerized to facilitate good governance and to accelerate public services and the compilation of various social services reports. The project also improved the management and processing of matters pertaining to foreign trade and investment in Kinondoni district, thus attracting foreign investors. This was a glowing illustration of e-governance's capacity to boost transparency in government operations at the local level and to minimize the loopholes for corruption that can be found in the realms of business licensing and tax collection, which were extremely cumbersome before the e-governance project. Business licensing was contaminated with elements of corruption due to the slow manual processes – often a week or more - that lacked transparency. In a nutshell, many local authorities in Africa still lag behind in embracing e-government.

1.2.3 Local authorities in Kenya

According to IDRC (2005), the Government of Kenya (GOK) had plans to mainstream ICT into government operations, invest in adequate ICT education and training, and implement a tax reduction on both computer software and hardware and review the legal framework to encourage adoption and use of e-commerce and e-government. As of 2005, the GOK had developed the GOK e-government strategy 2004- 2008, a master plan for e-government.

IDRC (2005) also reported that the Government of Kenya had developed the national Information and communications policy. The bill has been passed into law i.e. the Kenya Information and Communications Act. The ICT act was intended to provide a regulatory framework that recognizes the importance of information and communication technology in economic and social development, it is intended to facilitate the use of electronic transactions in the country; promote business and community confidence in the use of information technology; and enable businesses and individuals to use electronic communications in their dealings with government.

UNPAN (2009) reported that some progress had been made by the GOK in the implementation of e-government strategy 2004- 2008. According to UNPAN (2009), the most important progress made was the Kenya Transparency and Communications Infrastructure Project ($114 million World Bank IDA loan through Ministry of Information and Communications) whose highlights included the following: developing e-government applications starting with e-procurement and land information systems, creating e-government services access points called digital villages, bandwidth expansion and broadband network support for universities and colleges through KENET, support for business process outsourcing (ICT sector), creation of Kenya ICT board to oversee the project, laying of the 5,000 KM national optical fiber backbone , and the East African Marine Optical Fiber – TEAMS (Fujairah to Mombasa) and SEACOM (June 2009).

Wafula and Wanjohi (2005) established how ICTs and e-government were packaged into local government reforms in Kenya. Their research also attempted to establish the degree of involvement of local authorities in both the national ICT policy formulation process and the

e-government strategy in five local authorities. These local authorities were: the Municipal Council of Bungoma, the Municipal Council of Webuye, the Municipal Council of Kimilili, the Town Council of Sirisia, and the Town Council of Malakisi. The results of the study were as follows:

- It was observed across most of the local authorities that whenever they required computer generated accounts, budgets, and reports, they had to outsource these services. Most of the local authorities were planning to train their personnel as well as install their own computer systems.

- The Kenya Local Government Reform Programme (KLGRP) sought to improve the local authorities' financial management and revenue mobilization particularly by deploying Integrated Financial Management System (IFMS). The already existing Local Authorities Transfer Fund (LATF) and the e-government project were expected to accelerate the acquisition of these systems by local authorities and enable them realize the objectives of the KLGRP.

- Just like IDRC (2005) study, this study revealed that most of the local authorities were unaware of the e-government strategy released in March 2004. Those that were aware of the strategy had learned about it through the media and not the official circulars from the Ministry of Local Government. Local authorities did not know what to expect from the e-government strategy. All they knew was that there were advantages to adopting e-government and they would like to have those benefits, especially those that brought cheaper and faster communications and service delivery to citizens, increased transparency and efficiency, and supported greater participation of citizens. ALGAK intended to establish monitoring, follow-up, and

control systems at all levels, including progress reports; review meetings and reports; budgets and budgeting control systems; and reports from special committees or task forces.

Based on the foregoing discussions on the developments of e-government in local authorities, both locally and internationally, the researcher made the following observations:

- The adoption of e-government in local authorities bore better prospects for developing new relationships between local authorities in Kenya, service users and businesses. By adopting new e-government solutions, local governments would increase their capacities to effectively and efficiently provide public services.

- Local authorities in Kenya should move from merely using ICT to automate their processes to linking information and services for online delivery of services.

- The GOK policies to promote e-government in local authorities should address local challenges like language, and cultural differences presented in section 2.3.2. WITSA (2003) argue that the challenge of fully exploiting the opportunities afforded by ICT- the challenge of e-government - is to find ways of stimulating demand for information and online government services, thereby enabling citizens' participation and involvement.

UNPAN (2009) recognizes the following important challenges facing the GOK e-government strategy to date: ICT staff retention problems; and limited managerial experience among ICT officers; limited technical experience of ICT professionals; internal e-government infrastructure and backend applications; 'rough' public-private partnerships;

limited e-leadership capacity. Some of these challenges tally with those outlined by IDRC (2005) like the lack of clear e-government champion; lack of a clear demonstration of political will to mobilize resources for e-government, the strategy is biased towards supporting the G2G components more than the G2C components for instance, local authorities are not expressly mentioned in the e-government strategy. These are some of the important multi-sectoral issues that should be addressed in order for the country to fully realize the gains of e-government (IDRC, 2005).

1.2.4 Description of Municipal Council of Eldoret (MCE)

Eldoret town is the fifth largest town in Kenya after Nairobi, Mombasa, Kisumu and Nakuru. Eldoret town is located about 300km North West of Nairobi on the Trans – African Highway. The town lies in the Uasin Gishu plateau, 65 km north of the equator and at an average altitude of 2,085 meters above sea level (MCE Strategic Plan 2006/2010).

According to the council's website, the official town site of Eldoret started in 1910 with a post office on what was known to the white settlers as 64. This was because at that time, it was 64 km from the newly built Uganda Railway railhead at Kibigori. The post office was later developed to include market office serving the community in the area. In 1912, 64 was declared a township with an area of 11.2 square km.

In 1958, Eldoret was elevated to Municipal Council status. Since then, the town has grown into the administrative centre of Eldoret West, East and Wareng (formally Uasin Gishu) districts. It is a major business hub in Western Kenya and particularly the North Rift Valley region. (MCE Strategic plan 2006-2010). According to MCE website, the Municipal

council of Eldoret straddles three constituencies – Eldoret North, Eldoret, East, and Eldoret South. It measures about 147 square km**,** is made up of 14 Wards and has a population estimated at 300,000 persons (Kenya Bureau of Statistics, 2009) with the majority concentrated in Huruma, Kamukunji, Langas, Kapsoya and Munyaka estates.

1.3 Statement of the problem

Local authorities play a significant role in the social, political and economic development of Kenya, though they face a many challenges which impede their abilities to effectively and efficiently deliver public services. Most of these local authorities rely on manual file based information systems with can hardly cope with the dynamics of modern day public service delivery. The adoption of ICT--enabled systems could go a long way in alleviating some of these challenges.

As part of its endeavor to mainstream the adoption of e-government and e-governance practices in the public sector, the GOK, through the e-governance strategy (2004-2007) spelt out the mechanisms through which the public sector could adopt e-government. This document was expected to influence the way all public institutions adopt e-government facilities in Kenya including local authorities. However, an in depth analysis of the e-government strategy reveals that the blueprint did not expressly spell out the place of local authorities in the entire e-government strategy. Like many Kenyan public institutions, local authorities, owing to limitations in the e-government strategy and the limited adoption of ICT facilities, face the following challenges in the delivery of public services:

1) Time consuming business processes;

2) Too much paper work results in need of a lot of space to keep the data;

3) Possibility of data duplication as there's no repetition check like in computer software;

4) Concurrent access to council services is greatly hindered as opposed to computerized service delivery systems where many clients can access the same data concurrently through networking;

5) There is limited integration of back office services: similar services should ideally be grouped together in a database and be made available in a one-stop fashion. Currently, local authority services are scattered across buildings and offices thereby making them less time consuming to access;

6) There are profound delays in correspondence between the local authorities and their clients, often resulting in business losses and general inconvenience;

7) There is limited public participation in policy making and subsequently decision making on issues of local community interest;

8) The fact that most local authorities still rely on manual systems and files to store information imply that the records are cumbersome to deal with, may be prone to wear and tear and may generally be vulnerable human errors of commission and omission; and

9) There exist many loopholes for corruption since it is difficult to carry out comprehensive information audit in manual systems.

These multiple challenges need to be scientifically addressed with a view to coming up with logical solutions that can guarantee effective and efficient public service delivery in

local authorities. If local authorities can adopt ICT-enabled systems, then it would be possible to streamline and integrate both the front-end and back-end business processes and hence mitigate these challenges.

1.4 Aim and objectives of the study

The following were the aim and objectives of the study:

1.4.1 Aim of the study

The study investigated the current public services offered by the Municipal Council of Eldoret with a view to designing and developing ICT-enabled service delivery system for increased efficiency and effectiveness.

1.4.2 Objectives of the study

The following were the objectives of the study:

1) To establish the current public services offered by Municipal Council of Eldoret and their significance;

2) To determine the challenges affecting the quality of services in Municipal Council of Eldoret;

3) To ascertain the efforts and measures taken by the Municipal Council of Eldoret towards developing ICT-enabledpublic service delivery systems;

4) To establish the level of skills or knowledge required by the public and EMC to support the development and effective use of ICT-enabled services in Local Authorities in Kenya;

5) To develop a prototype for ICT-enabled public services delivery system in Municipal Council of Eldoret and other local authorities in Kenya.

1.5 Research Questions

This study was guided by the following questions:

1) How can the development of ICT-enabled public service delivery systems be supported in the Municipal Council of Eldoret and other local authorities in Kenya?

2) How can the contemporary issues in the development of ICT-enabled public service delivery systems be addressed to improve and facilitate the delivery of public services in Municipal Council of Eldoret and other local authorities in Kenya?

3) What components should an ICT-enabled public service delivery system for local authorities contain?

1.6 Assumptions of the study

This study was based on the following assumptions:

1) Local authorities in Kenya and Municipal Council of Eldoret in particular, have not adequately implemented ICT–enabled public service delivery solutions;

2) ICT-enabled public service delivery is a concept not fully understood, accepted and embraced by local authorities in Kenya;

3) Most of the Local government staff in Kenya lack sufficient skills to develop ICT-enabled public service delivery systems;

4) The current public service delivery systems in local authorities in Kenya are vulnerable to irregularities.

1.7 Significance of the study

Firstly, the significance of this study lies in providing a succinct analysis of the public service situation in MCE. By analyzing the public services offered by the council and their significance, the discoveries made could form the basis for efforts to improve the effectiveness and efficiency of the processes involved in public service provision. Secondly, In terms of the significance of the public services provided by the MCE, this study could form the basis for agitating for the council's increased capacity to deliver public services based on the premium attached to the said services.

Thirdly, this study characterised the challenges affecting the quality of public services in MCE, identifying their cross-cutting nature and categories with a view to advising the concerned parties appropriately. Fourthly, this study revealed the ongoing efforts and measures taken by MCE to develop ICT-enabled public services. This observation could form the basis for advising decision makers in the council.

Fifthly, by exposing the level of skills required for the successful adoption of e-government initiatives in the council, this study could be used to draw an institutionalized framework for building human resource capacity in ICT in the council. The study findings could also assist in developing e-service delivery curriculum for ICT colleges. Moreover, the study could give insights into Online Transaction Service Systems in developing countries' municipalities. It could also give directions for future e-service systems research and scholarship in Kenya. The GOK could also benefit from this study by using the findings to make policies to support OTSS in local authorities. Last but not least, the study conceptualized and developed a prototype of OTSS as the third tier of the e-service

hierarchy. The OTSS aims to consolidate the ICT gains so far made by the council and the information system characteristics presented in table 5-2 which provides options for building ICT solutions in local authorities in Kenya.

1.8 Scope and limitations

The focus of this study was to scrutinize the current public service delivery practices in Municipal of Eldoret, Kenya and subsequently to design and develop a prototype for OTSS, for increased efficiency and effectiveness in service delivery.

1.8.1 Scope

The study was confined to the Municipal Council of Eldoret. The reasons for the choice of EMC for this study were two-fold: one, because it was conveniently accessible to the researcher. Secondly, according to the *Report on Evaluation of the Performance of the Public Agencies in Kenya for the Financial year 2006/2007*, MCE was ranked 106th out of 175 local authorities in Kenya in terms of service delivery. The researcher therefore felt that there was sufficient ground to conduct the study in MCE since its public service delivery practices were a reflection of practices in other authorities in Kenya.

As part of the scope of the study, the output of the study consisted of developing an online transaction service system for MCE and other local authorities in Kenya. The researcher explored the domain of ICT-enabled public service delivery as a real world system, derived from the case study findings presented in chapter four and analyzed in chapter five, to conceptualize and develop the system. The system consists of seven modules which correspond with the seven departments in MCE.

1.8.2 Limitations of the study

Although this research achieved its aim and objectives, there were some limitations. Out of 175 local authorities in Kenya, Municipal Council of Eldoret (MCE) was chosen for this study thereby narrowing down wide the scope of the study. The main reason for the choice of EMC for this study was because it was conveniently accessible to the researcher. By undertaking a case study of EMC, the researcher conveniently obtained the required information. The case study revealed imperative issues regarding public service delivery system in the council such as technical, financial, policy issues etc. However, this study can be replicated at other local authorities in Kenya.

Another important limitation was the scarcity of local literature exploring the subject under study. From the literature reviewed, it was evident that a similar study has not been carried out locally, except for relevant policy papers and other guidelines. The researcher therefore relied on studies conducted in other countries.

1.9 Structure of the thesis

In chapter one, the researcher introduces the study by presenting the background to the study, stating the problem of the study and the study aims and objectives as well as the scope of the study. In chapter two, the researcher presents a review of literature relevant to the study and focuses on the main issues to be considered in developing ICT-enabled public service delivery systems as well as the supporting technologies. In chapter 3, the researcher discusses the research methodology by describing the research design, study population, sampling technique, data collection techniques, data presentation and analysis techniques

etc. The researcher presents data presentation and analysis in chapter 4. In chapter 5, the researcher presents the analysis and design of online transaction service system by presenting the context for the system, the user requirements elicitation and design requirements for the system. In chapter six, the researcher discusses how a prototype of the system was implemented. The researcher explains how the services of the system were translated into appropriate code. The researcher makes an evaluation of the research in chapter seven, and also presents the findings, conclusions and proposed recommendations for further research. The structure of this thesis is shown in figure 1-1.

Chapter 1: Introduction to the study
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Chapter 2: Literature review
↓
Chapter 3: Research Methodology
↓
Chapter 4: Data presentation and analysis
↓
Chapter 5: Analysis and Design of Online Transaction Service System
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Chapter 6: Implementation of the system in a prototype
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Chapter 7: Findings, conclusions and recommendations
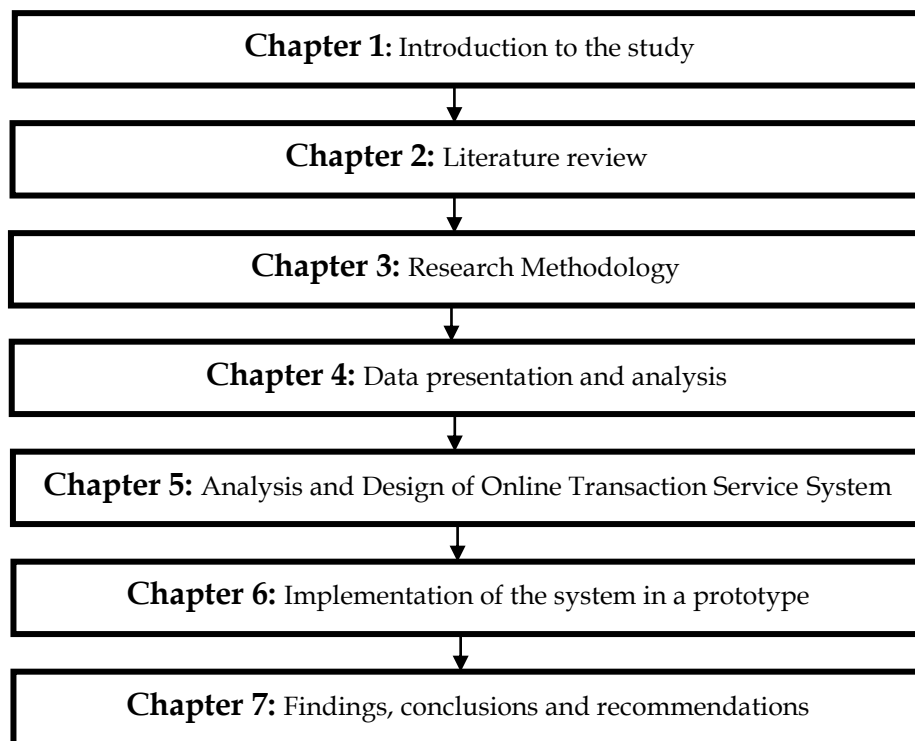
Figure 1-1: Structure of the thesis

1.10 Definition of important terms

Information Communication Technologies (ICTs)

According to UNDP (2004), ICTs include a multi-purpose set of tools, applications and services used to process, produce, store, distribute and exchange information. ICTs use both the 'old' technologies of radio, television, telephone and the 'new' of computers, satellite, wireless technology and the Internet.

E-government

According to the World Bank (2007), e-government refers to the use by government agencies of information technologies such as WANs, and the Internet, that have the ability to transform relations with citizens, businesses, and other arms of government.

E-governance

According to UNESCO (2005), e-governance may be understood as the performance of governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities. E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way citizens relate to governments and to each other. According to Palvia and Sharma (2007), E-governance can bring forth new concepts of citizenship, both in terms of citizen needs and responsibilities. Its objective is to engage, enable and empower the citizen.

Public services

Humphreys (2004) defines public services as those services which are mainly, or completely, funded by taxation. As such, they can differ markedly from commercial private-sector services in a number of ways. These differences need to be both acknowledged and discussed, because of their potential implications for the development of delivery systems.

Effective and efficient public service delivery

According to Muniafu (2007), effective and efficient public service delivery support means that a given service delivery process should place equal emphasis on the usefulness, usability and usage of the ICT-enabled services in meeting the end-user needs.

Local government / local authority

The CPRE (2004) defines local government as the administrative body that governs local services such as education, housing and social services. According to Tenants Services Authority (TSA) (2009), it is an umbrella term that could refer to any unitary authority or county, metropolitan or city authority.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher reviews literature on ICT-enabled public service delivery systems in local authorities. In addition, this chapter highlights the state of service delivery in local authorities in Kenya and other parts of the world. The researcher has also provided a theoretical model to anchor the study as well as the current trends regarding the development of ICT-enabled services. The aim is to understand these trends and contextualize them to develop ICT-enabled services for use in MCE and other local authorities in Kenya.

2.2 Theoretical Framework

This study was based on the concept of user acceptance of ICTs as a requisite condition for the successful implementation of any IT project, derived from the *Unified Theory of Acceptance and use of Technology (UTAUT).*

2.2.1 The Unified Theory of Acceptance and Use of Technology (UTAUT)

This is a technology acceptance model formulated by Venkatesh et al. (2003). The UTAUT model aims to explain user intentions to use an information system and subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, facilitating conditions) are direct determinants of usage intention and behaviour. Venkatesh et.al. (2003), further states that gender, age, experience,

and 'voluntariness' of use are posited to mediate the impact of the four key constructs on usage intention and behavior.

Venkatesh et.al. (2003), state that UTAUT model was developed through a review and consolidation of the constructs of eight models that earlier research had employed to explain information systems usage behaviour (Theory of Reasoned Action, Technology Acceptance Model, Motivational Model, Theory of Planned Behaviour, a combined theory of planned behaviour / technology acceptance model, Model of Personal Computer Utilization, Innovation diffusion theory, and Social Cognitive Theory). Venkatesh et.al. (2003) further state that this synthesized model was created to present a more comprehensive picture of the acceptance process than any previous individual models had been able to do. Eight models previously used in the information systems literature were merged in an integrated model, all of which had their origins in psychology, sociology and communications.

Rosen (2005) asserts that by consolidating and improving upon existing IT acceptance models, the UTAUT model should then serve as a benchmark for the acceptance literature. Although the UTAUT model is relatively new, its suitability, validity and reliability in technology adoption studies in different contexts has been proven.

According to Venkatesh et.al. (2003), the UTAUT model contains five direct determinants of behavioural intention and use behaviour:

- *Performance expectancy*, which is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance";

- *Effort expectancy*, which is "the degree of ease associated with the use of the system";

- *Social influence*, which is "the degree to which an individual perceives that important others believe he or she should use the new system";

- *Facilitating conditions*, which is "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system"; and

- *Behavioral intention*, which is "the person's subjective probability that he or she will perform the behaviour in question".

The UTAUT model also considers moderators influencing the four direct determinants: gender, age, experience and 'voluntariness' of use.

The comprehensiveness, validity and reliability of the UTAUT model have been tested in various studies including Al Awadhi and Morris (2008) and Oshlyansky, Carns and Thimbleby (2007).

The UTAUT model was considered suitable for this study because its parameters provided a fitting framework for the design of data collection equipment, analysis and interpretation of the data colleted in the field as follows:

- Performance expectancy was captured by the perceptions of MCE staff in using e-services in terms of such benefits as saving time, money and effort, facilitating communication with council clients, improving the quality of MCE services and by

providing council clients with an equal basis on which to carry out their business with the council.

▪ Effort expectancy was captured by the perceptions of ease of use of e- services by MCE staff as well as ease of learning how to use these services.

▪ Social influence was captured by 'peer influence' or MCE interdepartmental influence as staff in any organization need to belong to or feel connected with staff of their own calibre and interest, attitudes, interests and circumstances that resemble their own.

▪ Facilitating conditions was captured by the perception of the MCE staff's ability to access required resources, as well as to obtain knowledge and the necessary support needed to use e-services. It was also influenced by the perception of the technology fitting into the lifestyle of the staff.

▪ The measurement of behavioral intention included the intention, prediction and planned use of e- services.

The study also considered the influence of certain moderators the researcher thought would influence the four direct determinants: internet experience and academic level. This was in tandem with the following objectives of the study: to determine the challenges affecting the quality of services in Municipal Council of Eldoret; to ascertain the efforts and measures taken by the Municipal Council of Eldoret towards developing ICT-enabled services; to establish the level of skills or knowledge required by the public and EMC to support the development and effective use of ICT-enabled services in local authorities. To a greater extent, the components of the model are reflected in the data collection instruments.

2.3 E-Government

Muraya (2007) says that e-government is increasingly being viewed as an essential tool in the future outlook of any country, Kenya included, and is gradually transforming how services are delivered to the general public.

2.3.1 Components of e-government

Data management group (2006) identifies the following four e-government elements:

- **E-services**: this is the electronic delivery of government information, programs, services often (but not exclusively) over the internet.

- **E-democracy:** this is the use of electronic communication to increase citizen participation in the public decision making.

- **E-commerce**: the electronic exchange of money for goods such as citizens paying taxes and utility bills, reviewing vehicle registrations and paying for recreations, or government buying supplies and auctioning surplus equipment.

- **E-management**: the use of ICTs to improve the management of government from streamlining business process to maintaining electronic records, to improving the integration of information

2.3.1.2 E-services

According to *e-Macao program* (2009), an e-service automates or partly automates one particular administrative process. This process can be triggered by a request from a citizen or by the elapse of time (once a month, say), or even by the diary and scheduling software working on the citizen's client machine. According to Janowski (2008), e-services follow a hierarchical manner of development and many models exist to describe this hierarchy.

However, none of these models has been accepted as a standard. Generally, e-services to can be divided into the following phases:

- **Informational:** This is generally considered as the basic level in which governments develop web presence and then move on to further development. According to Janowski (2008), this is the first phase and includes the provision of information alone**.** The quality, usability and currency of the content determine the value of this phase of e-government. This is the least complex of all the phases.

- **Interactive:** in this phase, e-government provides some degree of online interaction (Baum and Maio, 2000). For instance, citizens can enter complaints or job applications online. Janowski (2008) says that this phase is characterized by users' ability to access agencies' databases: browsing, exploring and interacting with data and performing electronic searches and calculations based on the user's criteria. This phase does not include secure transactions such as financial or other transactions that require a high degree of authorization and audit.

- **Transactional:** enabling citizens to enter secure information and engage in transactions with the agency is the major characteristic of this critical phase (Janowski, 2008). It requires real-time responsiveness by government agencies to the service demands by citizens and businesses. It provides secure transactions with high level of authorization. In this phase, citizens can apply online for passports, National Identity Cards and make online payments (Baum and Maio, 2000). This phase requires a high level of security and basic infrastructure allowing for secure transactions.

- **Collaborative:** in this phase, businesses and citizens collaborate with the government on processes, projects etc. According to Baum and Maio (2000), this

phase is especially important for businesses working together with the government on projects, for public-private partnerships, NGOs, citizen forums, etc. This requires a collaboration infrastructure to bring together suppliers, consumers and the government in a network with the object of increasing value creation.

2.3.2 Challenges to e-government in Kenya

According to the International Bank for Reconstruction and Development (IBRD) (2008), e-government challenges can be categorized as follows: equity, privacy and security issues.

2.3.2.1 Equity issues

According to the Business Dictionary (2011), equity implies giving as much advantage, consideration, or latitude to one party as it is given to another. In the context of e-government, equity is essential for ensuring that e-government opportunities, funds, goods and services are fairly divided among their recipients.

E-literacy and illiteracy

Bernardo (2000) recognizes that literacy is embedded in the activities and practices of a community, entails extracting and processing complex meanings from text and other printed forms of language and that it involves sorting through information, to think and reason beyond the given information. The University of Idaho (2011) defines information literacy as the ability to identify what information is needed, understand how the information is organized, identify the best sources of information for a given need, locate those sources, evaluate the sources critically, and share that information. It is the knowledge of commonly used research techniques. According to IBRD (2008), there are

serious policy issues that should be addressed to achieve e-literacy and to realize the full potential of ICTs in all sectors of development in a country like Kenya.

Language localization

Gakuru (2010) observes that 99% of software used in e-government applications in Kenya are proprietary and largely foreign, although the government's ICT policy states that 50% of software in government systems should be locally developed. Indeed, IBRD (2008) noted that while English was spoken in many developing countries like Kenya, it was typically a second or third language, used for conducting business. The vast majority of the populations of developing countries do not speak English. IBRD (2008) further noted that even native language use poses a challenge in countries that have many local or ethnic dialects. As a remedy to this situation, IBRD (2008) proposes that effective e-government strategies should emphasize content in the national language or languages and also provide for translation into various ethnic dialects, like Microsoft's ambitious project of localizing languages for their applications in several developing countries including Kenya and Tanzania where Microsoft applications are now available in Swahili.

Disability access

E-government is considered a boon for disabled population. Kountzeris (2008) argues that through e-government, disabled people should have access to the same services provided to everyone. This view is shared by IBRD (2008) which states that individuals with various forms of disability like limited mobility, the deaf, the blind, or otherwise, could benefit greatly from e-government services tailored to carter for their disabilities.

Gender

E-governance strategies and policies should take cognisance of gender issues. UNDP (2008) asserts that ICTs are not gender-neutral i.e. they are not accessed, managed and controlled by all men and women equally. IBRD (2008) argues that in formulating e-government strategies, gender-blind does not mean gender-neutral. UNDP (2008) noted that "understanding gender roles and responsibilities from the very start is important to ensure that e-governance programmes and policies do not perpetuate existing gender gaps in government services and institutions.". Some of the key gender policy issues identified by UNDP (2008) that needed to be addressed include: increasing the presence and active participation of women in policy planning committees for national e-governance strategies and programmes, ensuring that male and female participants in the policy process understand how gender roles and relations impact on e-governance, linking public administration reform strategies and programmes to e-government strategies monitor e-governance policies, prioritizing e-services that address the specific needs of women and monitor women and men's recruitment to government institutions at national and local levels.

2.3.2.2 Privacy and Security

Privacy

Singh (2010) observes that success or failure of e-governance projects depends on the level of trust citizens have on such initiatives. And without addressing the privacy and security concerns of its citizens, government cannot build and maintain trust to support dynamic projects that promote e-governance. According to IBRD (2008), in the context of e-government, "privacy" specifically refers to principles for the fair use of information. IBRD

(2008) further argues that the concept of fair information practices holds that the citizen retains an interest in the information collected by the government in the course of a required or voluntary interaction.

Information security

Tassabehji (2005) states that security privacy and trust are consistent barriers to the adoption and full implementation of e-government for both government and citizens and are thus major factors for encouraging inclusion. IBRD (2008) observes that as governments become more dependent on computers, both internally and in their relations with citizens, they become increasingly vulnerable to a range of risks, from interruption of operations that are based on computers to loss of confidential data. Government agencies at all levels (national, provincial, and local) must protect the computer systems that they own and operate. IBRD (2008) further observes that information security requires a combination of business, management, and technical measures in an ongoing process. Security is costly, but, like privacy, it should be addressed in the design phase and periodically reviewed. Aspects of information security include, but not limited to, the following: developing a national cyber-security strategy, embracing cyber-security principles and guidelines (international models), leadership and organization for information security and cyber crime.

2.4 Local government services in Kenya

The purpose of this section is to provide an update of local government services in Kenya and to focus attention on the experiences of local authorities interacting with citizens, customers, and other levels of government. According to IDRC (2005), various national

studies in Kenya have addressed national e-government policy, strategy, and implementation, ignoring developments of the local government, whereas it is estimated that up to 80 percent of citizen-government transactions take place at the local level. In addition, this section also cites a few examples of the use of ICT to provide local e-government services in Kenya.

The MoLG (2011), states that Local Authorities are established under the Local Government act Cap 265 of the laws of Kenya. In addition to the act, the local authorities draw their legal powers from the constitution of Kenya, other acts of parliament, ministerial orders and by-laws (Mitullah and Waema, 2007). The MoLG (2011) states that there are 175 local authorities in Kenya, which include city councils, municipal councils, town councils and county councils with ministry of local government as the overall overseer of their operations.

Mitullah and Waema (2007) observe that Kenya's local authorities are charged with the provision and management of infrastructure and services in their respective jurisdictions; that their responsibilities include the following: mobilizing internal and external resources and, within existing regulatory framework; directing the resources towards addressing the following basic social needs of the populace in the authority; infrastructure development; and environmental sanitation, garbage collection and disposal; housing, health, education, welfare - markets, recreation and sports.

Mitullah and Waema (2007), further observe that there has been a recent shift towards nurturing an enabling environment for the enhanced participation of the citizens in urban

development; that most local authorities in Kenya face a number of challenges in realizing their mandate. These challenges include: delivery of infrastructure and services, financial management, institutional and legal framework, human resource capacity and managing rapid growth. Mitullah and Waema (2007) further noted that these challenges have resulted in poor service provision and management and many analysts have criticized the local authorities, and questioned their role in local development. It is the inefficiency of local authorities that has justified a re-examination of their role and the launching of the Local Government Reform Programmes (LGRP), which also include the decentralization of service provision and management, which is still in initial stages.

Radcliffe and Mitullah (2003), noted that since the beginning of 1990, the implementation of Structural Adjustment Programmes (SAPs) and civil service sector reforms have led to a number of reforms in the governance of local authorities. In particular, Radcliffe and Mitullah (2003) noted that there has been a deliberate attempt to decentralize governance by moving away from a centralized political system where citizens hardly make any contribution in governance of resources, to a decentralized political system where the inputs of citizens is considered critical to development.

In 2004, the GOK launched a four year (2003-2007) e-government strategy for better and efficient delivery of government information and services to the citizens, promoting productivity among public servants, encouraging participation of citizens in government and empowering all Kenyans in line with development priorities outlined in the *Economic Recovery Strategy for Wealth and Employment Creation* (The Directorate of e-Government, 2008). This initiative, according to Mitullah and Waema (2007), was

considered long overdue given the rapid changes in governance taking place worldwide. However, the initiative was faulted for being *ad hoc* in its approach to ICT policy, strategy development and implementation (Mitullah and Waema 2007). They observed that it was therefore imperative that the e-government strategy be implemented within a well-defined and integrated national policy framework in order to increase efficiency and effectiveness, enhance transparency and accountability in the delivery of government services through the use of information technologies, improve the internal workings of government to be externally-oriented and more customer-focused, facilitate collaboration and the sharing of information within and between government agencies, reduce significantly transaction costs leading to savings, encourage participation and empowerment of citizens including the disadvantaged groups and communities in the rural and remote areas through closer interaction with the government etc.

As of 2009, the directorate of e-government reported that the GOK had undertaken a number of e-government initiatives in line with the e-government strategy. These initiatives included capacity-building for government employees, basic ICT training for civil servants, distribution of ICT equipments to ministries and departments and networking of government buildings Government private network. However, citing the original e-government implementation framework, the researcher noted that the implementation of the e-government strategy had fallen behind schedule and the GOK should have laid sufficient ground for e-government and moved on the post 2007 e-government projects including e-government payments, e-trading of government securities, government service management, enhanced e-policing and integrated electronic payments.

2.5 Principles of ICT-enabled service delivery

This section provides a brief background to the current trends and underlying themes governing the development of ICT-enabled service delivery systems in public institutions. According to *etransform Africa* (2011), the demand for ICT-enabled public service delivery is increasingly being emphasized by governments, the private sector, civil society groups and development agencies as critical for strengthening good democratic governance. The benefits of ICT-enabled public service delivery, according to WITSA (2003), are twofold: cost cutting and improving efficiency in service delivery. ICTs have the ability to transform public institutions relations with citizens, businesses, and government. This is followed by an introduction to the concept of service orientation and service oriented architecture the basis for the development of ICT-enabled public service delivery system.

2.5.1 Impact of ICT on the design and delivery of publicservices

Mitullah and Waema (2007) observe that in Kenya, public service reform has been high on the political agenda and the role of ICTs in this process has been increasingly recognised. The National Council for Voluntary Organizations (2007), observes that at the heart of the debate around transforming public services, is the need to engage better with citizens, and to ensure that they have both choice and voice. ICT can provide those commissioning and delivering services with useful tools to improve public services and can enable much better user engagement, by not just allowing citizens to easily access information about services, but by moving beyond this to allow a conversation to develop between service users and service providers. However, ICT can also raise challenges and without adequate understanding, organisations may not be able to exploit its full potential.

According to NCVO (2007), the impact of ICT on the design and delivery of public services can be summarized as follows:

- Facilitating delivery of services in new or improved ways;

- Co-design of services by using ICTs to gather users views;

- Empowering citizen-consumers to publish their thoughts e.g via blogs;

- Sharing innovation by way of open source thinking;

- Data management especially through sophisticated Customer Relationship Management (CRM);

- Facilitating back office processes;

- Collaborative working;

2.5.2 Service oriented architectures (SOA)

Connell (2003) says SOA is the underlying structure supporting communications between services. According to Exforsys (2009), service-orientation is a design paradigm that specifies the creation of automation logic in the form of services. It is applied as a strategic goal in developing a service-oriented architecture (SOA). Like other design paradigms, service-orientation provides a means of achieving a separation of concerns.

BEA Systems (2005) argue that SOA has rapidly gained prominence because it allows the creation of flexible services where services are provided and used as required. Moreover, with the adoption of SOA, businesses expect to leverage their IT assets and to provide the agility needed to be competitive in today's economy. SOA provides the foundation for this infrastructure. Arguably, one of the best statements on SOA is given by Connell (2003). It explicitly shows the widespread use of SOA:

"Whether you realize it or not, you've probably relied upon SOA, perhaps when you made a purchase online. Let's use Land's End as an example. You look at their catalog and choose a number of items. You specify your order through one service, which communicates with an inventory service to find out if the items you've requested are available in the sizes and colors that you want. Your order and shipping details are submitted to another service which calculates your total, tells you when your order should arrive and furnishes a tracking number that, through another service, will allow you to keep track of your order's status and location en route to your door. The entire process, from the initial order to its delivery, is managed by communications between the web services -- programs talking to other programs, all made possible by the underlying framework that SOA provides."

Based on cornel's argument it is accurate to say that since SOA occupies a central place in facilitating communication between various services that we interact with on a daily basis, its use, characterization and application should be fully appreciated.

2.5.2.1 Fundamental concepts of service oriented architectures

SOA is a software architecture that starts with an interface definition and builds the entire application topology as a topology of interfaces, interface implementations and interface calls (Gartner group, 2003). SOA would be better-named "interface-oriented architecture." According to Eu-orchestra (2007), the interface constitutes a contract defining the functionality of the service in a platform-independent manner. Gartner group (2003) says SOA is a relationship of services and service consumers, both software modules large enough to represent a complete business function. Further, these services are software

modules that are accessed by name via an interface, typically in a request-reply mode. Service consumers are software that embeds a service interface.

Erl (2007) observes that different design paradigms exist for distributed solution logic. What distinguishes service-orientation is the manner in which it carries out the separation of concerns and how it shapes the individual units of solution logic. Erl (2007) further argues that the application of service-orientation, to a meaningful extent, results in solution logic that can be safely classified as "service-oriented" and units that qualify as "services." Erl (2007) identifies the following specific architectural principles for design and service definition focus on specific themes that influence the intrinsic behavior of a system and the style of its design:

- *Service encapsulation*: many web-services are consolidated to be used under the SOA Architecture. Often such services have not been planned to be under SOA.

- *Service loose coupling*: services maintain a relationship that minimizes dependencies and only requires that they maintain an awareness of each other.

- *Service contract*: services adhere to a communications agreement, as defined collectively by one or more service description documents.

- *Service abstraction*: beyond what is described in the service contract, services hide logic from the outside world.

- *Service reusability*: logic is divided into services with the intention of promoting reuse.

- *Service composability*: collections of services can be coordinated and assembled to form composite services.

- *Service autonomy*: services have control over the logic they encapsulate.

- *Service optimization*: all else equal, high-quality services are generally considered preferable to low-quality ones.
- *Service discoverability*: services are designed to be outwardly descriptive so that they can be found and assessed via available discovery mechanisms.

In the world of SOA and service-orientation the term "service" is not generic. It has specific connotations that relate to a unique combination of design characteristics. When solution logic is consistently built as services and when services are consistently designed with these common characteristics, service-orientation is successfully realized throughout an environment (Erl, 2007). It is important to remember that a single service can provide a collection of capabilities. They are grouped together because they relate to a functional context established by the service (Erl, 2007). The functional context of the service illustrated in figure 2-1, for example, is that of "shipment." Therefore, this particular service provides a set of capabilities associated with the processing of shipments.

Figure 2-1: Principles of service design (Source: Erl, 2007)

2.5.2.2 Implementing service-oriented architecture through web services

The W3C (2002) defines a web service as a software application identified by a unique resource identifier (URI), the interfaces and bindings of which are capable of being defined, described, and discovered as XML artifacts. A web service supports direct interactions with other software agents using XML-based messages exchanged via Internet-based protocols.

Web services do not necessarily translate to SOA, and not all SOA is based on web services but the relationship between the two technology directions is important and they are mutually influential: web services momentum brought SOA to mainstream users, and the best-practice architecture of SOA helps make Web services initiatives successful (Gartner 2003). According to IBM (2008), when implementing a service-oriented architecture using web services, a major focus is to make functional building blocks accessible over standard internet protocols that are independent from platforms and programming languages. These services can be new applications or just wrapped around existing legacy systems to make them network-enabled. Each SOA building block can play one or more of three roles: service provider, service consumer or service requester (IBM, 2008)

2.5.3 Service composition and coordination

The higher layer of the SOA pyramid provides support for service composition and management, and service orchestration, transaction, and security. In the composition layer several atomic services can be consolidated into one composite service (Eu-orchestra, 2007). Depending on their requirements clients apply atomic or composite services as applications and/or solutions. Service aggregators may utilize such composite services as

components in further service compositions thus becoming service providers by publishing

the service description they create.

According to Eu-orchestra (2007), a composer of several services must encompass

functionalities such as: coordination (establish and manage the control of data flow among

the services); monitoring (subscribe to events generated by component services);

conformance (ensure integrity of composite service by controlling conformance of

component services) and quality of service (QoS) (bundle QoS of component services to

derive the composite QoS, e.g. performance, security, authentication, privacy, scalability,

availability, etc.)
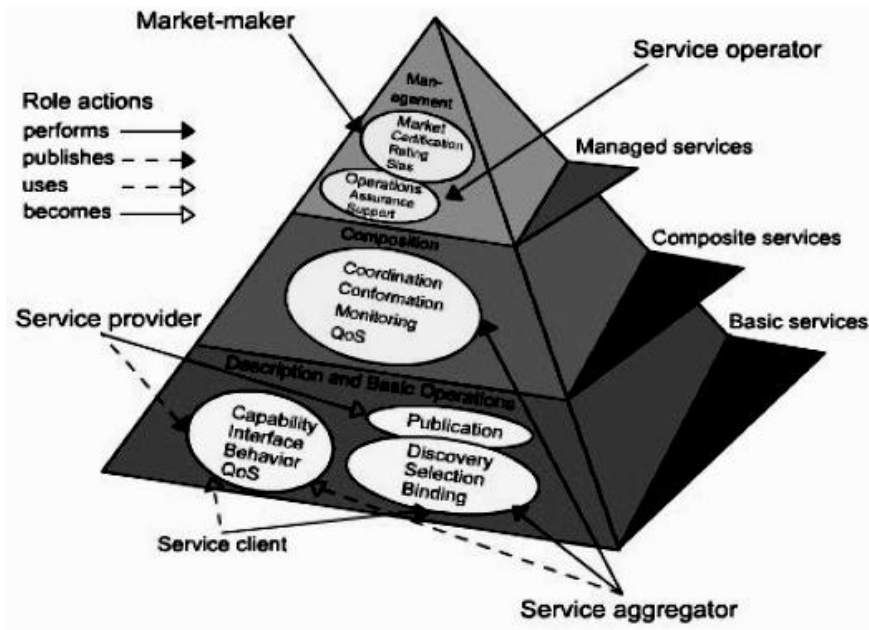
Figure 2-2: Extended SOA (Source: Papazoglou and. Georgakopolous, 2003. Pg. 26)

2.5.4 Emerging perspectives on service systems design

IfM and IBM (2008) recognize that we live in a world where it is a daily experience to interact with various service systems such as banking, communications, transport and health care. Spohrer and Kwam (2009) in Tan et al. (2010) postulate that *service* is the key concept to support value propositions of actors in an organizational network, since this concept only specifies (part of) the behaviour of an actor that is externally visible to other actors. 'Service' as such should not only constitute value propositions, but also requires governance mechanisms for uncertainty reduction.

According to University of Cambridge and IBM (2007), we all suffer frustrations (or worse) when service quality is poor and we all pay more when productivity is low. Yet this business-to consumer (B2C) or government-to-consumer (G2C) view of service systems is just the tip of the iceberg. Muniafu (2007) says that for a service system to be effective, it must meet the following criteria: the resulting services should be *simple*; they should be cheap *to develop and use*; they should be based *upon existing ways of doing things*; they should *solve real problems*; and they should *create some sort of leverage*, e.g. "if I pay x for the service, I should get a benefit of 3x". Effectiveness is measured based on the ability to fulfil the user service needs.

IfM and IBM (2008), assert that innovation, a term applied almost exclusively to technologies in the past, is increasingly used in relation to service systems. According to Tan et al. (2010), the Service Innovation Aspects Model addresses the conceptual concepts of the design process of service systems such as coordination and governance between the business analysis of services and identifying IT services to improve value exchange in a

service system. SIAM, therefore, fits the bill for the design framework of ICT-enabled service delivery systems which by nature are service systems. According to IfM and IBM (2008), service systems are dynamic configurations of people, technologies, organizations and shared information that create and deliver value to customers, providers and other stakeholders. They form a growing proportion of the world and are becoming central to the way businesses, governments, families and individuals work.

The Service Innovation Aspects model depicts a number of different aspects to consider when designing service systems. The service framework, which consists of four aspects, is presented in figure 2-3.
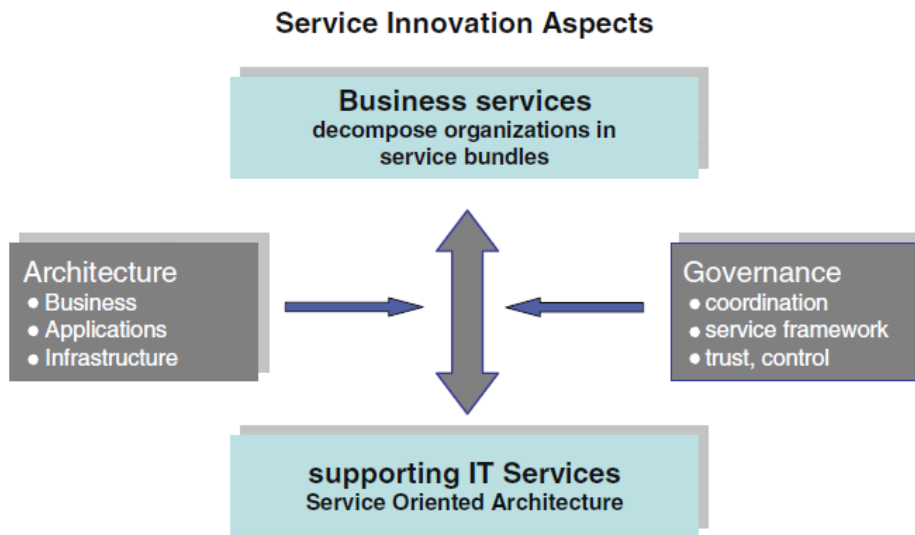
Figure 2-3: Service Innovation Aspects Model (Source: Tan et. al., 2010, page 53)

According to Tan et al. (2010), *Services* are the actual publication of value propositions with their conditions defined by parameter values. Typically, these services can be composed dynamically to meet customer requirements. *Supporting IT services* refer to the

design of IT services for value exchanges, technically realized by, for instance, web services according to a Service Oriented Architecture (SOA). *Governance* on the other hand refer to coordination and alignment of business and IT services, performance and service level agreements at business and IT level, trust and control mechanisms for fair distribution of value co-creation. Lastly, *architecture* is the conceptual approach to IT service modeling to support value exchange.

2.6 Conclusion

In this chapter, the aim was to present and discuss the relevant principles in ICT-enabled public service delivery systems and the impact of ICT on public service delivery as obtained from a review of the relevant literature. The researcher explored the current trends regarding the development of ICT-enabled public service delivery systems with the aim of understanding how these trends could be contextualized in developing ICT-enabled service delivery systems for use in local authorities in Kenya. The literature review presented in this chapter helps in understanding the concepts to build a system for online transaction whose details are presented in chapters 5 and 6.The next chapter discusses the research methodology.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a description of the methods, techniques and procedures employed by the researcher in data collection and recording. Kothari (2004) defines research methodology as a way to systematically solve the research problem. Research methodology may be understood as a method of studying how research is done scientifically. Kothari (2004) states that research methodology is the study of the various steps generally adopted by a researcher studying a stated research problem along with the logic behind them.

3.2 Research design

Research design has been defined by Kothari (2004) as the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. This study was an exploratory study based on qualitative research. The justification for using qualitative approach in this study was three-fold: first, to provide a more realistic, in-depth understanding of the council public services which was not possible with numerical data and statistical analysis used in quantitative research. Secondly, to provide a flexible way of gathering, analyzing, and interpreting the data collected and lastly, to give the study a descriptive capability.

The study was a case study of Municipal Council of Eldoret (MCE). According to Martyn (2008), a case study attempts to shed light on phenomena by studying in-depth a single case example of the phenomena. The method was therefore used in studying the opinions, attitudes, beliefs and attributes of the key respondents.

3.3 Study population

The population of the MCE is nearly 300,000 persons (Kenya Bureau of Statistics, 2009), whereas the MCE has a staff population of nearly 900. Given the large population and the qualitative nature of this study population, it was necessary to work with a select number of respondents because of the following reasons:

- It was impractical and inefficient to reach the entire population;

- The small number of respondents facilitated the researcher's close association with the respondents, thereby enhancing the validity of fine-grained, in-depth inquiry in the council's settings;

- The researcher was able to achieve data saturation after interviewing key respondents i.e. there were no new categories, themes or explanations emerging from the data collected after interviewing thirty one respondents.

The MCE personnel belong to the following departments: *social services and housing, environment, engineers, treasury, town clerk, education, public health*. Each department is divided into a number of sections. The study population consisted of key respondents drawn from each department and their key sections. The study population therefore, included the town clerk and all departmental directors, deputy directors and section heads.

The distribution of the study population by department was as follows: town clerk (7), treasury (9), education (6), engineers (5), public health (1), environment (1) and social services (2). This gave a total of thirty one (31) respondents.

The key respondents' input was considered crucial to the success of the data collection exercise because it provided data on the nature of services they render, challenges they experience in service provision, opinion on ICT use in enhancing public service delivery, nature of facilities they use as well as policies affecting the performance of their jobs.

3.4 Sample design

The researcher applied purposive sampling strategy in order to collect relevant data for this study. As stated by Kothari (2004), purposive sampling is a deliberate sampling technique where the researcher has supreme power to select the sample variables for the study. This effectively constitutes the most productive sample to answer the research questions. Using this technique, the researcher developed a framework of the variables that influenced the respondents' contribution to the research questions. The chosen departmental directors, deputy directors and section heads were sufficient for understanding their perceptions, problems, needs, behaviours and contexts on ICT-enabled services.

Table 3-1. Distribution of respondents across MCE departments

Department	Key Respondents
Town clerk	Town Clerk, HR Officer, Enforcement officer, Administrator I, Registry officer, Committee Officer, Chief Security Officer
Treasury	Treasurer, Accounts Officer, Revenue officer, Payments officer, Vote Book Officer, Salary Officer, ICT Officer , Procurement Officer, Billings Officer
Education	MEO, Deputy MEO, Deputy Municipal QAO, EMIS Officer, ECD Supervisor, , Deputy HRO (TSC)
Engineers	Municipal Engineer, Deputy Engineer, Building Inspector, Asst. Engineer II, Town Planner
Public Health	Chief Public Health Officer
Environment	Director
Social services and Housing	Director of Social Services and Housing, Social Welfare Officer

3.5   Data collection techniques

According to IDRC (2005), data collection techniques allow us to systematically collect information about our objects (people, objects, phenomena) and about the settings in which they occur. There are various methods of data collection such as personal interviews, telephone, mail and the Internet. For this study, the following techniques were used: interviews, observation and document analysis. Similar techniques have been used in related and successful studies like Muniafu (2007).

3.5.1 Interviews

The main data collection technique used in this study was semi-structured interviews. This is because the researcher felt that it would permit face-to-face contact with respondents,

provide opportunity to explore phenomena in depth, and it would also allow the researcher to explain or help clarify questions, thereby increasing the likelihood of useful responses.

As shown in appendix I, the semi-structured interview schedule consisted of three sections namely: *state of ICT and service delivery, ICT planning and resource allocation, ICT policies and regulatory issues and Staff involvement in ICT issues*. The interview schedules were administered to all the respondents listed in the previous section. Where necessary, the researcher probed or simplified questions in order to get the most accurate responses. In certain sections of the structured interview schedule, the researcher developed categories of responses in order to simplify the recording of responses and to restrict the number of responses for the sake of conciseness.

3.5.2 Review of documentary sources

Using this method, the researcher was able to examine records used in the present system. This was particularly important in the design of inputs and outputs of the new system; file and process specifications. The following documents were analyzed during the study: school data returns, school standards assessment document, employees' service forms, leave application and reconciliation documents, service charter, monthly service reports and departmental minutes. A checklist for review of documentary sources is shown in appendix III.

3.6 Content and face validity of data collection instruments

Before embarking on data collection, the data collection instruments were tested for face and content validity. In discussing content validity, the researcher sought to evaluate

whether the instruments were essential and whether they adequately covered the ICT-enabled services domain. Face validity on the other hand involved looking at what the instruments superficially appear to measure. The data collection instruments were discussed with the research supervisors.

3.7 Data presentation and analysis

Data presentation implies the editing, coding, classification and tabulation of collected information so that it is amenable to analysis. On the other hand, analysis refers to the computation of certain measures along with searching for patterns of relationship that exist among data groups (Kothari, 2004). The qualitative data generated by the study was effectively analyzed and interpreted using the two techniques of coding and classification. By coding, some responses were limited to a set of categories. Coding was necessary to restrict several replies to a small number of classes containing the critical information required for analysis. The data collected was categorized into the following research themes: *analysis of public services provided by MCE, development of ICT infrastructure, ICT planning and resource allocation, ICT culture and public service delivery, design of e-government solutions for core business functions (development of a prototype), human resource development in ICT* and *ICT policies and legislative framework.* These seven themes formed the basis of data analysis as presented in chapter four.

3.8 Systems analysis

After data presentation and analysis, the requirements for an online transaction service system were determined. As a starting point, the system was anchored on the MoLG framework as outlined in the *strategy for the sustainable implementation of ICT in local*

authorities (2008). Due consideration was also given to the service expectations of each of the council departments (objectives) and then determining what to do to meet these expectations.

3.9 Systems design

The online transaction service system was designed based on the logical and physical aspects of the system while also drawing ideas from the service innovation aspects model. The software requirements identified in the first part of chapter five were used as the blueprint for the construction of the online transaction service system. More precisely, this design exercise describes the online transaction software architecture and the interfaces between those components. The components are described at a fairly detailed level to enable their construction. The output of this study is an online transaction service system, an evolutionary prototype. This system has been developed in a structured manner thereby giving room for future refinement to cater for possible changes in user needs. The most visible aspects of the system were developed for demonstration to the user and to get feedback and incorporate them into the system.

3.10 Conclusion

This chapter has presented in a concise manner, the research methodology employed in this study. The qualitative research design employed in this study gave an opportunity for a holistic, in-depth investigation of the phenomena. The data collection techniques used were equally suitable and validated by related studies as explained in the relevant sections of this chapter. The data collected during the field work was presented and discussed in chapter four.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this chapter, the researcher presents and analyses the qualitative data arising from the field work. The field work provided an opportunity to explore service delivery practices at the Municipal Council of Eldoret (MCE) and the challenges facing the council in this regard. The data presented and analyzed in this chapter therefore serves as a precursor to the ICT solution to be developed or adopted in order to improve the efficiency and effectiveness of the council's service delivery system.

The data collected from the study was analyzed according to the themes presented in section 4.2. The themes reflect the aims and objectives identified in section 1.5. By drawing on the findings presented in this chapter, the researcher evaluates the public service situation in MCE and proposes an online transaction service system to address ICT-related challenges in service delivery in MCE.

4.2 Findings of the study

As indicated in the previous chapter, data was collected from the key informants involved in the development and use of ICT-enabled services in Kenyan local authorities by primarily administering interviews, supported by document analysis. The choice of interviews as the primary data collection technique was to minimize low response rate. The key respondents, a total of 31 MCE officials, were as follows:

- ***Departmental directors****:* they design, develop and implement strategic plans for their respective departments in a cost-effective and time-efficient manner. The departmental directors are also responsible for the day-to-day operation of their departments, including managing committees and staff and developing business plans in collaboration with the higher management levels in the council.

- ***Section heads:*** they co-ordinate the delivery of public services in the various sections of the MCE. In total, MCE is divided into more than 40 sections spread across the seven departments of the council. Only key section heads served as respondents in this study in order to minimize data redundancy.

The data collected was classified and analyzed according to the following themes:

1) *Analysis of public services offered by MCE*

   Being the most important theme in this study, this theme laid the ground for the other themes explored in this study. This theme presents an appraisal of the prevailing public service situation in MCE. Based on this appraisal, various components of public service delivery in the council are addressed in the subsequent themes.

2) *Development of ICT infrastructure in MCE;*

3) *ICT planning and resource allocation in MCE;*

4) *ICT culture and public service delivery in MCE;*

5) *E-service solutions for core business functions in MCE;*

6) *ICT human resource development in MCE;*

7) *ICT policies and legislative framework affecting the development of e-services in MCE.*

Data relevant to each of the seven themes enumerated above are discussed in the sections that follow.

4.2.1 Analysis of public services offered by MCE

In line with the first objective of the study, the researcher sought to find out the current services provided by the MCE and their significance. This was necessary to provide the premise from which to evaluate the status quo and possibly develop new service solutions. The researcher learnt that the council offers a range of public services, spread across the council departments. Table 4-1 summarizes the range of public services provided by MCE.

Table 4-1: Public services provided by MCE

Department	Public Services
Town Clerk's department	▪ Effective information and communication mechanisms between the council and Stakeholders; ▪ Achieving zero tolerance on corruption and ensuring that council by-laws are adhered to promote goodwill between the council and stakeholders; ▪ Protecting and safeguarding council premises and property.
Education	▪ Expanding physical facilities in schools; ▪ Improving and maintaining high quality and standards of learning in schools; ▪ Ensuring all school-age pupils attend school; ▪ Mobilizing resources for expansion of facilities.
Treasury	▪ Revenue collection; ▪ Optimizing council expenditure and reducing current debts; ▪ procurement of goods and services;
Engineers	▪ Human and motor traffic flow management; ▪ Town planning; ▪ Disaster preparedness;
Public health	▪ Handling morbidity and mortality from malaria and childhood diseases; ▪ Reproductive health services; ▪ Managing HIV / AIDS; ▪ Ensuring environmental friendly and acceptable disposal mechanisms; ▪ Abattoir, sewerage and cemetery services.
Environment	▪ Instituting mechanisms for effective storage, transportation and disposal of solid waste; ▪ Beautifying Eldoret town; ▪ Controlling illegal and wanton destruction of trees; ▪ Maintaining town cleanliness.
Social services and housing	▪ Providing assistance to the destitute and street children; ▪ upgrading and expanding recreational facilities; ▪ promoting self reliance among the youth; ▪ Enhancing community participation in service delivery projects.

In terms of *significance*, the public services provided by MCE are important because they are cross-cutting and serve various stakeholder interests in the municipality. However, the council faces a host of challenges including political patronage, lack of public ownership of the council and poor public image, high population growth rate and limited resource base (MCE, strategic plan 2006/2010). One of the interesting responses obtained from one respondent (R1) with respect to the MCE services is presented on the next page.

'I feel that council politics take a lot of time, which should be dedicated to serving wananchi (citizens). For instance, the recently concluded council elections were occasioned with so much drama with different factions trying to outdoor each other and settling political scores with each other. The resulting animosity between the winners and losers, I think, does not provide a favourable environment for service delivery and yet these councillors are supposed to chair every important committee in the council. Again, the election of the mayor mid-term [after two and a half years] in my view doesn't give room for the incumbent to implement his or her programs.'

R1

To provide a new dimension in service delivery and to address some of the challenges highlighted above by the respondents, the council has adopted a different approach in service delivery including private-public service partnership, good leadership and governance, as indicated in the council's strategic plan for 2006/2010. The analysis of the public service in the council as presented above revealed that there are a number of challenges affecting service delivery in the council. Some of these challenges are beyond

the scope of this study, like political patronage. However, the analysis herein formed the basis for the description of the public service delivery *components* which are presented in table 4.2. The responses presented in the table (R2….R7), represent the sub themes developed out of the first theme (analysis of the public services in the council) because they represent the components of ICT-enabled service delivery.

Table 4-2: Sub-themes arising from analysis of public service delivery at MCE

Ref.	Text	Theme(s) arising from text analysis
R2	'For this department, it is not even about having computer skills**, we need to have computers first then we can think of learning how to use them.** I would be very glad to do my work on the computer as it would save time and greatly improve my work'	ICT infrastructure
R3	'We don't have a big budget as such. Last year (2010), we had a budget of about Ksh.1 million **for buying computer equipment** out of several millions earmarked for capital expenditure'	ICT planning and resource allocation
R4	'The council **does not have a clearly spelt out blueprint for ICT**, much of the directives related to ICT come from the parent ministry, but as you realize, each council has its own priorities'	ICT planning, policies and legislative framework
R5	'In this department **we rely on manual files**. You can see those large heaps of files over there, some are old, torn. I must admit that with these files, it is **difficult to process information**. When LAIFOMS came, we thought it would spread quickly to all the departments, but so far, I think piloting has taken far too long'	E-service solutions
R6	'We are keen to **change the face of the council by bettering our services**. Right now, we have a number of tools like strategic plan. You must have visited sections like billing to see for yourself that **we are using computers to improve our services**'	ICT culture and public service
R7	'Some of us came here (to work at the council) when we were already **computer literate**. **I wouldn't say the council has done much in terms of HR development in ICT**, but some people have made own arrangement to learn computers. I think people here are willing to adopt computers in there work. Here for instance, we need PASTEL for better financial reporting'	HR development in ICT; E-service solutions

Based on table 4-2, the researcher recognizes that in order to effectively develop an ICT-enabled service delivery system, several, cross-cutting components or themes need to be addressed. These themes, which are necessarily interlinked and overlapping, are discussed the he following sections.

4.2.2 Development of ICT infrastructure in MCE

The *California State Administrative Manual* (2007) defines an agency's information technology infrastructure as the base or foundation for the delivery of information to support the agency's programs and management. The infrastructure contains elements upon which an agency's information technology activities are dependent.

Mitullah and Waema (2007) state that one of the long term outputs of the Kenya e-government program (2006-10) was to develop a flexible, reliable, secure and scalable infrastructure connecting all locations of government offices to application and database servers. However, this has not been the case in MCE. Like in many Kenyan local authorities, a close observation of the ICT infrastructure in MCE revealed that the council is deficient in ICT infrastructure. This observation compares favourably with the findings of another study conducted by Wanjohi and Wafula (2005). The development of ICT infrastructure in MCE can be segmented as follows:

4.2.2.1 Application systems

Although, the council operations are far from full automation, the researcher learnt that the council uses common applications like word processors, databases, spreadsheets, communication software and CAD to support productivity and other necessary support. The

researcher also learnt that under the auspices of the ministry of local government, the council had adopted the use of *Local Authority Integrated Financial Operations Management System* (LAIFOMS). A succinct analysis of LAIFOMS is done in section 4.2.5. Many respondents indicated eagerness to use advanced application systems for project management, communication (e-mail), online transaction, geographic information, advanced financial reporting like PASTEL e.t.c. Generally, the researcher observed that the application systems in the council appear to be inadequate for the rigors of modern day business operations that require interconnectivity. It was therefore noted that there is need to upgrade the application systems in the council with a view to improving council services.

4.2.2.2 ICT architecture

The researcher learnt that the council has not developed a written blueprint to follow in designing, acquiring, and implementing information technology solutions. According to the office of the deputy treasurer, what obtains in the council are policy documents from the parent ministry, dictating that local authorities embrace ICT for documentation and reference purposes. According to the *state administrative manual* (2007), organizationally approved definitions, specifications, and standards are the primary components in an agency's information technology architecture. It was noted that the council has computer facilities of varying models and specifications.

4.2.2.3 Communication equipment and facilities

The researcher learnt that the council has installed a small LAN which mainly serves the treasury department. The LAN in place consists of a server that hosts LAIFOMS database and about 15 computers spread across the treasury department. It was noted that the most of

the departments in the council have no LAN facilities. For instance, the department of education has five stand-alone computers. This may not sufficiently meet the growing needs of the department as they seek to implement EMIS (Education Management Information System) besides other information processing and management tools; the department of social services has one stand-alone computer, mainly used for word processing.

It was observed that the electrical, ventilation, fire suppression, physical security, wiring, and other components required to support the councils information technology capability, including the physical structure itself were inadequate. For instance, the server room which doubles as the ICT office, is small, and it's ventilation needs to be improved; there are a few fire extinguishers installed in the council premises.

4.2.3 ICT planning and resource allocation in MCE

Like other local authorities, MCE is funded by the Government through the Local Authority Transfer Fund (LATF) which transfers 5 per cent of national income tax to local authorities. This fund is used to finance both *service delivery components* and *performance components*. According to the LATF annual report (2007/2008), the local authority budget is required to allocate the equivalent of at least 65% of the LATF service delivery amount for capital projects which include ICT equipment. During the 2007/2008 financial year, the MCE allocated Ksh 1 million for ICT infrastructure development, out of a total of Ksh. 68 million budgeted for capital expenditure. Going by the level of infrastructural development in the council, the budgetary allocation seems inadequate. However, there is optimism that

the council will increase budgetary allocations for ICT, since it has been identified in the current strategic plan for 2006/2010 as a key pillar.

4.2.4 ICT Culture and public service delivery in MCE

The study sought to ascertain the extent to which the council has embraced common public service delivery tools as well as the use of ICT in service delivery. The researcher learnt that the council appreciates the use of ICT in promoting better service delivery. This is epitomized by the following comment, which captured the mood of the staff about the introduction of ICTs into the operations of the council.

'I welcome the use of ICTs in our work. It presents a great break from the past where the use of manual files was the order of the day. I truly believe that proper and sustainable use of ICTs is the way to go insofar as improving service delivery in the council is concerned.'

R8

The above response clearly shows that there is a great deal of enthusiasm for the adoption of ICT-enabled services in the council as an important step towards improving service delivery.

The study also revealed that the council has developed three important service delivery instruments namely: *council service charter, performance contracting* and *strategic plan*. Other than these tools, the researcher sought to compare the council's public service parameters against the OECD (2001) public service parameters.

4.2.4.1 Council service charter

A service charter allows for an open and transparent approach that all parties understand and can work within (Government of Australia, 2000). The researcher learnt that MCE has a service charter that describes the service experience a client can expect from the council. The MCE service charter's purpose is stated in the council's *service charter* booklet as follows:

> *'To enhance public awareness of our mandate, vision, mission, values, our clients and their responsibilities, standards we have set, avenues for remedy where the service falls short of standards and our commitment to continuous improvement of services to satisfy our clients and residents'*- MCE service charter

The service charter outlines the service delivery approach and the relationship the council client have with the council, including: *what* the council does; *how* to contact and communicate with the council; the standard of service clients can expect; clients' basic rights and responsibilities; and *how* to provide feedback or make a complaint. The development of the service charter is a laudable effort towards improving public service delivery, although a lot more resources needs to be set aside in order to actualize its tenets.

4.2.4.2 Strategic plan 2006/2010

The MCE had a strategic plan for the period 2006-2010. This plan, besides being a government requirement, serves as a management tool, articulating the council's operations and helping to organize activities (MCE strategic plan, 2007). It organizes planned activities by department and is sufficient enough to provide a 'theoretical and practical

framework towards participatory planning'. However, the council appreciates that among its challenges / threats towards implementing the strategic plan is the inadequacy of its infrastructural base, including ICT (MCE strategic plan, 2007).

4.2.4.3 Performance contracting

The researcher learnt that, as part of commitment to service delivery in Local authorities, the ministry of local government had cascaded performance contracting to local authority officers. MCE had formed a unit to manage and evaluate performance contracts. The researcher also learnt that performance contract monthly reports were periodically submitted to PLGOs. According to the ministry of local government, cascading performance contract ensures complete ownership of performance contracts by local authorities.

4.2.4.4 Other service delivery components

The researcher sought to know how the current MCE service delivery parameters compare with the OECD (2001) benchmark for assessing public service parameters. These service parameters are:

- **Responsive service delivery:** the key components of responsive service delivery are: transparency; participation; satisfying user requirements; and accessibility.

- **Improving public service delivery systems:** there are five identifiable points on the potential spectrum of user involvement with service delivery: **information**; **consultation**; **partnership**; **delegation**; and **control**. Improving public service delivery systems is central to the wider process of public management reform and

the fundamental implications such improvements have for organizational culture and the developing relationship between citizens and the state.

- ▪ **Quality service organization:** how can we recognize a quality service organization when we see one, particularly in the public sector?

On a scale of 0-4 (0- poor, 1- Average, 2-Good, 3- Better, 4- Best), the researcher rated the components of the three service parameters highlighted above and made the following findings:

Table 4-3: Components of responsive service delivery

COMPONENT	MCE RATING	COMMENTS
Clients participate in or are consulted about decisions on what level and type of service is to be provided;	2	Limited to community meetings with **ADCs**
Clients are informed as to what **level and type of services** are to be provided;	2	(financial) resource limitations
Clients can reasonably expect to receive this **level of service**;	1	(financial) resource limitations but some services have been improved e.g. business licensing
Clients have rights of **complaint** and redress if the appropriate level of service is not provided;	3	Establishment of help desk; open door policy
Service delivery agencies are required to set **service quality targets** and to report their **performance** against them.	2	Emphasis on strategic planning but concerns over staff motivation, workload and general welfare; reporting is excellent (monthly) The treasury has daily and monthly collection targets

Table 4-3 shows that the council has embarked on the path of developing components of responsive service delivery, however, a lot more still needs to be done. There is need to engage the council clients in decision making. Although the Area Development Committee initiative is laudable, its composition needs to be expanded to include more stakeholders. In addition, it can be inferred from the table that the greatest impediment in this endeavour is

financial constraints. It is hoped that the council's financial strength will continue to grow so that the components listed in table 4.3 are realized.

Table 4-4: Towards improving public service delivery systems (information; consultation; partnership; delegation; and control.)

COMPONENT	MCE RATING	COMMENTS
Ask their **clients to identify their needs** and expectations;	3	Community forum, participatory planning, suggestion box, help desk
Continuously meet the **needs of their clients** while managing their expectations;	2	This is a tall order because it depends on resource availability; there are attempts to make best use of available resources
Support active **employee involvement** in meeting these needs;	2	Limited resources including ICT equipment
Foster **employee innovation** to improve processes continuously;	2	Concerns over staff professional development and welfare
Cultivate **a 'people first' environment** where teamwork is valued;	2	Concerns over staff professional development and welfare
Accept the **risk** associated with innovation;	2	Regular LAIFOMS data backup
Support a **continuous learning environment**;	2	Continuous training and seminars e.g. LAIFOMS
Provide **visible leadership** for employees, which is crucial to the success of any quality services initiative	3	Administratively, Town clerks office leads the way in performance contracting. In some cases, it's difficult to monitor officers in the field.

Table 4-4 describes the MCE working environment and how it influences public service delivery in the organization. From the table, it can be observed that the MCE has made strides in improving the flow of information, notably by setting up the help desk. It is hoped that the council will continue to address issues that affect its clients and the staff in order to enrich its public service.

Table 4-5: Quality service organization

COMPONENT	MCE RATING	COMMENTS
Everyone understands **where the organization is heading** and understands his or her part in the process	1	Concerns that service improvement initiatives do not uniformly cut across all the departments; Council treasury, in particular, appreciate LAIFOMS as key to financial reporting
There is **respect** for people in the organization and all employees are encouraged to develop their potential;	1	No structured employee training scheme; employees often rely on own training initiatives with the exception of LAIFOMS
The primary focus is on **serving clients**; cooperation and teamwork are a way of life;	1	Clients often sit on the waiting benches for long; getting appointments often tricky (even for this study); some departments seemingly understaffed.
Leaders are fully involved in the **quality services** programs and initiatives;	2	Strategic plans are department-owned but implementation lies with higher echelons of power
Everyone concentrates on achieving quality; there is a focus on **continuous improvement**;	1	Ingredients for achieving this concern are scarce- finance, staff motivation etc.
Employees appreciate and understand **stakeholders' expectations** and know how to satisfy them;	3	YES, but this is a tall order because it depends on resource availability; there are attempts to make best use of available resources
The organization is **driven by quality and innovation**	2	The strategic plan is excellent, but LATF and council funds often inadequate for its full implementation.

Table 4-5 shows that the council has many concerns over quality service components. Although the council has documented service quality plans, a lot more resources need to be invested in such service quality programmes.

4.2.5 E-service solutions for core business functions in MCE

4.2.5.1 Description of the e-service situation in MCE

The ministry of local government (MoLG) says that as part of the reform process, local authorities in Kenya have come of age to integrate ICT in their operation. local authorities are increasingly being compelled by the tax payer and the government to be more responsive and accountable at levels of the council operations. According to MoLG (2008), the need for improved service delivery requires that local authorities maintain and updates regularly their data base and ensure adequate reporting on the status of each local authority

operations. This includes financial reporting on the revenue received and how the local authority utilized such revenue in provision of services to the residents.

As part of the KLGRP reforms, the ministry of local government has developed the LAIFOMS system to enable local authorities to improve on local budgeting, revenue mobilization and financial management, with a view to encouraging greater efficiency, accountability and transparency. LAIFOMS is an abbreviation for Local Authorities Integrated Financial Operations Management System. It is a computer-supported Financial Management tool intended to assist Local Authorities in Kenya to address the whole range of operational, monitoring and management requirements arising from their financial activities. Piloting of LAIFOMS system started in year 2000 and continued for longer time than it was expected owing to lack of standardized administrative and management procedures. Although all local authorities, whether town, municipal, county or city council, are governed by local government act cap 265, each of these types operate different system to conduct their businesses. Different procedures also exist in one type of local authority making it difficult to standardize the various LAIFOMS modules.

According to MoLG, (2008), one of the main objectives of implementing LAIFOMS was to standardize local authority operations to be in line with the local government act and financial regulations. The differences in local authorities' administrative procedures and transaction processing have widely contributed to lack of adherence to the guidelines provided by the Ministry. Therefore, there was need to re-design LAIFOMS to not only be a financial management system but to also monitor other operational activities.

As shown in figure 4-1, LAIFOMS has three main components. These components are:

Revenue component

The revenue component manages revenue related information, including the taxpayer/customer database, assessment and billing, revenue collection, and report generation to monitor compliance and assist enforcement.

Expenditure component

The expenditure component manages information related to operational expenditure, including payroll, procurement of goods and services, and capital investments.

Budgeting and financial management component

The budgeting and financial management component is the core sub-system of LAIFOMS. This ensures that both revenue and expenditure management components are integrated with the budget monitoring subsystem.
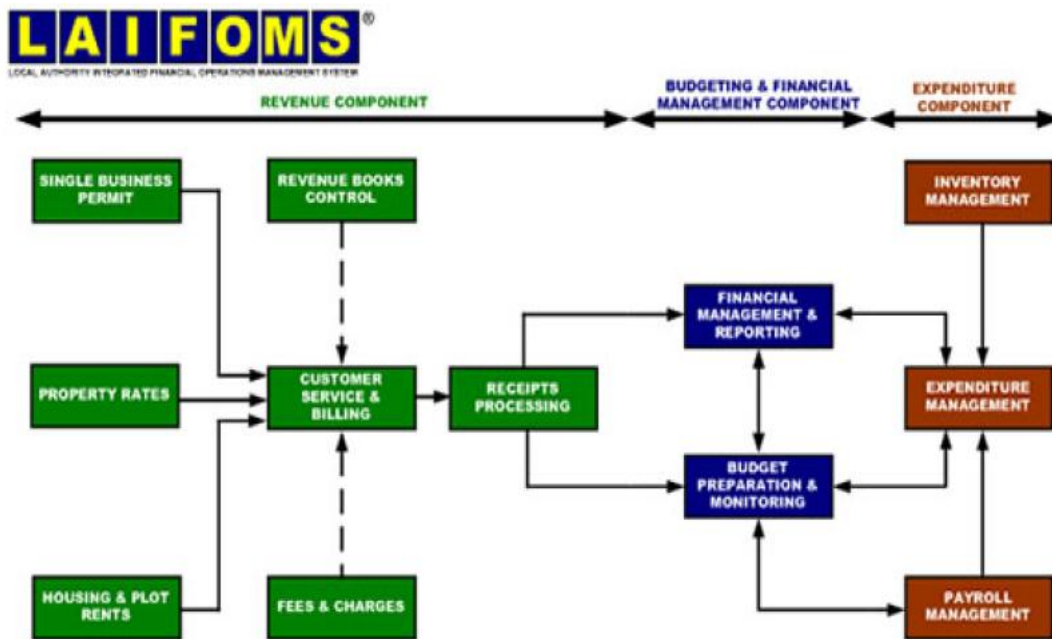
Figure 4-1: LAIFOMS framework (Source: Ministry of Local Government, 2008)

These components are integrated to have a comprehensive system to monitor all operational activities. Focus is centred on monitoring and assisting the management of all revenue and expenditure activities, the preparation of the council's budget and monitoring its execution throughout the fiscal year (MoLG, 2008).

4.2.5.2 Other e-service initiatives

According to council's strategic plan (2006-2010), the council has other e-service initiatives other than LAIFOMS. These e-service initiatives include computerization of the records and revenue sections, networking all departments, creating a documentation / information centre and developing a council website. As of July 2011, the council website was complete and accessible while the other e-service initiatives were at various stages of

completion. These initiatives, however, fall short of the expectations of an OTSS which fall in the third tier of e-service hierarchy.

4.2.6 Human resource development in ICT

Data collected from the council revealed that there was lack of an ICT human capital development strategy and the ICT technical and managerial human capacity in MCE was highly inadequate. Apart the mainstream ICT professionals in the IT support unit, many a service delivery agent had made own arrangements for ICT training. Some service delivery agents have also benefited from on-site training. These findings are exemplified by the following responses obtained from respondents about ICT training in the council:

> *'I have attended LAIFOMS training workshop and I think it was important as far as the use of the system is concerned. Maybe the council should consider putting in place an ICT training programme for all the MCE staff'*
>
> R9
>
> *'Some of use have had to make own arrangements to learn the use of computers, like after work, I and my colleague attend computer classes in town'*
>
> R10

From the responses from R9 and R10, the researcher learnt that ICT training in the council is not uniform across the various departments. For instance, training on the use of LAIFOMS software has been largely concentrated in the council treasury. This has been conducted in the form of LAIFOMS workshops and has greatly transformed service delivery in billing, procurement, and payment e.t.c. The researcher also found out that

personnel in the EMIS section, department of education, have been trained on EMIS software to manage school data. A general finding from the case study was that the EMC staff members are keen to embrace ICT in their work. From the interviews conducted, it was realized that many service delivery agents embraced the idea of using ICTs to improve service delivery.

4.2.7 ICT policies and legislative framework affecting the development of e-services in MCE

According to the directorate of e-government Kenya, (2009), effective and operational e-government should facilitate better and efficient delivery of information and services to the citizens, promote productivity among public servants, encourage participation of citizens in government and empower all Kenyans. In 2009, the directorate of e-government of Kenya outlined the e-government strategy which detailed the objectives and processes for the modernization of government, as a means towards enhancing transparency, accountability and good governance; making the government more result oriented, efficient and citizen-centred; and enabling citizens and business to access government services and information as efficiently and as effectively as possible through the use of internet and other channels of communication.

The researcher sought to find out the '*operationalization*' of the e-government strategy in MCE. Some respondents indicated that they were not fully aware of the e-government strategy, except by association with the ministry of Local authorities. This observation

concurs with UNDP report (2005), which indicates that there was no clear picture showing how local authorities were to be integrated in the e-government strategy. One of the most interesting comments on e-government strategy and its (lack of) publicity is given below:

'My observation is that the strategy has largely not diffused to the local levels, our council included. In a way, the government didn't properly communicate the strategy to us'.

R11

'I had expected that we would have more input in the strategy since we are the people to implement it but that was not to be. I feel that in drawing up the strategy, they should have consulted more and more downwards and not restricted much of their fact gathering to inter-ministerial committee discussions'

R12

Reponses R11 and R12 clearly show that the e-government strategy has suffered from limited publicity and inadequate communication to the players in the municipal council. It is also clear that a bottom-up strategy should have been adopted when drawing up the strategy.

4.3 Analysis of the public service scenario in MCE

The data presented in this section gives a clear picture of the public service situation in MCE. A thorough appreciation of these problems would be the first point in developing effective solutions that would catapult the council to higher levels of service delivery. The findings from the case study revealed that, in general, some work has been done towards

improving the delivery of public services in the MCE. However, full ICT support was still lacking. In this research, the researcher proposes that ICT-enabled service delivery can alleviate some of the challenges highlighted in the case study and provide solutions to some of the technical problems experienced in the council.

The issues highlighted in the preceding sections need to be scientifically addressed because the council is under constant pressure from citizens who expect better services. As a rapidly growing town, the council needs to scale up the use of ICT in its operations: not just achieving web presence or interaction but embracing higher levels of e-service like online transaction in order to improve public service delivery.

At present, provision of services in the council is a hybrid of manual and pseudo-automated processes. This means that the council processes are a lot dependent on manual processes with varying degrees of back office automation. By and large, an ICT-enabled front end, which would bring the clients (public) into the service loop, would significantly improve this mix. From the findings, the researcher presents these challenges as follows:

- *Expensive services*: By embracing ICT-enabled services, the council can reduce paperwork processing, printing costs, document storage, telephone calls and visits to council offices. Mitullah (2007) says that the resulting efficiencies will translate directly into reduced overhead cost.

- *Slow processes:* the council can reduce the cycle time of its business process. The council can especially 'hasten' repetitive tasks which, according to Bradly (ed.)

(2005), lend themselves easily to automated solutions. More so, the council can greatly improve information retrieval by automation.

- *Redundant data / processes:* the council can store data once, and only change the processes that rely on the data, for instance, the council can store business details once, and only update the register when renewing business license.

- *Disintegrated services:* the council can group similar services together in a database and make them available in a 'one-stop shop' fashion. For example, store land rates information in a file closely linked to revenue payment, because clients often require new land rates before making any payment.

- *Inaccessible services:* the council can use ubiquitous technology (web technology) to avail council services at the convenience of the user. For example, a user client can file returns online.

- *Erratic processes:* the issue here is that the council can greatly reduce human errors of commission and omission by embracing ICT solutions.

- *Corruption- prone systems:* ICT-enabled services can be subjected to a great level of audit and thus remove any chances of corrupt and unethical practices.

- *Unscalable system:* the issue here is not to use ICT just to automate local government processes but to link information and services for online delivery of local government. The researcher is looking at a system that can be progressively developed from one hierarchy to another in line with e-service hierarchy as highlighted by the Gartner group (2001), Sharon (2002) and the Janowski (2008).

The researcher noted that there are currently a high number of ICT initiatives in Kenya, which should improve availability of internet services and subsequently promote e-

government solutions. These initiatives include *digital village* project and the fibre optic cable project. According to Kenya Data Network (2010), these initiatives should place Kenya on the pedestal of free and easy access to computers and local internet increase opportunities for personal and community development. The KDN (2010) further argues that apart from improving access to basic internet service like e-mail, the expansion of the ICT infrastructure should propel Kenya increased opportunities for e-learning, e-business, e-health, e-farming, e-government and e-development.

This study rides on the crest of the expanding ICT infrastructure in Kenya. The researcher observes that it is possible to exploit the developments in ICT infrastructure to deliver MCE services using internet technology. The use of online services, and online transaction would render several advantages such as those listed above.

4.4 Conclusion

The data collected and presented in this chapter gives a clear picture of the public service situation in the Municipal Council of Eldoret, notably, the development of service delivery infrastructure. While taking stock of the gains so far made by the council, it is imperative to note that a lot more needs to be done in order to upscale e-service level in MCE to higher levels (see table 4.6). As demonstrated by Janowski (2008) and presented in table 4-6, developing e-services is a bottom-up hierarchical venture, that begins with establishing web presence and progressively moving up the ladder. The council has only achieved the first two levels of e-service delivery systems. By considering the development of the third level of e-service delivery, this study seeks to consolidate the gains made by the council in levels one and levels two by moving to level three of the e-service scale.

The *need* for an online transaction service system lies in offering a new paradigm in service delivery by making service delivery more efficient and effective. Moreover, with an online transaction service system, the council's service provision would be available round the clock. In a nutshell, online transaction would come with increased accessibility, convenience, savings on cost and time.

Table 4-6: E-service levels and initiatives in the Council.

Maturity Level of E-service	Characteristics	MCE initiatives	Comments
Web presence / web information	Website publishing information about service(s); Information is static	Council website	One-directional flow of information
Interactive	Browsing, exploring and interacting with data; performing electronic searches and calculations based on the user's criteria	feedback facility on the council's website	One-directional flow of information
Transactional	users' ability to enter secure information and engage in transactions with the agency	-	Complete council tasks online; bi or tri-directional flow of information.
Participatory / data sharing	Ability to share with other agencies personal information, when approved by law and with the users consent.	-	Share council data and collaborate with ministry and other stakeholders

The data presented in this chapter also shows that there are a number of important challenges affecting the uptake of ICT solutions in the council like financial constraints. Despite these challenges, this study seeks to optimize the development of e-service delivery systems in the council by developing a model for online transaction. This would ultimately move the MCE to a higher level of service delivery. Chapter 5 discusses the modelling of the online transaction service system.

CHAPTER FIVE

MODELLING ONLINE TRANSACTION SERVICE SYSTEM

5.1 Introduction

In the first part of this chapter (analysis), the researcher discusses the requirements of an online transaction service system. In order to develop online services transactions in MCE, the researcher began by appreciating the service expectations of each of the council departments (objectives), aligning the development of the system to the long term ICT strategy of the MoLG and then finally determining what to do to meet these expectations by outlining the logical and physical design of the system.

The objectives of systems analysis were, therefore, twofold: to study the objectives of each department with the aim of understanding the *infrastructure architecture* (framework) on which to base the development of online transaction system; and to derive a statement of requirements for developing the system based on the characteristics of the council's working environment. According to KLGRP, MoLG, (2008), *infrastructure architecture* is the process glue that binds the business and organizational information processing requirements to all future ICT investment decisions. By studying this framework as outlined in the *strategy for the sustainable implementation of ICT in local authorities (2008)*, the researcher places the development of the online transaction system within option 3 of ICT solutions development (see table 5-2) thereby providing effective support to improve the delivery of public services and 'insure' the decision to develop web-based applications. The conceptual models presented in this chapter serve to explain the system to all the actors by showing the data model and the process model for the system.

In the second part of this chapter, the researcher discusses the design and development of online transaction service system. The logical as well as the physical design of the system are outlined while borrowing from the service innovation aspects mode developed by Tan et al. (2010). In this section, the software requirements identified in section 5.3 are analyzed in order to produce a description of the software's internal structure that will serve as the basis for the construction of the online transaction service system. More precisely, this design describes the online transaction software architecture and the interfaces between these components. It also describes the components at a level of detail that enable their construction.

5.2 MCE departmental objectives

A summary of the major service delivery objectives for each of the MCE departments is presented in the next table. The MCE endeavours meet these objectives, although it's faced with many challenges like limited technical and financial support.

Table 5-1: MCE departmental objectives

Department	Objectives
Town Clerk's department	▪ To promote effective information and communication mechanisms between the council and stakeholders ▪ To achieve zero tolerance on corruption ▪ To ensure council by-laws are adhered to promote goodwill between the council and stakeholders ▪ To protect and safeguard council premises and property
Education	▪ To expand physical facilities in schools ▪ To improve and maintain high quality and standards of learning in schools ▪ To ensure all school-age pupils attend school ▪ To mobilize resource for expansion of facilities
Treasury	▪ To ensure council maximizes revenue collection ▪ To optimize expenditure ▪ To reduce current debts ▪ To improve the procurement process
Engineers	▪ To ensure free-flowing human and motor traffic ▪ To facilitate proper town planning ▪ To enhance disaster preparedness
Public health	▪ To reduce morbidity and mortality from malaria and childhood diseases ▪ To strengthen reproductive health services ▪ To manage HIV / AIDS ▪ To ensure environmental friendly and acceptable disposal mechanisms ▪ To ensure that abattoir, sewerage and cemetery services are provided.
Environment	▪ To institute mechanisms for effective storage, transportation and disposal of solid waste. ▪ To beautify Eldoret town ▪ To control illegal and wanton destruction of trees ▪ To maintain high standards of cleanliness in town
Social services and housing	▪ To provide and provide assistance to the destitute and street children ▪ To upgrade and expand recreational facilities ▪ To promote self reliance among the youth ▪ To enhance community participation in service delivery projects

Source: MCE strategic plan 2006/2010

The development of online transaction system should support the public service objectives presented in table 5-1 and should also address some of the challenges presented in section 4.3. Mitullah and Waema (2007) argue that the adoption of full fledged ICT services in Kenyan local authorities has the potential of promoting and supporting routine business service needs, promotion of trade and investment, and joint planning and development co-operation in identified areas of interest.

Since 1996, the Kenya Local Government Reform Programme (KLGRP), in conjunction with the British Department for International Development (DFID) and European Union (EU), have undertaken major reform agenda with the objective of overhauling and revitalizing the local government sector so that local authorities can become more professional and transparent in their financial management and delivery of service (MoLG , 2008). A number of public service initiatives have been implemented in order to improve local authority services. Notable among these initiatives has been the development of ICT-enabled systems for financial operations and reporting.

The KLGRP, in its *strategy for the sustainable implementation of ICT in local authorities (2008),* states that there is a valid argument that current ICT systems in place in local authorities use stand-alone structures that do not allow for seamless integration of services in local authorities. That the technical support is provided through CDs, flash drives, telephone help lines, or in the case of LAIFOMS updates, through the ministry website. The currently applied technology is shown as option one in table 5-2. Option two considers the use of .Net technology which is a framework that has a large library of pre-programmed solutions to common computer programming problems. The key features of the framework include better security features, interoperability and ease of deployment. Option three is the use of web applications as the *standard* approach to ICT systems development and support in the local government sector. This is the preferred option which is highly scalable and amenable to developing high levels of security.

The development of this system would also lead to reduced Total Cost of Ownership (TCO) i.e. no desktop software to deploy and maintain, all data stored on central server; easier to

secure and backup, much quicker and cheaper to implement and manage changes); human resource flexibility (processing centers can be instantly opened wherever there is secure network connectivity, outsourcing possibilities, work from home) (Redstone, 2003). This will ensure that the ICT infrastructure continues to grow as ICT systems are implemented. At the bare minimum, the TCO of the system consists of Hardware (servers, desktop computers, cables, switches etc), Software (OTSS, operating systems, anti-virus), Personnel, maintenance, change management etc.

Table 5-2: Options for building ICT solutions in local authorities in Kenya

	Option 1- Visual Basic Ver. 6 Application	**Option 2-.NET Technology Application**	**Option 3- Web Application**
Pros	• Skills to develop readily available since it is old technology	• Stable product due to technology	• Enables centralized, integrated application – increases speed and improves efficiency • Easy to implement and update remotely • Stable product that can be supported remotely • Less costly to maintain – • fewer interfaces, fewer support staff and vendors to manage
Cons	• Difficult and costly to implement- OS dependent • Large bandwidth requirements to access over WAN	• Difficult and costly to implement – OS dependent • Large bandwidth requirements to access over WAN	• More costly to develop

Source: KLGRP (2008)

5.3 Requirements analysis for Online Transaction Service System

In the previous section, the researcher placed the development of an online transaction service system within the *strategy for the sustainable implementation of ICT in local authorities (2008),* as outlined by the MoLG. The use of web applications (option 3) as a standard approach to ICT systems development and support in the local government sector was guided by the third research question which helped to identify the requirements presented in this section, and implemented in a prototype as shown in chapter 6.

Janowski (2008) describes an online transaction system as the third stage of a four stage on-line services model and involves "*users' ability to enter secure information and engage in transactions with an agency"*. The model identifies *front-end* and *back-end* services as distinct components of online transaction systems. The two components are defined as follows:

- *Front-office* service refer to the government as its constituents see it, meaning the information and service providers, and the interaction between government and both citizens and businesses. Front-office implementation of e-government involves two issues: on-line services and citizen engagement.

- *Back-office* services refer to the internal operations of an organization that support core processes and are not accessible or visible to the general public.

Drawing from the perspectives presented above, the requirements for the system were derived as shown in the next table.

Table 5-3: Requirements for online transaction service system

	Requirements	Online transaction service system	
		Front-end	**Back-end**
1	Provide user friendly interface	✓	
2	Facility for providing authentication (where necessary)		✓
3	Facility for making online service request	✓	
4	Facility for submitting and processing online service request	✓	
5	Facility for audit trail		✓
6	Provide querying and reporting facilities	✓	✓
7	Facility for securing transactions		✓
8	Provide sufficient documentation for the system	✓	✓

A brief discussion of each of these requirements is presented in the sections that follow.

5.3.1: Provide user-friendly interface

The system should provide users with an enjoyable and fulfilling experience when they interact with it. This is because users who have positive experiences with a system will most likely use it again, refer friends, submit an inquiry about a service, etc. The system should be user-focused. Snell (2007) says there are many factors that can make a website user-friendly but four important ones include: *page load speed, accessibility, navigation* and *information*.

5.3.2: Facility for making online service request

The system should provide facilities for making a service request by means of an *on-line request* form, *using service request template*, *downloading* and *uploading* documents e.t.c.

In most cases, the client should provide personal Information: name, address, phone number and email address etc.

5.3.3: *Facility for providing authentication (where necessary)*

For certain services, the user maybe required to provide some form of authentication. Various methods of system authentication are well documented and include biometric-based systems such as finger-prints, cryptographic methods, logon passwords (Andersen, 2005). For purposes of this research, logon passwords have been used because it was easier to configure them by creating a file containing the usernames and passwords and then specifying which sectors are to be protected and which users are allowed (after entering a valid password) to access them.

For services that require monetary transactions, an ideal system should facilitate online payment, but this study has not fully explored this province. Instead, there are provisions for clients to give evidence of payments by supplying such information as cheque no, receipt no, e.t.c. These details can then be verified at the back-end.

5.3.4: *Facility for submitting and processing online service request*

The system should provide a way for a user to submit online service request and the request be routed to the appropriate department by use of a simple 'submit' button. The facility should ensure that clients supply complete information as well as providing options for edit or reset.

Processing online services in this system will take the form of automated responses and (mainly) pseudo-automated processing whereby the service providers receive online service requests and make manual intervention during processing. The main form of correspondence explored in this design is the use of e-mail services.

5.3.5: Provide transaction log / audit trail

The system should provide a mechanism to show changes made in the data base with the identity of the person who made the change, especially in financial records. By following the transaction log, the system administrator can obtain a picture of the events which affected the system and reconcile the activities which took place during service processing. Issues in the management of transaction trails include the eventual purging of old data transactions.

5.3.6: Provide querying and reporting facilities

Querying and reporting facilities should be provided both at the front-end and at the back-end. At the front-end, this may take the form of simple responses to user queries whereas at the back-end, complex queries may be made depending on the clients' needs.

5.3.7: Facility for securing online transactions

This system should be accessed through SSL-enabled browsers like Microsoft Internet Explorer that can communicate securely with the server, using SSL. According to IBM (2004), with SSL, it is possible to easily establish a security-enabled Web site on the Internet, or on a private intranet. A browser that does not support HTTP over SSL cannot

request URLs using HTTPS. The non-SSL browsers do not allow submission of forms that require secure communications.

IBM (2004) explains that SSL uses a security handshake to initiate a secure connection between the client and the server. During the handshake, the client and server agree on the security keys to use for the session and the algorithms to use for encryption. The client authenticates the server; optionally, the server can request the client certificate. After the handshake, SSL encrypts and decrypts all the information in both the HTTPS request and the server response, including: the URL requested by the client, The contents of any submitted form, access authorization information, like user names and passwords and all data sent between the client and the server.

5.3.8: *Provide sufficient documentation for the system*

Since documentation is an integral part of any software development process, the following types of documentation should be developed for this system:

- **Architecture/Design** - Overview of software; includes relations to an environment and construction principles to be used in design of software components;

- **Technical** - Documentation of code, algorithms, interfaces, and APIs;

- **End User** - Manuals for the end-user, system administrators and support staff;

- **Marketing** - Product briefs and promotional collateral.

The above sets of requirements describe the online transaction service system. As earlier stated in table 4.7, these requirements represent a level of e-service (OTSS) not currently available to the council and would offer a new paradigm in public service delivery.

5.4 Modelling the Online Transaction Service System

The *ITmodeller* (2007) defines a conceptual model as a high-level view of an information technology system in its context. It's purpose is three fold: to aid understanding of the system by all stakeholders; to help decide where to make changes to existing IT systems and to provide a firm basis from which to initiate application development projects.

The *ITmodeller* (2007) presents an elaborate description of conceptual model in terms of its relation to other models that underlie the development of information systems. The next level of detail beyond the conceptual model is the *logical model* which annotates the box bag model with the structural detail. The logical model describes the data structures of all activity input and output and itemizes the business rules implemented by the activity. The implementation level then turns the logical model into code. The *application architecture* enumerates the applications, places the applications into layers, enumerates the databases and shows which applications use which databases and the which applications invoke other applications. The *technical architecture* chooses the technology, outlines of the physical distribution of hardware resources, and provides an outline network, security and systems management design. Linkages between the logical model and the application architecture tell you which activity uses which application. Linkages between the application architecture and the technical architecture tell you what technology will be used to implement the applications. Together they provide a specification sufficient for the programmers, database administrators and human interface experts to create the application. Figure 5-1 shows the conceptual model in context.
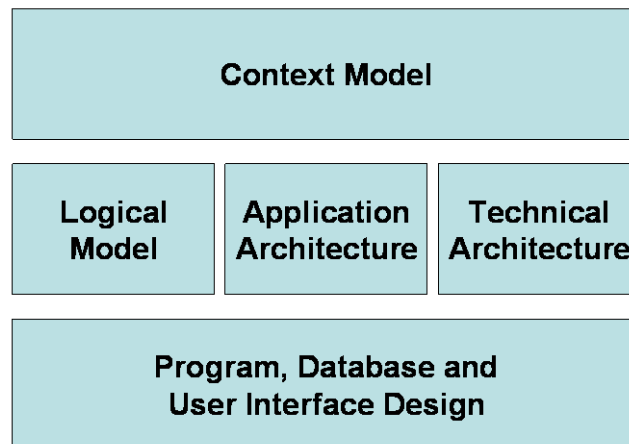
Figure 5-1: The conceptual model in context (Source: The ITmodeller , 2007)

5.4.1 Conceptual data model (UML class Diagram)

The conceptual model for the online transaction service system has been described using Unified Modelling Language notations (UML). *Smartdraw.com* (2009) presents a template of UML conceptual model as a class diagram in which classes represent concepts, associations represent relationships between concepts and role types of an association represent role types taken by instances of the modelled concepts in various situations. The researcher used *Smartdraw.com* template to model the OTSS classes. The researcher presents the UML class diagram for online transactions in figure 5-2. This model shows the various classes in user interaction with an OTSS. This class diagram is derived from requirements for online transaction service system shown in table 5-3. For instance, verification and validation form both relate to authentication, search engine page has attributes of user friendly interface and submission of requests.
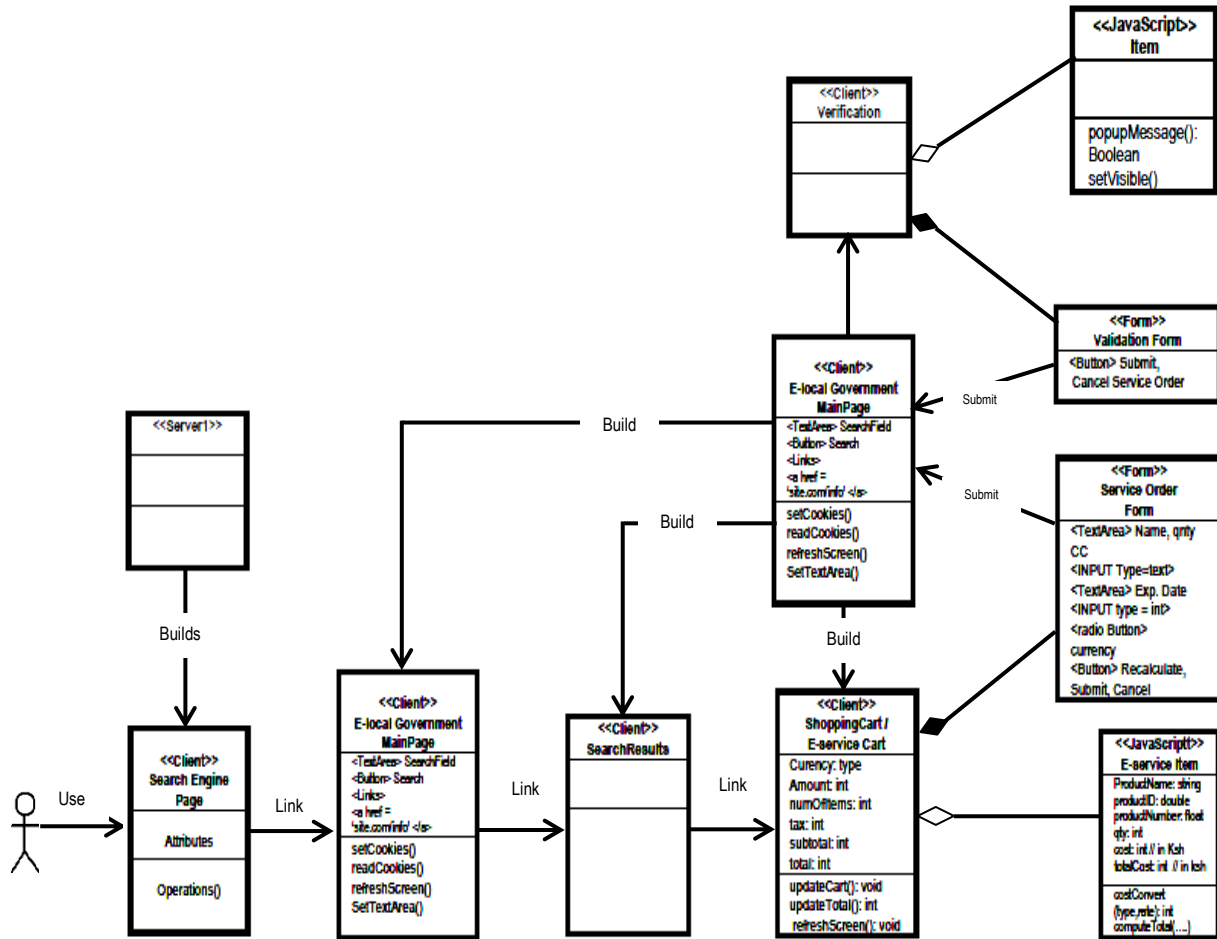
Figure 5-2: UML Class Diagram: Local Government Online Transactions
(Adapted from Smartdraw.com)

Figure 5-2 contains a number of important concepts borrowed from e-commerce. These concepts have been included in this UML diagram in order to capture the essence and enhance understanding of the nature of online transaction service systems. These concepts are presented as follows:

- The ***main page*** or ***home page*** concept (presented here as e-local government homepage) has been borrowed from e-commerce. Whereas electronic commerce is *solely* concerned with the sale and purchase of goods or services over the Internet, online transaction service system is one that is authorized electronically from the

front-end network; and includes transactions that *may not* necessarily involve monetary aspects, except that the tasks are completed online.

- ▪ ***Shopping cart*** concept has been labelled as *e-service* (cart) or *e-cart* in order to make it relevant to this task. The e-service cart serves as a 'holding' place for service requests.

- ▪ ***Order form*** concept has been renamed ***service order form*** or ***service request form*** to capture the same requirement expressed in the second item above.

Further, the model presented above has identifiable *back-end* and *front-end* services that together constitute a mix that leverages online transaction service system. From the diagram, one can classify back-end services as those associated with the *server* side whereas front-end services are those associated with the *client* side. These definitions are in tandem with the definitions for the back-end and front-end services as presented in section 5.3.

5.4.2 Conceptual process model (Data Flow Diagram)

Borysowich (2007) says that data flow diagrams are used to describe how the system transforms information. They define how information is processed and stored and identify how the information flows through the processes.

In building the DFD for the online transaction system, the researcher made the following considerations: *where* the data that passes through the system come from and where does it go, *what* happens to the data once it enters the system (i.e., the inputs) and before it leaves the system (i.e., the outputs) and *what* delays occur between the inputs and outputs (i.e.,

identifying the need for data stores). A simplified DFD for the system is presented in figure

5-3.
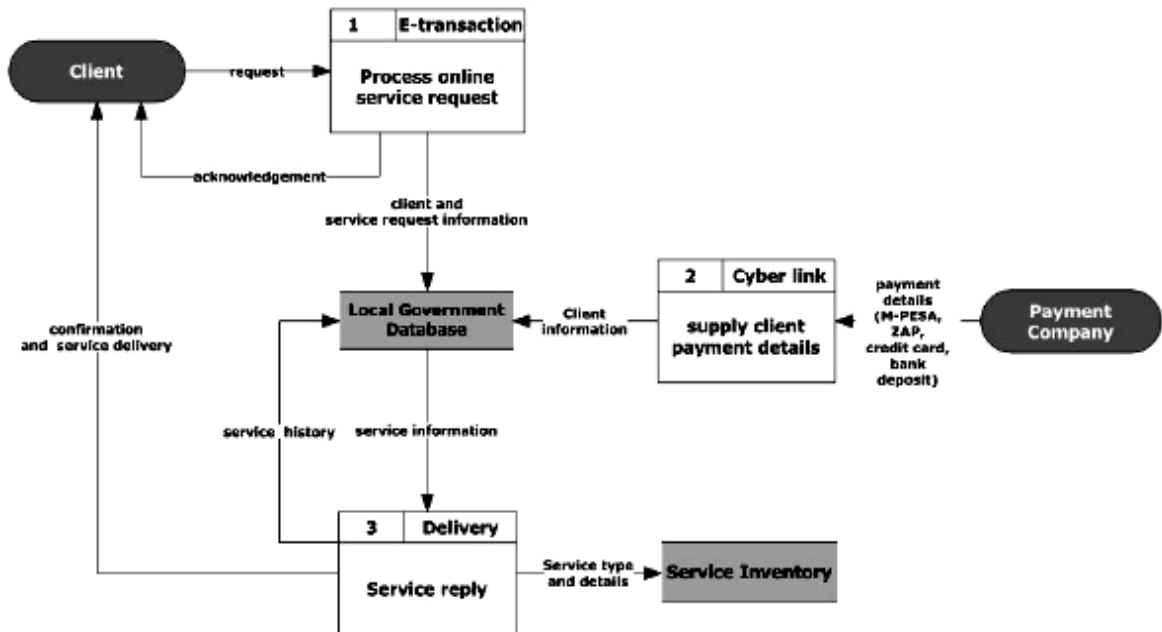
Figure 5-3: DFD for online transaction (adapted from Smartdraw.com)

Generally, the payment company should receive payment on behalf of MCE, for those

services that require payment. As indicated in the previous section, the researcher expects

to make use of existing payment technologies like money transfer services like *M-Pesa*.

This study seeks to make use of such existing systems hence, the focus in this study is to

develop a software solution to handle the three major process i.e. *e-transaction*, *cyber-link*

and service *delivery.*

5.5 System design

Design for the online transaction services system was undertaken at two levels namely *logical* and *physical* design. System design was further enriched with ideas drawn from the Service Innovation Aspects Model discussed in chapter two. In logical design, a detailed conceptualization of 'what' the OTSS must do was undertaken. In essence, the logical design describes the functional requirements of the system. It differs from the requirements analysis rendered in section 5.3 in the sense that it's more detailed and specific. On the other hand, physical design involved specifying the system components necessary to implement the functional requirements detailed in logical design.

5.5.1 Logical design

1. Composing online service request

A computer screen, modelled like a one-stop shop contains a list of important public services provided by the local authority. As a business model that has become commonplace, the theory of one-stop shop is that, by providing many local authority services in one place, the council can offer clients the convenience of accessing them in a one stop fashion. This is especially cost-effective given the many man-hours spent walking from office to office.

The council services are categorized by department. Currently, the council consists of seven departments, each of which offers a number of distinct services to the public. Details of each of these services are presented in the subsequent sections.

As earlier stated, there is need to base the online transaction service system on existing ways of doing things, so we compose a service request by simply filling in an online service request form which resemble the manual ones currently used. The forms are also simple in design in order to cater for users with limited technical knowledge. The word *composition* is used here to simply describe the process of filling in online forms to request for local authority services.

2. Online submission and communication of service request

The purpose of the *submit* service is to send the completed service request form so that it can be received and acted upon at the back-end. By use of a simple submit or send button, the client can engage the *communication service* whose purpose is to communicate the details of a service request to the council. It also assists in initiating the payment for services that have been rendered, upon receiving information on a completed service delivery. Since there is no formal money-payment binding between the service providers at the back-end and the clients, each client is expected to pay for the services as per the conditions set by the MCE.

In the perspective of this work, the researcher assumes that where necessary, customers are billed online and then they make payment in the appropriate form, proof of which is then communicated to the council.

3. Processing online service request

This is one of the most critical set of services in this whole set up. There are two ways of processing user requests:

- *Fully automated processing of service requests* e.g. automated database response to land rates inquiry.

- *Pseudo-automated processing of service requests* which involves service providers at the back-end engaging in manual processes, but relying on the system to facilitate the process.

Each service request has its own process flow which is a reflection of the council's technology, facility layout, resources, technology decisions, and work methods.

4. Querying and reporting of service results

The purpose of this set of services is to give stakeholders a set of tools for on-line querying of the MCE database. A HTTP request for a particular web page comes from the client's web browser. The request is sent to the web server which retrieves it and gives it to the processing engine. The server engine begins analyzing the script which includes both a command to connect to the database and execute a query. A connection to the database server is opened and the appropriate query is sent and processed. Once processed, the query results are sent to the processing engine. Running the scripts also involves formatting the query results nicely in HTML. The resulting HTML is then returned to the web server which in turn passes the HTML back to the browser, where the user can see the results.

5. User authentication

Authentication is a fundamental requirement for any information system more so, online systems. Basically, in this system, there are two types of authentication namely: dialogs and forms. Since this is a dynamic site, there is need to restrict some areas from normal users

and grant access only to a set of trusted users. This is particularly necessary for purposes of administration. By using *multiple access levels* and *user management* (add, edit, and remove users), the researcher expects to meet the goals of authentication.

6. Audit trail

The purpose of this service is to keep a history of service requests or changes made in the system. This is expected to provide data for management by tracking all of the modifications performed within the database. This log ensures both that the database is able to recover when abruptly interrupted (such as a loss of power) and that users are able to undo (rollback) the results of a database transaction. Unfinished transactions are maintained in the log before they are permanently stored (or committed) in the database. The transaction log backup functionality enables us to store copies of the database's transaction log on a backup device.

7. Secure transactions

For the sake of securing the data transacted over the site, the researcher intends to activate Secure Sockets Layer (SSL) which is the standard security technology for creating an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browser remains private and integral. Comodo Group, Inc (2009) says SSL is an industry standard and is used by many websites in the protection of their online transactions with their customers.

According to Comodo Group, Inc (2009), once the online transaction system is complete, an SSL link is generated for the web server which requires an SSL Certificate. To activate

SSL on the web server, one is required to indicate the identity of the website including the website's URL and the company's name and location. The web server then creates two cryptographic keys - a Private Key and a Public Key. The Private Key must remain private and secure. The Public Key does not need to be secret and is placed into a Certificate Signing Request (CSR) - a data file also containing one's details. The CSR should then submitted during the SSL Certificate application process to the Enterprise SSL Certification Authority, who validates the details and issues an SSL Certificate containing the relevant details and allows one to use SSL. The web server will match the issued SSL Certificate to the Private Key. The web server will then establish an encrypted link between the website and the customer's web browser. In this way, a transaction on the website is secured.

8. Sufficient documentation for the system

This set of services is necessary to provide documentary support the project, more so in management and project execution. With documentation in place, the continuity of the project won't pose a problem. In this study, all forms of the project documentation have been generated and kept. Beginning with the concept notes and earlier versions of the software architecture, all the descriptions of the code are documented. Similarly, the technical design document was updated with the latest changes.

9. User friendly interface

The purpose of this service is to enable users to effectively complete tasks and make their interaction with the system as pleasant as possible. The researcher observed *consistency*, *feedback*, *recovery from errors*, and *user control* as the fundamental design principles of good user-interface design for the system. Moreover, there should be limited use of

graphics in the system in order to improve *page load speed, accessibility, navigation* and *information*, according to Snell (2007).

5.5.2 Physical design

1. Software design

PHP scripts and various classes and methods for communicating with MySQL servers and accessing databases were used in this project. PHP is a server side scripting language (leading to faster execution), compatible with many web servers and supports MySQL database (among a host of other databases). PHP combined with MySQL are cross-platform (one can develop in Windows and serve on a UNIX platform). Java script was used for validation.

2. Data base design

The database for the system was developed using MySQL 5.0.24 to implement the server and client sides of the application. In this study, the server was set up as a *local host* via TCP/IP. *Sun Microsystems* (2009) argues that MySQL reduces the total cost of ownership of database software by reducing database licensing costs by over 90 percent and cutting systems downtime by 60 percent. At the same time, it lowers hardware expenditures by 70 percent and reduces administration, engineering, and support costs by up to 50 percent. Further, the MySQL® database has become the world's most popular open source database because of its consistent fast performance, high reliability and ease of use. It's widely used by individual Web developers as well as many of the world's largest and fastest-growing organizations to save time and money to power their high-volume web sites, business-critical systems and packaged software. *Sun Microsystems*(2009*)* further argues that

MySQL is not only the world's most popular open source database but it's also become the database of choice for a new generation of applications built on the LAMP stack (Linux, Apache, MySQL, PHP / Perl / Python.). MySQL runs on more than 20 platforms including Linux, Windows, OS/X, HP-UX, AIX, Netware, giving a great deal of flexibility.

The *localgov* database developed in this application contains close to 50 tables. The tables have been normalized to second normal form. Some of the scripts used to generate tables in the localgov data base are shown in appendix IV. Using the *phpMyAdmin* interface, the requirements for the table design including fields and their data types, number of characters and XAMPP for testing PHP scripts and accessing *phpMyAdmin*, were defined. Given the sheer number of tables created in the *localgov* database, it was not possible to list all of their details in this section. The information stored in this database includes details of the public services provided by the local government in MCE, and information regarding various services characteristics. In order to implement the services, data from a number of services from different departments were coupled. The services use standard formats to communicate with the web services and the messages are received in the presentation layer.

3. Network and telecommunication design

It takes the form of client / server protocol that enable communication between the data layer and presentation layer. This layer addresses the main part of determining the service request and response by implementing the various business processes involved. This is where the matching of service requests to service reply is carried out. The server connects to client via TCP/IP port or a local socket. The session begins after successful connection i.e. after handshake and authentication are performed. A command is sent by the client and the server gives a suitable response. When this is done, the client sends a stop command

and the session is terminated. The communication between the server and the client devices takes place over the normal network provided by the network operators like Safaricom.

Closely associated with transmission is the presentation layer, also known as the interface layer, and its main purpose is to enable communication with the service end-users through the computer. It describes how the service is presented to the users and how they should interact with the service. It receives its data from the server and is visualized using software. The software allows the client to choose the services by accessing a menu on the interface by scrolling through the different options.

The client gets access to the services provided by the local authority with their ICT-enabled equipment, by connecting to the computer at the MCE. This is when the interaction with the service system begins. The main assumption is that the typical customer possesses a piece of equipment that can communicate remotely, e.g. mobile phone, PDA, etc., and that can communicate via an IP address system, e.g. computer connected to the internet through which information can be routed.

4. Module level design

The MCE business processes coalesce into seven departments of the MCE which translate into the system's modules. In this project, *modular decomposition* was used to divide the system into manageable modules that could be easily understood. One obvious advantage of this approach is that, in the event that changes are made, they would be localized to a specific module thus minimizing any ripple effect. Each department consists of various

sections, which were translated as key sub-modules. The software architecture is shown in

figure 5-4.
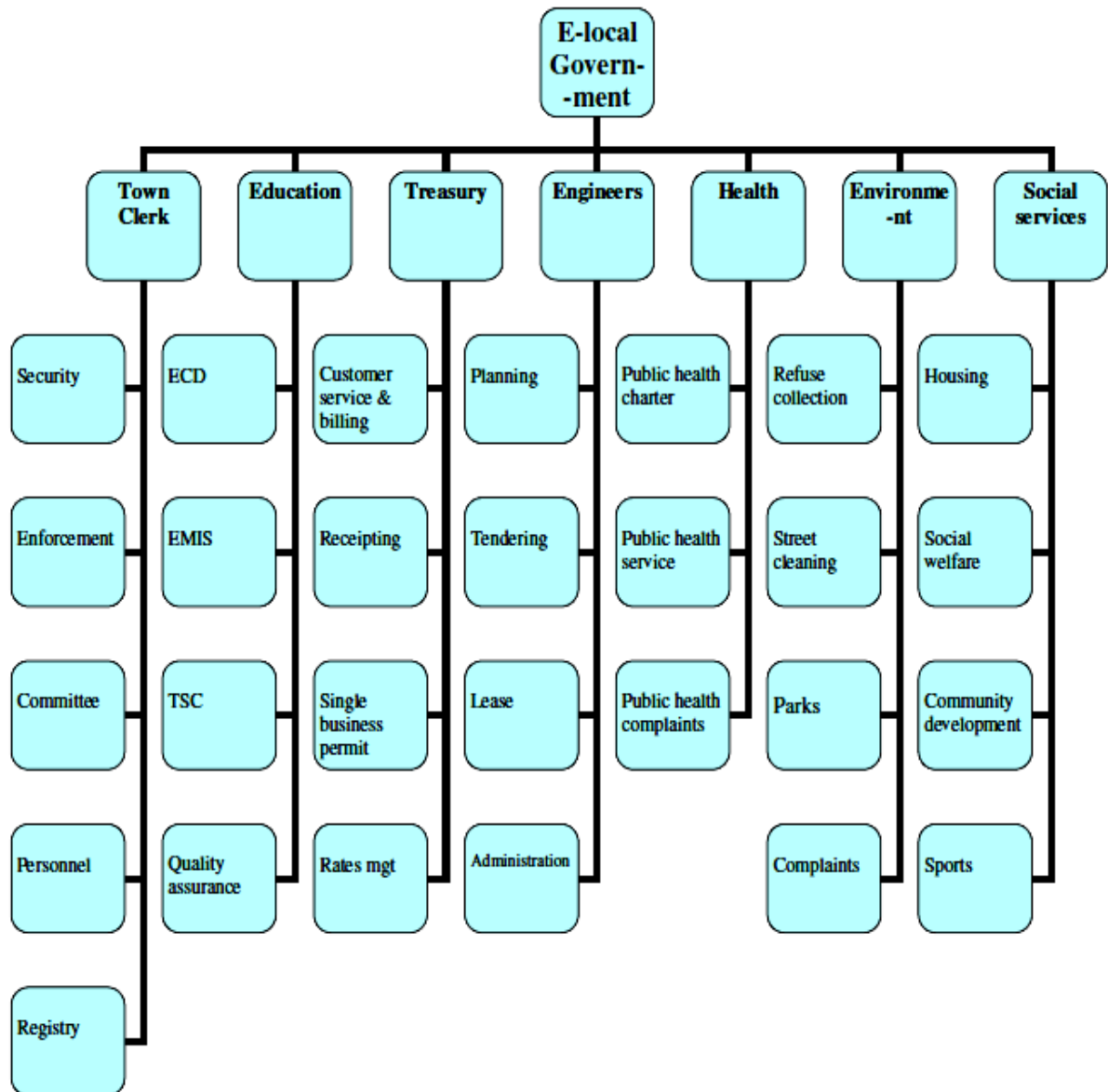
Figure 5-4: Software architecture for the OTSS

Figure 5-4 represents the overall software architecture. The researcher further refined this

architecture by specifying the *design* specifications for each module and sub-module. This

is shown in the subsequent tables.

Table 5-4: Module 1 (Town clerk's Department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Security	• Store security officers details; • Generate weekly duty roster; • File weekly and monthly security; • Query security incidents; • Security officers query duty roster	chief security officer; Security officers	• Report security; incidents online; • Send feedback to sender;	Public
Enforcement	• File illegal activities (hawking, trespass, obstruction), date, comments, sign); • Monthly Reports of illegal activities -SNo, name, court fine, offence e.g. obstruction, date; • Monthly Report of storage charges for animals and vehicles impounded.	Enforcement officers.	• Queries concerning impounded items.	Public
Committee	• Issue e-mail notice of meeting to council officers indicating agenda and venue to respective committees; • File electronic minutes in varying formats- word, PDF etc.	Committee clerk.	• E-search of council minutes by date, month or year	Public
Personnel	• E-records for council Personnel submit documents online e.g. leave form, leave reconciliation form etc; • Query personnel information like state of leave application.	Personnel officer; Council staff		
Registry	• Receipt of correspondence – Date, name of correspondent, address, Ref no – [as a composite field (RE: or subject, Date of doc, file reference e.g. B8/2)], action; • Record dispatch of correspondence: date, file reference no, .Address, subject, postage amount.	Registry personnel	• E-mail correspondence to the registry; • Query status of correspondence via SMS or e-mail; • Receive acknowledge of receipt of doc by automatically sending e-mail to sender.	Public

Table 5-5: Module 2 (Education department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
ECD	• Reports from the system- monthly and annual summaries of the data returns filed online; • Queries – teachers establishment per school, pupils enrolment per school, fee payment; • Avail ECD curriculum online.	ECD personnel	• View ECD curriculum online • E- registration of ECD school (code, name, location, address); • File to the council, monthly data returns- teachers establishment, student establishment, fees payment and challenges.	ECD teachers
EMIS	• Generate quarterly reports; sorted by school; • Queries by school name or Code.	EMIS staff	• E-registration of schools; • File return booklet online; • Queries by school name or code.	Primary school staff
TSC	• Monthly reports; • Respond to teachers queries online.	TSC staff	• Quarterly School data returns – Form A (P); H/T retains a copy (school Database), one copy sent to DEO's Database and another copy to TSC's database; • Teachers to file requests for leave online (compassionate, sick, maternity); ▪ File disciplinary cases online by Heads of schools.	School head teacher
Quality assurance	▪ Provide summaries of QA assessment	QA officers	• School assessment returns online see school standards assessment tool and school standards assessment report	QA officers NOT teachers

Table 5-6: Module 3 (Treasury department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Customer service and billing	• Income type setup; register fees and charges • Billing- regular and special • Regular reports on Issued bills, paid Bills, bills by description and Employee Revenue collection analysis.	Customer service and billing staff	• Online request for bill • Online queries for issued bills, Paid bills, bills by description	Public
Receipting	• Receipting for bills issued – cash, cheque and direct banking • E-mail / SMS bills • Prepare banking data- daily or periodic revenue details for revenue collected • Generate various bills reports e.g. daily revenue abstract, daily revenue analysis	Receipting department	• Receive bills by e-mail • E-mail payment details - directing banking or cheque deposit	Public
Single business permit	• Set fee schedule • Set business permit penalty rate • Set up Local authority zones and Wards- database for administration of business • Generate Business permit bills and e-mail to customer • Business search and editing • Inactivating business • Printing business permits • Single business permit reports	SBP section	• E-registration for new business • Receive bills by e-mail • E-mail payment details for business permit – directing banking or cheque deposit • E-mail change of business particulars	Public
Procurement	• Local Purchase Order (LPO) Requisition filed online by departmental officers • E-mail LPO requisition to procurement section • Forward LPO requisition for vote checking • Fill and e-mail LPO • LPO reports	Procurement officers	• Process LPO • E-mail feedback to council	Contracted company
Rates management	• Setup the property charges, rate struck waiver • on receipt of application for property registration, prepare valuation details • Generate property rates bills and e- mail to client • Reports- property register, arrears list, rates statement, properties statement	Rates management section	• Online application for property Registration • Receive property rates bills • E-mail payment information	Public

Table5-7: Module 4 (Public health department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Public health Service Charter	• Avail service charter online	Public health officers	• Online access of public health service charter	Public
Public health service	• Record and track public services rendered by indicating date, description and user charges (if any)	Public health officers		
Public health service complaints	• Capture and analyze public Health service views or Complaints	Public health officers	• Online interactive forum for filing complaints or views	public
Public health service reports	• Generate various public health service reports	Public health officers		

Table 5-8: Module 5 (Engineers department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Building plans	• E-filling of building plans • Avail building code online	Engineers Department	• Submit building plans online • Query status of building plans processing by mail • Access building code online	Public
Council tenders	• Place e-tenders • Receive and process e-tenders • Communicate tender Awards	Engineers Department	• List council tenders and details. • Download tender document or fill online and Submit	public
Extension of lease	• Avail application documents online • Receive and process lease extension application • Communicate results by e-mail	Engineers Department	• Fill and submit application for lease extension	public

Table 5-8: Module 5 (continued)

Administration	• Record daily departmental expenditure- date, particulars, IDNO, Receipt / cheque no. description (personnel, operations, maintenance), amount. • Record daily departmental revenue- date, particulars, IDNO, Receipt / cheque no., description (survey fee, building plan preparation fees, building plan approval fees, building inspection fees, right of way fees, sign board and advertisement fees), amount. • Record daily departmental work- date, description, amount, and receipt no.	Engineers Department		
Reports	• Building plans submitted, • Council tenders submitted, awarded. • Extension of lease plan summaries, • Monthly administrative expenditure, revenues and departmental work			

Table 5-9: Module 6 (Environmental department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Refuse collection	• Record daily refuse collection – date, particulars, quantity, • Record transport details	Environment Department staff		
Street cleaning	• Record cleaning services offered	Environment Department staff		
Parks	• Record park conservation Activities	Environment Department staff		
Complaints	• Process complaints received	Environment Department staff	• File complaints or issues Online	public
Reports	• Transport services • Street cleaning services park services	Environment Department staff		

Table 5-10: Module 7 (Social services and housing department)

Sub-module	Back-end		Front-end	
	Design specifications	Actor	Design specifications	Actor
Housing	• Rent database for council estates • Estates maintenance register	SS and H staff		
Social welfare	• Social welfare records • Query facility	SS and H staff		
Community development	• Community development database • Query facility	SS and H staff		
Sports	• Sports database	SS and H staff	• File complaints online	public
Reports	• Monthly reports on housing, social welfare, community development, sports	SS and H staff		

5. Governance, control and security

Auditing actors is one of the most important aspects of governance with respect to service systems. As a matter of fact, the proposed system contains a number of key actors whose semantics and security are of paramount importance in achieving the success of the system. The actors involved in making the online transaction service system possible are as follows:

- *Client:* this is the actor for whom the online transaction service has been set up. The clients are responsible for sending service demands to the service providers. In return, they receive a list of available services from the providers and the service requirements. These actors are members of the public who seek services from MCE. Depending on the service requested, some form of authentication may be necessary for clients using the system.

- *Public service provider (MCE):* this is the actor that provides the service system with information regarding their ability and requirements to meet the public service demands. It is a mix of professionals from all the seven departments, sitting at the

back-end who complete the service loop and have varying levels of authority to access different aspect of the back-end.

- *Network provider:* this is the actor who facilitates communication among the actors via internet connections. This group may be made up of several different operators, e.g. Safaricom, Zain, etc., and other ISPs. Their responsibility is to ensure that the network is running at acceptable levels to enable the client and the service provider conduct business effectively. Network providers have their own, independent security and semantics.

- *Application provider*: the actor who develops and provides the software systems on which the public services are run. In this case, the researcher is identified as the main actor since he is expected to provide the software and the related support and maintenance.

- *Service System auditing firms:* Tan et al. (2010) state that service system auditing could be implemented by considering periodic or behavioural aspects. That behavioural auditing adds trust to service systems, since it will immediately detect flaws in the system. Auditing firms could be actors that play an important role in auditing service system.

Another important aspect of governance is the fair distribution of co-created value between all actors in a service system. This is a fairly complex model using software tools like e^3 control to analyze value exchanges between actors in the service system; exploration of weak points in the business model and understanding changes of the existing business model by introduction of the two IT innovations (Tan et al., 2010). However, this support

tool is not explored in this study because of constraints in time and resources for modeling processes in more detail.

5.6 Conclusion

The requirements and conceptual model for the online transaction system were presented and contextualized in this chapter. The researcher presented the infrastructure architecture (framework) contained in the ICT strategy for local authorities to offer the direction for developing ICT solutions in MCE. From this strategy, the researcher realized that web application is the preferred option, according to the discussions presented in section 5.3. The researcher applied the *back-end* and *front-end* services framework from Janowski (2008) to define the requirements of the system. The online transaction service system captures the requirements identified through the findings from the data analysis presented in chapter four. The researcher applied the web transactions template from *Smartdraw.com* (2009) to model the online transaction service system, and identified the requirements to be fulfilled by the system in support of delivery of these services.

In the second part of this chapter, the logical and physical designs for the system were undertaken, enriched with ideas taken from the service innovation aspects model. The design ideas presented in this section were used as the basis for the implementation of the system in chapter six.

CHAPTER SIX

SYSTEM IMPLEMENTATION

6.1 Introduction

In this chapter, the researcher explains the system prototype which embodies the various system services and business processes discussed in the previous chapter. A graphical illustration of selected services and business process is presented to enhance the understanding of the system as well as the overriding considerations during implementation. Lastly, a set of system recommendations is made to explain to the desired operating environment for the system.

6.2 Implementation framework

Figure 6-1 shows the UML class diagram for the OTSS. This UML diagram depicts the close interaction of the various self-contained services or components defined in the previous chapter. The system services support the various business processes outlined in section 5.5.2. As pointed out by Muniafu (2007), it is of paramount importance to develop an ICT-enabled system in such a way that the services contained in it can function in a loosely coupled manner. Simply put, it should be possible, for instance, to 'pluck' one service e.g. authentication service (library of codes) from the system without the system grounding to a halt.
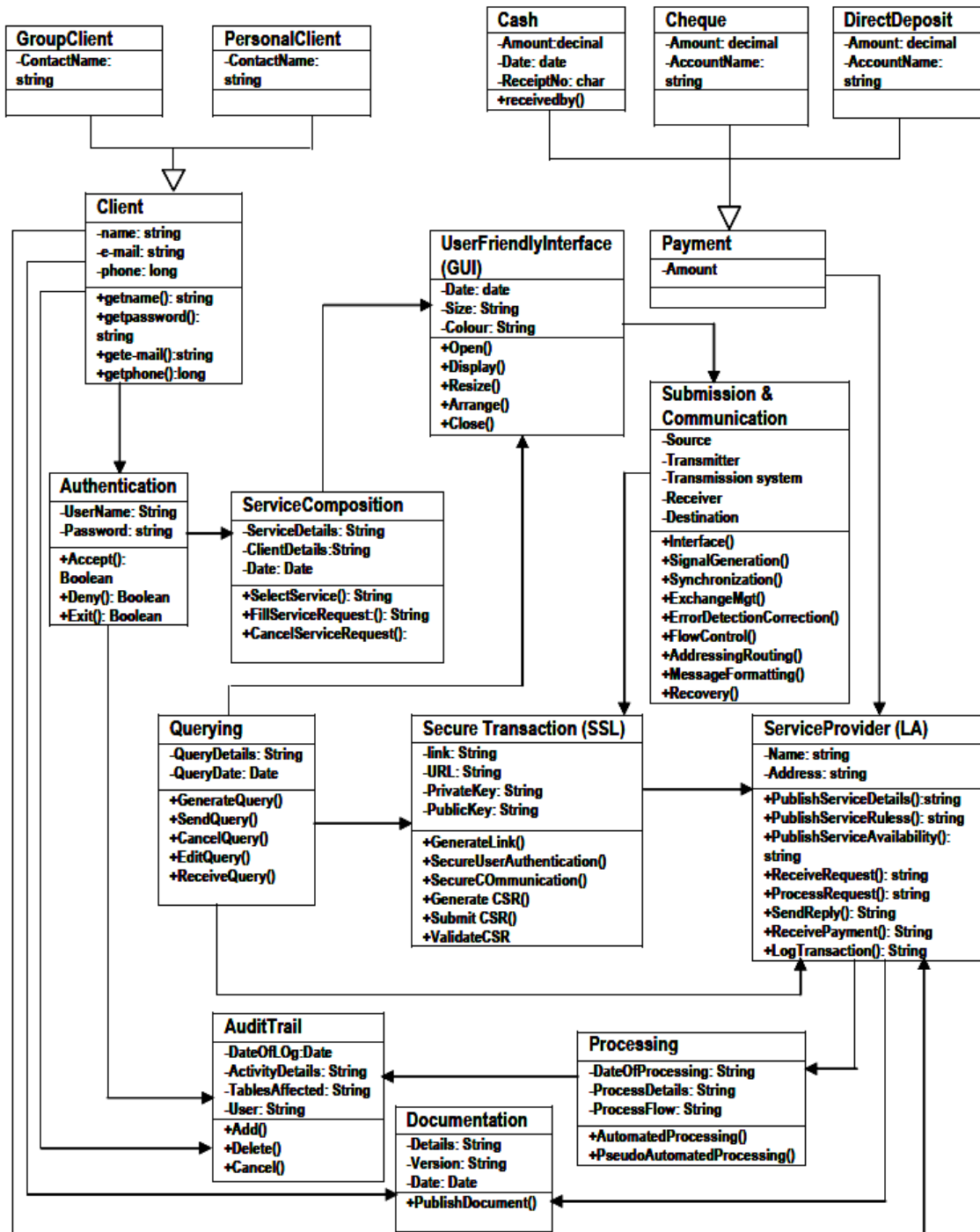
Figure 6-1: UML class diagram for the online transaction service system

(Adapted from Muniafu, 2007)

The UML diagram presented in figure 6-1 was used as a basis for implementing the system. It is these services that support any single function of the system. For example, when a client applies for a Single Business Permit (SBP), this application is ideally supported by the mechanisms (services) of *authentication, service request composition, submission and communication, secure transaction, audit trail* e.t.c

Table 6-1: Distinction between services developed and 'plug-in services'

Services developed by the researcher	'Plug-in' Services
User authentication	Secure transaction
Service request composition	Submission and communication
Querying and reporting services	
Audit trail	
Processing online service requests	
User friendly interface	
Documentation for the system	

The researcher used design evaluation methods presented by Somerville (2006) in the development of the system to ensure that the system worked as required. The researcher undertook black box testing whose aim was to determine the functionality of the system in relation to its requirements as identified in section 5.3, without going into the details of the implementation. Integration testing was also carried out on the individual components, in which case, the different software modules were combined and tested as a group. White box testing was used to design test cases to determine whether the software would produce the required output.

Out of the nine distinct services presented in figure 6-1, the researcher developed seven services whereas the other two were considered as 'plug-in' services. The *Seven* services

developed by the researcher forms the basis of the subsequent discussions. This distinction is presented in the next table:

6.2.1 User authentication

User authentication constructs are implemented in two levels i.e. administrator and general users. Administrators are required to log into the system in order to transact any business (mainly back-end) whereas general users are able to access parts of the system that do not require any security restriction. The administrator user name and password data are stored in the *'access'* table which exists in the *localgov* database.

Some select tasks within the application require some form of authentication for general users, for example leave application which requires the staff members to log in with their Personal Numbers (PF) as their user names and use a password assigned to them and stored in the table *'u'.* Where non-authentication is required, users simply click on any of the links listed on the page.

A segment of the PHP code for user authentication is shown below:

```
<?
  include("./config/class.inc");
  include("./templates/header.inc");
  include("./templates/title.inc");
?>
<br><br><br><br>
<div align="center">
<h3>Please Login to continue...</h3>
<form name="login_form" action="validate.php" method="post">
<table id="setup" border="0" cellspacing="0" cellpadding="0">
 <tr>
  <td>Username: </td>
  <td><input type="text" name="username" size="20" maxlength="20">
 </tr>
 <tr>
  <td>Password: </td>
  <td><input type="password" name="password" size="20" maxlength="20">
 </tr>

</table>
<br>
<div align="center">
```

```
    <input type="submit" name="login" value="Login">
    <input type="reset" value="Reset">
<br>
<tr>
<td align="center"><a href="login1.php">Users click here</a></td>
</tr>
</div>
</form>
</div>
<body background="./images/WB02073_.gif">
<? include("./templates/footer.inc"); ?>
</body>
```

This section of the code simply instructs the system to receive user name and password and direct them to another form for purposes of validation. A sample screen for user login and authenticating is presented below.
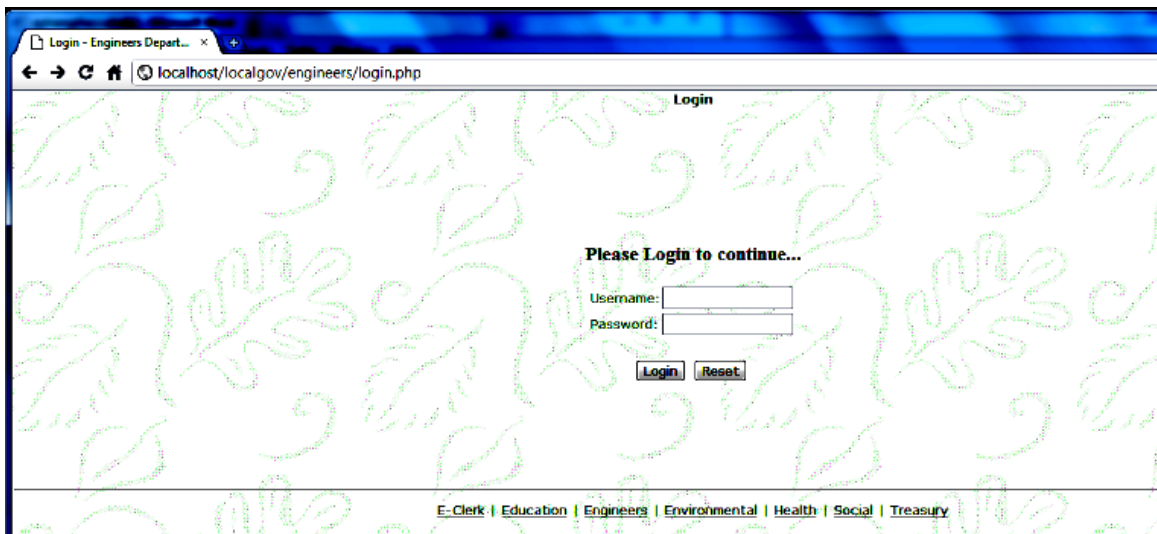
Figure 6-2: User login and authentication screen

6.2.2 Service request composition

Users request for services by completing online forms. Each service request made is unique in terms of data required by the council. Generally, the forms used in this system have the following characteristics: wide variety of field types, field validation, single-page, secure

data, and simple integration with the system structure. The service request composition

tools used in this system are designed to minimize the cost and effort required at each step

or set up.

The system has seven modules and each module has distinct forms for composing different

service requests. As such, it is not possible to describe all the service request forms. One

example of user service request is leave application which is composed or filled by council

staff members. This service request has been used to illustrate the concept of service

request. The code segment below creates a form which allows a user to compose leave

application using the *e-clerk module*.

```php
<?
 /*
   validate the administrator login and redirect to leavef.php
 */

 // include("./config/errors.inc");

include("./config/class.inc");
 include("./templates/header.inc");
 include("./templates/headerpicture.inc");
 include("./templates/toolbar.inc");
 include("./templates/title.inc");

  /* prevent empty entries from going beyond this point */
  if ($pf == "0") {

     $chronerr->addError(1,"PFNo.:");
      }

  if (strlen(trim($password)) == 0) {
  $chronerr->addError(1,"Password");
      }

if ($chronerr->error_flag) {
    header("location: leave.php");
    exit();
 }

?>
<div align="center">
<a href="leave.php">Go to Leave Applications</a>
<br><br><br>
<form name="leaveform" action="addleaveapplication.php" method="post">
<table width="680">

<tr>
```

```
   <td align="right">PFNo.:*</td>
   <td><b><? echo  $pf ?></b></td>
</tr>

<tr>
   <td align="right">Department:*</td>
<td><select name="department">
<option value="0">--- Department ---
<option>ICT
<option>Business
<option>MIS
</select>
</td>
</tr>

<tr>
   <td align="right">Section Head:*</td>
   <td     colspan="3"><input     type="text"     name="shead"     size="30"
maxlength="30"></td>
</tr>
<tr>
   <td align="right">Number of days applied for:*</td>
   <td     colspan="3"><input     ype="text"     name="nodays"     size="30"
maxlength="30"></td>
</tr>

<tr>
   <td align="right">With Effect from:*</td>
   <td     colspan="3"><input     type="text"     name="fromf"     size="30"
maxlength="30"></td>
</tr>
<tr>
   <td align="right">To:*</td>
   <td     colspan="3"><input     type="text"     name="tof"     size="30"
maxlength="30"></td>
</tr>
<tr>
   <td valign="top" align="right">Reasons: </td><td colspan="3"><textarea
name="reasons" rows="2" cols="25"></textarea></td>
</tr>

<tr>
   <td align="right">Date when recalled:*</td>
   <td   colspan="3"><input   type="text"   name="daterecalled"   size="30"
maxlength="30"></td>
 </tr>
<tr>
   <td align="right">Leave Accepted?:*</td>
<td><select name="accepted">
<option>No
<option>Yes
</select>
</td>
</tr>

<tr>
   <td><input type="submit" name="action" value="Add"></td>
   <td><input type="reset" value="Reset"></td>
</tr>
<tr>
   <td align="right">PFNo.:*</td>
   <td  colspan="3"><input  type="hidden"  name="pf"  value="<?  echo    $pf
?>"></td>
</tr>
```

```
</table>
</form>
</div>

<? include("./templates/footer.inc"); ?>
</body>
```

Once complete, the user clicks the add button to submit the form. The sample screen generated by the code above is shown next.

Figure 6-3: Leave application

6.2.3 Querying and reporting services

The system supports various aspects of querying and reporting based on PHP and MySQL facilities. Key among this set of services is database connection where persistent connections were used, the idea being to keep connections open for some particular time, and if the page loads multiple times, PHP code would reclaim the same connection. Secondly, given that this would be a fairly high traffic website, it was considered reasonable to use persistent connections, though it would use too much of web server resources. The *localgov inc* class in particular establishes *connection parameters,*

configuration, error definition parameters and *querying parameters* for the localgov
database.

There are many service-specific queries in the system. These queries are mainly SELECT
queries based on defined criteria. For instance, the select query below searches *dcharges*
table and adds a set of indicated values. It also performs a set of error-checking routines as
indicated.

```
<?
 /*
   validate the administrator login and redirect to charges.php
 */

  include("./config/class.inc");
  include("./config/errors.inc");

    /* prevent empty entries from going beyond this point */

  if (strlen(trim($durationid)) == 0) {
      $chronerr->addError(1,"Duration ID.:");
      }
  if (strlen(trim($item)) == 0) {
      $chronerr->addError(1,"Item");
      }

if (strlen(trim($duration)) == 0) {
      $chronerr->addError(1,"Duration");
      }

  if($chronerr->error_flag) {
    echo $qry_str;//die();
    header("location: dcharges.php");
     }

 $localgovdb = new localgovdb_sql;
  /* look for existing items */
$qry_str = "select durationid from dcharges where durationid
='".$durationid."';";
  $localgovdb->query($qry_str);
  $localgovdb->next_record();
if ($localgovdb->record[0]) {
  $chronerr->addError(11,"Item.");
 }

  if ($chronerr->error_flag) {
  header("Location: dcharges.php");
 die();

  }
```

```
    $qry_str = "insert into dcharges(durationid,item, duration) values
('".$durationid."','".$item."','".$duration."');";
    $localgovdb->query($qry_str);
    header("Location: dcharges.php");
?>
```

6.2.4 Audit trail

The code for system audit trail is implemented in the *statistic.php* form. This function

connects to the *localgov* database via the normal connection parameters set in the system.

Using a select query, the system selects the names of pages visited from the counter table

ordering them by page name ASC. The query result is displayed in a tabular fashion in the

following format: $result, $i, "pagename".

The *pagecounter.*php code is included in the system header files. This code inserts into the

counter table the *pagename* and corresponding *hits* i.e the number of times a page is

visited. The PHP query returns a null value (zero) if a page's reference is not yet stored in

the *counter* table. If a page has been previously referenced, the count value is incremented

by one. The *pagecounter.php* code is linked to other pages in the system by including it in

the two header files contained in the templates folder. Figure 6-4 shows a snapshot of the

site statistics.

PAGE	COUNT
/localgov/eclerk/committee.php	3
/localgov/eclerk/enforcement1.php	6
/localgov/eclerk/index.php	15
/localgov/eclerk/issues2.php	4
/localgov/eclerk/leave.php	2
/localgov/eclerk/login.php	9
/localgov/eclerk/options.php	4
/localgov/eclerk/passwords.php	12
/localgov/eclerk/reports.php	3
/localgov/eclerk/search.php	3
/localgov/eclerk/search.php?domain=officers	2
/localgov/eclerk/security.php	5
/localgov/eclerk/statistic.php	11
/localgov/education/index.php	2
/localgov/education/login.php	2
/localgov/engineers/index.php	1
/localgov/engineers/login.php	1
/localgov/environmental/index.php	4
/localgov/environmental/login.php	4
/localgov/treasury/index.php	1
/localgov/treasury/login.php	1

Figure 6-4: Site statistics

6.2.5 Processing online service requests

This functionality proved to be the most challenging component to implement in the entire prototype because of the following reasons:

- When users submit online requests, the data is received and it is stored in the council database. Depending on the complexity of the request made, it is not possible to determine how much time will elapse before the request is processed. For example, when a client submits a building plan, it is not possible to determine when the relevant committee will sit to discuss the plan and eventually send a reply to the customer.

- At present, the processing of user requests at the back-end is largely manual requiring the officers to make manual interventions at every stage. This presents a big challenge in terms of electronically tracking every stage.

In order to get around this problem, the researcher has implemented facilities to record or track the **status** of service requests sent to the council. To illustrate this concept, let us take

the case of leave application. Once received, this application is ascertained by both the section head and the departmental head. At this point, the processing is purely manual. Once the processing is complete, the new status is updated in the system so that a user can query the system to know the success of his/her leave application. An illustration of the updated leave application is shown in the next figure.

Figure 6-5: Processing status for leave application

There are also elements of automated responses for routine tasks or those that require no major processing. For example, queries concerning rates.

6.2.6 User friendly interface

The system has a simple user interface. Right from the home page, the user can effortlessly navigate the system with the aid a simple menu showing each of the respective modules in the system. As much as possible, simple commands like submit, view, print, file etc., are used to make the system user friendly. A screen shot of the system home page is shown in figure 6-6.
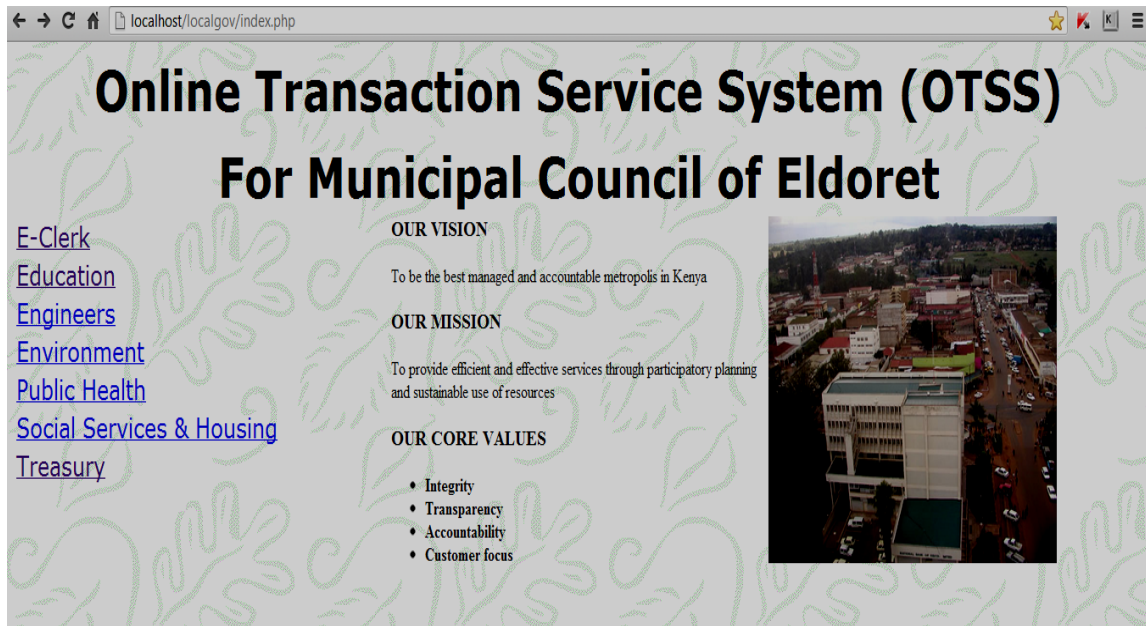
Figure 6-6: Home page showing system modules

As can be seen from the screen layouts earlier presented in this section, data entry is done using fill-in screens accompanied by pop-up menus from which the user can select the required data entry item. Once the data is entered into the system, the user has to make a confirmation before the data is submitted and eventually committed to the database at the back-end. The fill-in forms simplify data entry, and take the format of a physical form such as those currently used at the MCE. The structure of the menus and fill-in forms was considered suitable enough for the prototype as they took the form of manual forms currently used. Moreover, the use of simple navigation aids like hyperlinks at the bottom of every page makes it pretty easy for a user to access other menus. Figure 6-7 shows page links that appear on every screen in the system.

Figure 6-7: Hyperlinks as navigational aids

6.2.7 Documentation of the system

As indicated earlier, various forms of documentation have been developed for this system. For a start, the thesis write-up itself serves as the main documentation for the system, covering both technical and non-technical aspects of the system. In particular, a simple easy to use manual has been developed for use by non-technical users. Being a prototype, the system is set to undergo several revisions and so the researcher has endeavoured to keep a record of these changes.

6.3 System recommendations

OTSS should be installed on a web server. The system server can be located on-site at the MCE office or hosted remotely in the cloud or another web hosting provider. Since OTSS is centralized and web-based, the application can then be accessed from any internet-connected device without the need to install any software locally. The software runtime

environment should consist of windows 2003 or higher version. Apache web server is recommended. The data base server used should be MySQL 5.0.24 or higher version. For client system, the processing power should be a minimum of Pentium 2.0 MHz or equivalent or more. Installed memory (RAM) should preferably be 2.0 GB or more. There is no special storage requirement except for software installation which should be about 4GB or more for optimum operation. Internet connection should be 512kbps or more.

6.4 Conclusion

The focus of this chapter was to describe the implementation of the OTSS. The researcher began by describing the services and how these services support the business processes of the council. The services were presented in a UML diagram to show how they interact. A description of the services directly implemented by the researcher followed. Since the system contains several modules, it was not possible to describe each and every module in the system. To this end, a few examples were used to depict the implementation of the system. The next chapter provides a summary of major findings, conclusions, recommendations of the study and recommendations for further study.

CHAPTER SEVEN

SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents a summary of the major findings of the study including the OTSS model, conclusions of the study, recommendations of the study and recommendations for further study. The aim of the research was to investigate the current public services offered by Municipal Council of Eldoret with a view to designing and developing ICT-enabled services for increased efficiency and effectiveness. The Municipal Council of Eldoret case study enriched the researcher's understanding of the issues, problems and challenges in developing ICT-enabled public services in local authorities in Kenya.

The study was expected to achieve the following specific objectives:

1) To establish the current public services offered by Municipal Council of Eldoret and their significance;

2) To determine the challenges affecting the quality of services in Municipal Council of Eldoret.

3) To ascertain the efforts and measures taken by the Municipal Council of Eldoret towards developing ICT-enabled services.

4) To establish the level of skills or knowledge required by the public and EMC to support the development and effective use of ICT-enabled services in local authorities.

5) To develop a prototype for ICT-enabled services in Municipal Council of Eldoret.

By undertaking a succinct analysis of the current public situation in MCE, objectives 1-4 were met. A prototype of an OTSS was then developed based on the same analysis thereby meeting the last objective. These findings are presented in the sections that follow.

7.2 Summary of major findings

The major findings of the study, according to the *five* objectives of the study are presented below.

7.2.1 Analysis of public services offered by MCE

One of the findings of the study was that the MCE provides a range of public services in a multi-stakeholder environment. The range of services provided by MCE is presented in Table 4-1. The researcher learnt that the drive by MCE to offer improved public services is enormous, although challenges abound. As shown in section 4.2.1, the study revealed that the council employs public-private sector partnerships as a key concept in service delivery. Basically, this approach involves commercialization, privatization and out-sourcing of services. By using this approach, the council has been able to bring on board, the views, support and participation of the private sector. The most notable example of this approach was the formation of Eldoret Water and Sewerage Company in 2001.

The study also revealed that the council has adopted the following public service tools to indicate the council's commitment to provide improved public services. These tools

include: *strategic planning, performance contracting* and *service charter*. As discussed in section 4.2.4, these were considered impressive efforts in restating the council's commitment to improving the provisioning of public services, resource limitations not withstanding.

In terms of OECD (2001) benchmark for assessing public service parameters which are: *responsive service delivery, improving public service delivery systems and quality service organization,* it was revealed that the council has made some strides in order to meet the requirements of these parameters (see section 4.2.4.4). For example, by developing Area Development Committees (ADC), the council has been able to provide a forum for stakeholder consultations. However, a lot more needs to be done in this regard, for instance, by expanding the composition of the ADC. Certainly, the council needs to pay a lot of attention to service quality parameters for example by developing ICT-training programmes for continuous staff development.

Generally, MCE experiences a high demand for public services because of rapid economic and social growth that the town has experienced in the last decade or so. The rapidly growing population of Eldoret municipality (estimated at 8% p.a) which challenges the council's ability to render services, the emergence of many commercial and industrial activities in the town, the need for more responsive and sustainable public services are some of the reasons why the services of the council remain absolutely significant (see section 4.2.1). Specifically, the growth in the town's population (and subsequent growth in the council client base), places an exceptionally high premium on the council to efficiently and effectively manage large amounts of data and information in the quest to provide good

public services. There is increased demand for the council to invest in ICT-enabled public service delivery systems as a way to leverage increased efficiency and effectiveness by removing outdated manual based and labour intensive working practices in MCE.

7.2.2 Challenges affecting the quality of public services in MCE

The Municipal Council of Eldoret, like other local authorities in Kenya, faces a number of challenges in delivery and management of services. As presented in section in section 4.2.2, some of the most important challenges are:

- Poor legacy of public service in MCE;

- Bloated size of the council's workforce;

- Outdated labour intensive working practices in the council;

- Politicization of the council public service;

- Inadequate ICT planning and resource allocation in the council;

- Lack of appropriate structures for ICT in the council;

- Lack of mechanisms to retain professional ICT staff in the council;

- The professional ICT personnel in MCE are at entry levels and a sizable number of the council staff do not have professional training in ICT;

- Poor public service culture in the council i.e. information is seen as a source of power (rent seeking), thereby creating substantial resistance to change during implementation of e-governance solutions.

It was established that in order to address some of these challenges, the KLGRP has over the last couple of years, initiated a number of local government reforms with particular focus on financial reforms aimed at enhancing intergovernmental fiscal transfers,

improving financial management, debt resolution, streamlining budgeting system and service provision capacity building. However, a lot more still needs to be done in terms of availing resources and other structures necessary for the full realization of reforms. In particular, the researcher established that the introduction of LAIFOMS as an integrated management and reporting tool has improved council operations, especially in the council treasury. The council should strive to achieve uniformity in automation so that all departments can have a uniform face.

7.2.3 Efforts and measures undertaken by MCE to develop ICT-enabled public services

The study found out that the Municipal Council of Eldoret (MCE) has begun adopting ICTs in their management and operation. This is so because, like other local authorities in Kenya, the council was increasingly being compelled by the tax payer and the government to be more responsive and accountable at all levels of its operations. According to MoLG (2008), the need for improved service delivery requires that every local authority maintains and regularly updates its data base and ensure adequate reporting on the status of each local authority operation. This effort has been particularly hinged on the need for financial reporting on the revenue received and how the local authority utilizes such revenue in provision of services to the residents (see section 4.2.5).

Like other local authorities in Kenya, MCE has adopted LAIFOMS to enable the council to improve on local budgeting, revenue mobilization and financial management, with a view to encouraging greater efficiency, accountability and transparency to the tax payers of the council, in line with the local government act and financial regulations. The study found out

that the MoLG had long noted that the differences in local authorities administrative procedures and transaction processing was widely contributing to lack of adherence to the guidelines provided by the ministry. Subsequently, there was need to re-design information systems to not only cater for financial management system but to also monitor other operational activities. The study established that the ICT initiatives in use like LAIFOMS do not sufficiently meet the requirements for a modern ICT-enabled public service delivery system. Part of the reason was that the current initiatives were not fully web enabled and appeared to better serve as back-end systems and lacked a mechanism to integrate clients into the service delivery loop.

Another finding from the study was that although LAIFOMS was the main ICT project in the council, the system had been in use on pilot basis for a long time and its use had been mainly restricted to the council treasury whereas other departments in the council had continued using manual systems. The result was that the 'face' of the council's public service delivery appeared somewhat like a hybrid of manual and computerized systems. As a way to present a uniform 'face" in service delivery, the study proposed and developed a web-enabled, online transactional service system.

7.2.4 Skills and knowledge required to provide ICT-enabled services in MCE

As presented in section 4.2.6, there is high demand for ICT training at all levels of management in the council in order to tap the potential of e-government to improve business processes and service delivery. It was further revealed that training programmes in

the council should go beyond learning about systems and applications to harnessing ICT in pursuit of the strategic goals of the council.

The study revealed that MCE has no defined strategy for human resource development in ICT. However, the study noted that most of MCE staff members have a great deal of enthusiasm to embrace ICTs in their work. Based on the above information, the key ICT training needs of MCE were summarized as follows: the need to fully mainstream the national ICT policy into MCE through MoLG (some success stories like LAIFOMS have been noted) ; the need to develop integrated ICT structures in the council and to develop the council's information infrastructure with a high degree of penetration; the need to make ICT more accessible to MCE staff and encourage a culture of transparency, openness, accountability and responsiveness to the MCE staff in ICT.

7.2.5 Online Transaction Service System

This research proposed and developed an online transaction service system after a careful analysis of the existing e-service situation in MCE (see sections 4.2.5.1, 4.2.5.2 and 4.3). As the third level in e-service hierarchy, the OTSS seeks to fully consolidate the gains made by the council in modernizing their service offerings in a number of ways, namely: reducing costly physical interactions; making service provision processes faster; reducing data redundancy; integrating back and front-end services; ubiquitous access to council services / improving general accessibility to the council services; Facilitate error free processes; Reduce corruption (through audit trail); improving the scalability of the council's public service delivery system.

The system, whose features are implemented in chapter 6, consists of a number of functionalities supported by the services defined using the service innovation aspects model by Tan et al. (2010). Generally, the system allows the client and MCE to engage in online transaction by providing facilities to support the following:

- User authentication;

- User friendly interface for composing service requests;

- Facility for composing online service request;

- Submission and communication of requests among the stakeholders;

- Processing online service request;

- Querying and reporting service request results;

- Audit trail;

- Secure transaction;

- Sufficient documentation for the system.

The services presented in the previous paragraph support the business processes of the council which coalesce into seven OTSS modules whose specifications are outlined in section 5.5.2. The seven modules of the system project a trade-off between horizontal and vertical prototype. This means that the OTSS provides a broad view of certain subsystems, focusing on user interaction more than low-level system functionality, such as database access while in other subsystems of the system there is complete elaboration of certain subsystems or functions. The system is considered an evolutionary prototype. The main goal was to build a robust prototype of the OTSS in a structured manner thereby giving room for future refinement.

7.2.6   The Online Transaction Service Model for MCE

The model of the system is presented as a data flow diagram in figure 7-1. The DFD shows the relationships among the business processes within MCE to external systems and organizations, clientele and other business processes. In using a DFD to model the system, the researcher sought to describe how the online transaction service system transforms information; to show the data flows between the service components by partitioning them into functions. The intention of this exercise was to show the functional partitions of the system, since this would help to clarify the functions of the services implemented in the system.
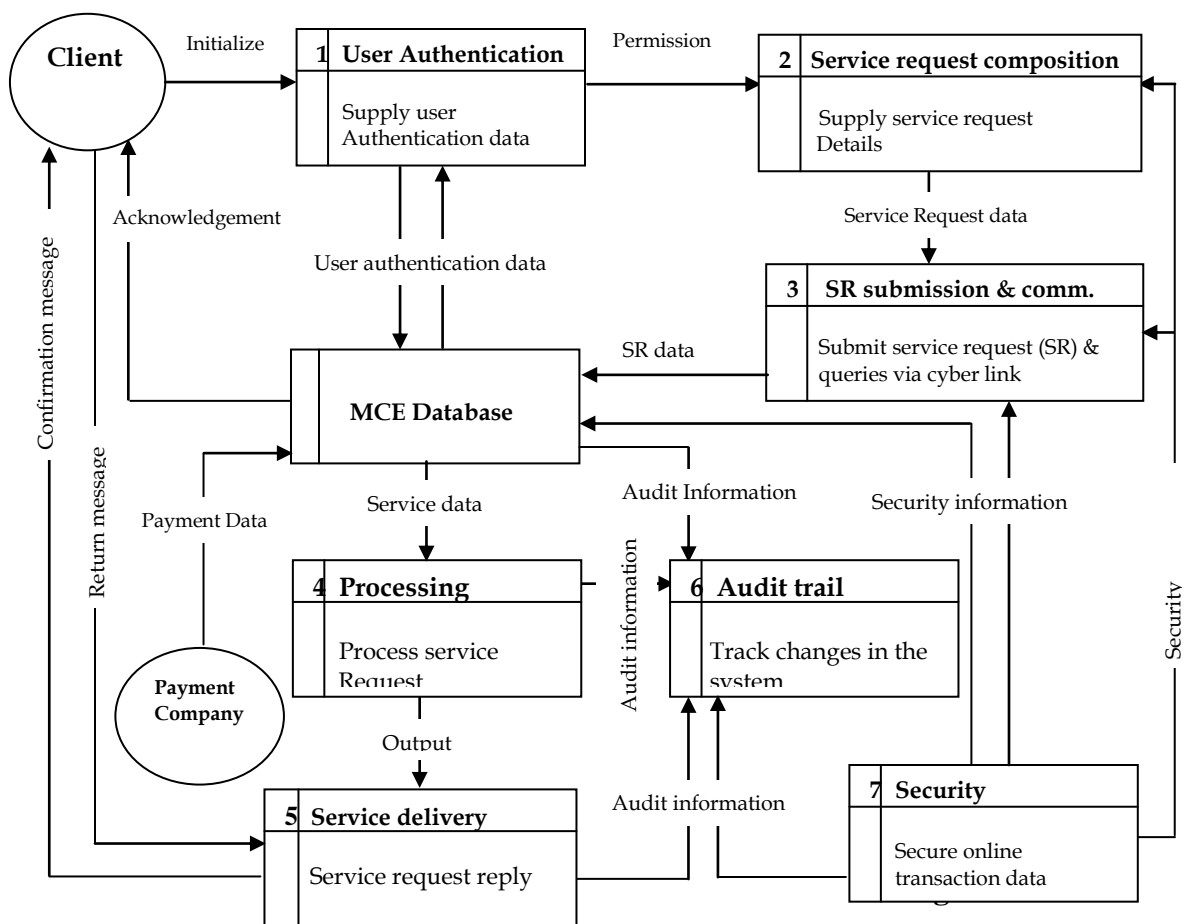
Figure 7-1: The Online Transaction Service System model for MCE

A brief description of the seven partitions of the model is presented in the next sections.

7.2.7.1 User authentication services

The user authentication services deal with registering the data that is needed for verifying the identity of a user before the online transaction process can be started. This involves a username and a password. This group comprises functions that are included in login and logout processes namely: assignment of username and choice of password and the accompanying privileges, verification of username and password, denial of access and exit from the system. The data concerning user authentication is obtained from system database with the permission of the system administrator. A standard graphical user interface is deployed to provide the user with a means of interaction with the functionalities of the prototype. The researcher distinguishes between two categories of users namely: back-office users and front-end users.

Through the GUI, the user is able to input username and password details preset in the system by the administrator. These details are stored in the ***localgov*** database and involve two tables namely '***access'*** and '***u'.*** Access table stores global user login data while '*u'* stores department specific login data. A sample of user login interface is shown in figure 6-2.

From the researcher's perspective, user authentication consists of three sequential tasks namely: initial user verification and session creation (login), session maintenance and re-verification of user credentials and session termination (logout). During the initial user verification and session creation (login), the online transaction service system (OTSS) requests the user's credentials (usually a unique username/password combination), and

granting or denying access based on these details. Creation of user session is also done at this stage to store user variables across multiple HTTP transactions. Then comes session maintenance and re-verification where the OTSS again verifies the user's credentials and either grants or disallows access to specific pages based on the supplied user data. A check is done by the application to ensure the existence of a valid user session. Finally, session termination (logout) destroys all session variables created by a given user. Although this is the last step in the sequence, its significance cannot be downplayed; omitting it can have serious consequences as far as the security of the OTSS application is concerned.

7.2.7.2 Service request composition

A user can request for council services by completing an online form. Each service request is unique in terms of details required by the council. Generally, the forms used in this system are *simple to use*, *authenticating*, *smart* and *fully interactive.*

The forms used in OTSS are *simple to use* in the sense that they make use of facilities such as drop down boxes, to reduce both errors and workload, as there are limitations on the type of data that can be entered. This data is then programmatically extracted from the form and placed into the *localgov* database. The forms are *authenticating* in the sense that they check against definitions of what is acceptable in the OTSS for example, reporting back if mandatory fields like user name have been left unanswered. This feedback is done on the basis of 'internal' rules, i.e. contained entirely within the form. *Smart* forms are used in the system to provide the users with feedback and modify the form itself. Modifying the form itself or conditional branching helps to avoid burdening the user with irrelevant answers. Lastly, the forms used in this system are *fully interactive* because they are connected to the

internet. These connections allow the form to: apply rules that rely on external data (e.g. check that a requested business name isn't already registered); and submit data directly to the *Localgov* database.

7.2.7.3 Service Request (SR) submission and communication

As indicated in table 6-1, this set of components is described as 'plug-in' since it makes use of the existing HTTP and TCP/IP protocols. Like in any web application, once the service request is complete, the HTTP sends it over the internet to the *Localgov* server which holds the document in question. If all goes well, the server responds by sending the document. HTTP is part of the Internet Protocol (IP) suite. It is used by 'client' such as a web browser to establish a connection with the MCE server which hosts the OTSS. The *localgov* server waits for incoming requests by monitoring TCP port 80.

From the end user perspective, it is possible to get the response to a submission made when using the OTSS. Ideally, the system user considers two main things: whether the response contains a body and whether the submission attempt was successful. If the attempt is non-successful, then the form will always remain in the current display. If the submission is successful, however, more results are possible.

7.2.7.4 Processing service requests

As presented in section 6.2.5, processing functions refer to all the course of actions taken on the various service request received at the back-end. These functions vary a great deal since every business process in the council has a defined 'circuit' or procedure. For example, processing an application for Single Business Permit (SBP) is likely to be less

involving and take a shorter time to complete compared to processing and approving a building plan.

Although the system doesn't have such high back- end automated processing such as intelligent character or image recognition, it nonetheless, presents an automated processing solution to capture and process high volumes of web-based information quickly and efficiently enabling automated data capture, speedier processing, reduced data entry, lower costs, improved performance and generally streamlining the council business processes.

7.2.7.5 Service delivery

Service delivery is implemented as data process number five, as shown in figure 7-1. Once the results of processing service request have been obtained, the client is informed of these results and the how to get the results. The OTSS proposes the use of e-mail to communicate these results. However, it is acknowledged that some services require clients to present themselves in person. For services that do not require the client to appear in person, an e-mail is sent to the customer informing them of the results. These messages contain details of the relevant information such as date, service description, payment data etc., and are unique to each service offered.

The messages sent to the customers take the form of *acknowledgment* and *confirmation* messages. Acknowledgement message ideally informs the client that the service request has been received by the council and that it is being processed whereas confirmation message indicate that the request has been processed and dispatched. Clients may also send

messages to the council confirming receipt of the results or agreement with the results of the transaction and these messages constitute *return messages.*

7.2.7.6 Audit trail

Audit tail is based on PHP and MySQL logging mechanism. The aim of this component is to identify each step in the process from the initiation of the transaction all the way through to the completion of the transaction. In this context, it is taken as a record showing who has accessed the system and what operations he or she has performed during a given period of time. Audit trail is implemented as shown in section 6.2.4.

7.2.7.7 Security services

The aim of security services is to provide secure transactions over the internet. It is deemed to be one of the most challenging functions for the system. As indicated in section 6.2, security function is implemented as a 'plug-in' service based on SSL. It uses a combination of programs and encryption/decryption routines that exist on the web hosting computer and in browser programs used by the internet. By signing up and obtaining SSL certificate, the OTSS should meet the minimum security requirement for online transaction.

The SSL certificate allows users of OTSS know that they are doing authentic business with the local authority and that the information they send through the OTSS-such as online forms is protected from interception or alteration over the Web. When the customer contacts the OTSS, he/she accesses a secured URL. The OTSS server responds, automatically sending the customer the site's digital certificate, which authenticates the site. The customer's web browser generates a unique code or session key to encrypt all

communications with the site. The user's browser encrypts the session key with the OTSS public key so only OTSS can read the session key. Once a secure session is established, communications proceeds. It all takes only seconds and requires no action by the user.

7.3 Conclusion of the study

This study investigated the current public services offered by Municipal Council of Eldoret with a view to designing and developing ICT-enabled service delivery system (prototype for online transaction) for increased efficiency and effectiveness. In line with the study objectives, a succinct analysis of the public service situation was done and presented in this chapter. By analyzing the public services offered by the council and their significance, it was discovered that the council offers a variety of important services to the public under its authority. The implication of this is that there is enormous demand to increase the effectiveness and efficiency of the processes involved in public service provision. The fact that the council has initiated a number of public service initiatives including public-private partnerships, and public service tools like strategic planning, indicates that that the council is keen to provide the best services to its clientele. Although the council scores average in terms of OECD benchmarks for assessing public service parameters, the fact that the council has instituted important initiatives like Area Development Committees (ADC) is a strong pointer to its enthusiasm for continued improvement in stakeholder consultations in public service delivery.

The fact that the clientele base of the council continues to grow at an estimated rate of 8% per annum and the resultant high premium this continues to place on the council, implies that the council's capacity to deliver becomes one of immense concern. Naturally, as the

population of the municipality continues to grow, the number of individual service requests in the council increases by the day. The effect is that the council will continue to witness long queues at the various service counters. As indicated elsewhere in this thesis, ICT-enabled service delivery system remains one of the viable options to address such challenges.

The implication of the challenges affecting the quality of public services in MCE is one of immense concern. As identified in section 7.2.1.3, these challenges are cross-cutting and range from internal challenges to external ones. It is worth noting that most of the internal challenges like poor legacy systems, outdated labour intensive practices, can easily be tackled. This study, for instance revealed that the KLGRP has initiated a number of local government reforms with particular focus on financial reforms aimed at enhancing intergovernmental fiscal transfers, improving financial management, debt resolution, streamlining budgeting system and service provision capacity building. Such reforms are already beginning to bear positive results in selected departments like the treasury due to the use of LAIFOMS. It is clear that some of the challenges identified in the study are beyond the council's ability to solve, especially those involving the input of the government, for example, the enactment of e-transaction legislation which is considered to be long overdue. It is hoped that the government will soon expedite the enactment of e-transaction legislation in order to promote e-government.

The successful adoption of e-government initiatives in the council requires a lot of investment in ICT skills and knowledge. The fact that the council has no institutionalized framework for building HR capacity in ICT presents challenges in the successful development of ICT-

enabled services. However, the council has from time to time organized ICT workshops and seminars for particular projects like LAIFOMS. In addition, a number of council personnel have made own arrangements for ICT training revealing a high level of enthusiasm for use of ICT. Moreover, a number of staff members suggested various ways in which they felt ICT would improve their work thus showing a high level of the likelihood of accepting new ICT solutions. If such ICT training needs can be addresses then the council stands to gain from ICTs.

By virtue of the ongoing efforts and measures undertaken by MCE to develop ICT-enabled public services, there is great optimism that the council services delivery can be effectively scaled to a higher level. To date, the council has successfully implemented levels one and two of the e-service hierarchy i.e. web presence and web interactivity. Owing to the need to consolidate the ICT gains so far made by the council and the information system characteristics presented in table 5-2, the researcher conceptualized and developed a prototype of OTSS as the third tier of the e-service hierarchy. The prototype allows the MCE and clients to conduct online transaction by providing the necessary functions as described in the previous section. This model explains the nature of interaction between the council and clients by shows the relationships among the business processes within MCE to external systems and organizations, clientele and other business processes. With the use of this system, the researcher expects to make use of OTSS to address the challenges presented, *inter alia*, such as reducing costly physical interactions; making service provision processes faster; reducing redundancy; integrating back and front-end services; ubiquitous access to council services / improving general accessibility to the council

services; providing error free processes; reducing corruption (through audit trail); and offering system scalability.

7.4 Recommendations of the study

Based on the findings of the study, the following recommendations were made:

7.4.1 Develop a forum for online discussions to facilitate problem handling and discussion among the actors in online transaction service system

The researcher anticipated that the requirements of the OTSS stakeholders will change in future and as such there was need to continually capture them. The study therefore proposes the development of a forum to provide a means to share ideas, suggestions, and recommendations concerning promising practices, best practices, and victim issues.

7.4.2 Carry out study on the use of versatile DBMS like Oracle to meet the needs of a growing data base

This study employed the use of MYSQL data base which may not adequately handle very large data in future, should the system grow in stature. At this point of the study, the choice of MySQL was the ideal option, based on the fact that it was cheap and readily available and was sufficient enough for the study. Although expensive, especially the licensing costs, Oracle would be the alternative DBMS since it is more versatile than MySQL and can run and handle more transactions than MySQL. MySQL takes up resources with PHP and is this likely to affect the server load. Oracle on the other hand would perform better with memory leaks and handle multiple threads.

7.4.3 Undertake comprehensive system testing in real work environment

The system has been subjected to inspection in order to identify faults in the design. However, enhanced tests are recommended for the system in order to fully test for usefulness, usability and usage of the system in the end-user environment over a longer period of time in MCE to determine how it supports and facilitates the delivery of public services.

As a starting point for testing, the requirements of the system are documented. This is important for the testing process because without knowledge of the requirements, one will not be able to determine if the system is functioning as designed and you will not be able to tell if required functionality is missing.

7.4.4 Explore more mechanisms for public- private partnerships to improve service delivery in MCE

Currently, the municipal council of Eldoret has undertaken a few public- private sector partnerships in order to improve service delivery. A notable example of this initiative was the formation of ELDOWAS. The Council should explore more of such initiatives. Besides, the council should engage the public in decision making by expanding the composition of the Area Development Committees.

7.4.5 Expand the council's revenue base, explore new opportunities for fund raising and increase resource allocation towards service provision

Like other local authorities in Kenya, one of the most important challenges facing MCE is financial resource constraints. The council mainly relies on the revenue it collects to meet

its financial obligations. There is need for the council to increase its revenue collection and seal any loopholes through which revenue is misappropriated. Although the central government through the Local Authority Transfer Fund (LATF) programmes has been funding local authorities for sometime now, there are still huge gaps in the council's financial budget that need to be plugged in. There is a growing concern that the LATF fund allocations should be increased. The MCE should strive to improve accountability of such funds. Overall, the council should strive at reducing the large variations between budgeted allocations and actual expenditures; enhancing the low absorption capacity in the development portion of the budget and reducing the volume of recurrent expenditures in the development budget; reducing the high civil service wage bill; reducing the level of transfers to public enterprises; providing adequate financial resources for priority projects like ICTs; and reducing the high levels of expenditure arrears and numbers of stalled projects.

7.4.6 Develop policies and legislation to support the development of e-services in local authorities

Kenya is weak on the regulatory, knowledge and technical foundation fronts to regulate online transactions. Of particular importance has been the delay in passing the Electronic Transactions Bill 2007 and the Information and Communications Bill 2008. The Information and Communications Bill 2008 (Information Communication Bill) seeks to consolidate legislation for the ICT, telecoms, broadcasting and postal industries whereas the Electronic Transactions Bill, 2007 (The ET Bill) is a niche Bill which Addresses a niche aspect of ICT– use of electronic records (Murungi, 2008). The two bills are supposed to legalize, facilitate and Control/regulate e-commerce and by extension e-government. The

issue here is that parliament has been slow in passing the bills into law thereby posing latent threats to e-commerce and e-government.

Kenya should borrow from international best practices whereby some countries with consolidated legislation still have separate electronic transactions law providing for, among other things, state control of certification authorities. For example, in Singapore there is established the office of the Controller of certification authorities while UK has OFCOM which is separate from EU Digital signature directives. The Communications Commission of Kenya's regulatory authority should be clearly constituted and its roles clearly defined in legislation.

The Information Communication Bill needs to include provisions on cyber-jurisdiction. In particular, there is need for capacity building in electronic forensics, international and regional partnerships for cross-border law enforcement and reciprocity or mutual assistance between nations on extradition offences. Moreover, the two bills appear to be less candid on the offence of unauthorized access, cyber-terrorism and waging cyber- war. The Information Communication bill is considered by experts to be relatively lenient on fraud.

7.5 Recommendations for further study

In the process of carrying out this research, new issues arose. Since these issues were not part of this study, they were not addressed by this study. In this section, the researcher discusses these new issues that may need to be investigated further.

7.5.1 Explore the possibility of integrating the system with GPRS / GPS based information systems

As presented in chapters 5 and 6, the basic argument of this thesis was that using a system to facilitate the provision of online transaction services in local authorities should provide nine important facilities as presented in section 7.2.7. To further enhance these facilities, the system should work with existing systems and use technologies that have proven successful in delivering location-based services such as the geographical information systems (GIS). With the help of such tools, the council can develop a complete, wholesome picture of service provision in the council (ESRI, 2008). This would greatly enhance and streamline the council business processes, improve public services, and ensure precious resources are always wisely used. According to ESRI (2008), GIS can play a vital role in helping MCE departments to network, collaborate, and achieve their transformational objectives. This is because geographical data underpins a vast range of MCE tasks. From planning and housing, to emergency response and highways asset management, staff can create a single, centrally-managed set of spatial, land and property data that can be accessed by staff across the council to support a vast number of local government functions.

7.5.2 Explore the possibility of using hand-held devices like mobile phones to deploy the OTSS

Hand-held devices like mobile phones are gaining prominence in usage in Kenya. The successes realized in using mobile phone access have led to great innovations resulting from the use of these fairly novel technologies. The Kenyan economy has realized a steady uptake of diverse services, notably the mobile based products. Mobile banking and mobile

money transfer services are two particular innovations which have increasingly rendered themselves in all-encompassing ways cutting across several sectors of economy and industry. Like in these innovations, further research should explore the possibility of cost-effectively deploying OTSS on mobile phones since they are such a strong driving force in the Kenyan economy. According to ITU (2008), mobile-phone penetration in Kenya is significantly higher than internet penetration rates, estimated at nearly 12 million subscribers in 2008. Moreover, mobile-phone coverage extended to 92 percent of the country. According to ITU (2008), the availability of internet access via mobile phones increased in 2008, as Safaricom, a mobile-phone service provider with 10 million users and an 80 percent share of the market, launched internet capabilities for its subscribers.

7.5.3 Explore the possibility of using simulation models to support online service deployment and to support the task of identifying and overcoming service implementation issues in local authorities

The researcher recommends further research on simulation to model the local government service situation and develop a portfolio of models representing the various stakeholder interests to evaluate the reliability, scalability, and agility of a system in facilitating all stakeholders in service deployment. The models can be plugged into the online service delivery infrastructure in local authority's areas to evaluate how the services are used.

7.5.4 Investigate the impact of content management and online public service delivery in local authorities

Future research is needed not only to track the maturity of local government e- services, but also to identify the changes to the nature of those services. Research into the types of services that are important to MCE and other local government authorities at various stages

would also provide some understanding of council priorities at various stages of maturity. The use of content management packages in local government would most likely have a major impact on the development of local government online services and ongoing maintenance. Future research examining how these packages have impacted on the maturity of local e-Government would be highly beneficial.

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Appendix I

INTERVIEW SCHEDULE FOR TOWN CLERK AND DEPARTMENTAL DIRECTORS

Date_____ Time _____

Designation of the respondent _____

Department/ Section_____

Qualification _____

STATE OF ICTs AND SERVICE DELIVERY

1. What activities / services does your department provide to:

a) The public?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

b) Development partners?

_____

_____

_____

_____

_____

_____

c) The Government?

_____

_____

_____

_____

_____

_____

2. Do you think the Council has done well in providing these services?

   Yes[   ]   No[   ]

   How? (justify your answer)

   _____

   _____

   _____

3. Are there any challenges facing Municipal Council of Eldoret in providing these

   services?

   _____

   _____

   _____

4. a)   Does the current system of service delivery suffer from any form of information

        related irregularity? Please give a brief description.

   _____

   _____

   _____

   _____

   b) What precautions do you take against such irregularities?

   _____

   _____

   _____

   _____

5. Does the Council use computers and related technologies in handling data and

   information? Justify your answer.

_____

_____

_____

_____

6. Would you suggest the use of ICTs to enhance public service delivery?

    Yes[ ] No[ ]

  What do you think should be the features of ICT-enabled service delivery?

_____

_____

_____

ICT PLANNING AND RESOURCE ALLOCATION

7. Does the Council/department have a blue-print or plan for developing and using ICTs in its operations?

  Yes[   ] No[   ]

  How? (Justify you answer)

_____

_____

  What is the annual ICT budget and who are the financiers? Please provide a breakdown

_____

_____

_____

_____

_____

E-GOVERNMENT / E-SERVICE SOLUTIONS FOR CORE BUSINESS FUNCTIONS

8. Do you think it would be good practice to provide the following services and transactions on the internet? Justify your answer.

  a) Social services delivery (education and health)

_____

_____

_____

b) Tax collection

_____

_____

_____

_____

c) Business licensing

_____

_____

_____

_____

d) Trade and investment information

_____

_____

_____

e) Administration

_____

_____

_____

_____

ICT POLICIES AND LEGISLATIVE FRAME WORK

9. Are there government policies and legislative frame work that affect the use of
   ICTs in your operation?

_____

_____

_____

10. In the e-government strategy paper of 2004, Local Authorities are not mentioned, yet
    they form an important component of government in this country. What measures have
    the council taken to implement the e-government strategy?

_____

_____

_____

STAFF INVOLVEMENT

11. Are the staff of EMC involved in making decisions affecting ICT use in council

 operations?   Yes[   ] No[   ]

   i) If not, why?

_____

   ii) if yes, how?

_____

_____

12. Are the EMC staff trained on ICT use?

_____

_____

13. If not, how do they go about their duties without ICT skills?

_____

14. Suggest ways in which EMC should assist its staff with limited ICT skills.

_____

_____

Appendix II

INTERVIEW SCHEDULE FOR DEPUTY DIRECTORS AND SECTION HEADS

Date_____ Time _____

Designation of the respondent _____

Department/ Section _____

Qualification _____

STATE OF ICTs AND SERVICE DELIVERY

1. What activities / services does your department provide to:

a) The public?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

b) Development partners?

_____

_____

_____

_____

_____

_____

c) The Government?

_____

_____

2. Do you think the Council has done well in providing these services?

    Yes[   ] No[   ]

    How? (justify your answer)

    _____

    _____

    _____

3. Are there any challenges facing Municipal Council of Eldoret in providing these

    services?

    _____

    _____

    _____

4. a)   Does the current system of service delivery suffer from any form of information

        related irregularity? Please give a brief description.

    _____

    _____

    _____

    _____

   b) What precautions do you take against such irregularities?

    _____

    _____

    _____

    _____

5. Does the Council use computers and related technologies in handling data and

   information? Justify your answer.

    _____

    _____

    _____

    _____

6. Would you suggest the use of ICTs to enhance public service delivery?

Yes[ ] No[ ]

What do you think should be the features of ICT-enabled service delivery?

_____

_____

_____

ICT PLANNING AND RESOURCE ALLOCATION

7. Does the Council/department have a blue-print or plan for developing and using ICTs in its operations?

Yes[   ] No[   ]

How? (Justify you answer)

_____

_____

What is the annual ICT budget and who are the financiers? Please provide a breakdown

_____

_____

_____

_____

_____

E-GOVERNMENT / E-SERVICE SOLUTIONS FOR CORE BUSINESS FUNCTIONS

8. Do you think it would be good practice to provide the following services and transactions on the internet? Justify your answer.

a) Social services delivery (education and health)

_____

_____

_____

b) Tax collection

_____

_____

_____

c) Business licensing

_____

_____

_____

_____

d) Trade and investment information

_____

_____

_____

e) Administration

_____

_____

_____

_____

ICT POLICIES AND LEGISLATIVE FRAME WORK

9. Are there government policies and legislative frame work that affect the use of
   ICTs in your operation?

_____

_____

_____

10. In the e-government strategy paper of 2004, Local Authorities are not mentioned, yet
    they form an important component of government in this country. What measures have
    the council taken to implement the e-government strategy?

_____

_____

_____

_____

_____

STAFF INVOLVEMENT

11. Are the staff of EMC involved in making decisions affecting ICT use in council
    operations?   Yes[   ] No[   ]

i) If not, why?

_____

ii) if yes, how?

_____

_____

12. Are the EMC staff trained on ICT use?

_____

_____

13. If not, how do they go about their duties without ICT skills?

_____

14. Suggest ways in which EMC should assist its staff with limited ICT skills.

_____

_____

Appendix III

Checklist for documentary sources review

- Document name
- Author
- Document source
- Description of content
- Destination
- Frequency

Appendix IV

Scripts for some of the tables created in the localgov data base

```
CREATE DATABASE localgov;

create table
sch_identification (
  r varchar(15),
  school_name varchar(30),
  tsc varchar(30),
  kcode varchar(30),
  contacts varchar(50)
  );

create table sch_location (
  r varchar(15),
  province varchar(30),
  district varchar(30),
  constituency varchar(30),
  division varchar(30),
  location varchar(30),
  slocation varchar(30),
  zone varchar(30)
  );

create table
sch_characteristics (
  r varchar(15),
  status varchar(30),
  type varchar(30),
  category varchar(30),
  seducationn varchar(50),
  sponsor varchar(30)
  );

create table sch_enrolement (
  eid varchar(15),
  age varchar(15),
  sex varchar(30),
  std varchar(30),
  seducationn varchar(50),
  sponsor varchar(30)
  );

create table sch_attendance (
  std varchar(15),
  streams varchar(30),
  ngirls varchar(30),
  nboys varchar(30)
  );

create table sch_admissions (
  std varchar(15),
  sex varchar(15),
  referenceg varchar(30),
  admissions varchar(30)
```

```
  );
create table study_programmes
(
  tscno varchar(15),
  name varchar(15),
  costudy varchar(30),
  dates varchar(30),
  edateoc varchar(30),
  fptime varchar(30)
  );


Create table options (
  theme varchar(50)
  );


create table access (
 username varchar(50) primary
 key,
  password varchar(50)
 );

create table u (
  r varchar(50) primary key,
  p varchar(50)

  );

insert into access values
('dennis', 'education');
INSERT INTO OPTIONS VALUES
('');
```