UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING & INFORMATICS

IMPROVING APPLICATION OF KNOWLEDGE MANAGEMENT SYSTEMS IN ORGANIZATIONS:

CASE OF NAIROBI CITY WATER AND SEWERAGE COMPANY

By

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UNIVERSITY OF NAIROBI

DECLARATION

This Research Project is my own original work and has not been presented for a Degree Qualification or any other award in another University or Institution of Higher Learning.

SIGNED …… DATE …….

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This Research Project has been submitted for Examination with my approval as the University Supervisor.

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DEDICATION

First and foremost I thank the Almighty God who has graciously made it possible for me to complete this journey.

To my husband Benard for standing by my side and encouraging me to press on even when things seemed tough; to my children Joshua and Joy for being very understanding when I had to spend time away from them.

To my parents Mr. and Mrs. Ngei as well as my brothers and sisters who have encouraged and assisted me in prayer and with words of wisdom, may God reward you.

Finally, to my friends and colleagues who had to bear long hours without me as I pursued my education, thank you very much for making my dream come true.

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I thank my classmates for their valuable contributions, support and encouragement.

I am also very appreciative of my family for always being there for me. Your support has proved to be priceless.

Thank you all.

ABSTRACT

Knowledge is an asset to any organization and has become a vital resource to organizations and hence a growing need for knowledge management (KM). Knowledge is described as information provided in context to produce an actionable understanding; it is what makes an organization take action or provides the ability to take action.

Knowledge is classified as either tacit or explicit. Tacit knowledge exists in the minds of people and is very difficult to manage while explicit knowledge is the documented information, presented in the form of journals, books, policy manuals, and processes among others.

Research has noted that capturing, storing and utilizing both tacit and explicit knowledge is critical to an organization's success in the fast changing market place. If organizations don't manage knowledge, we will lose a lot in terms of productivity trying to reinvent the wheel when there are changes.

This research demonstrates how the development of a knowledge management system can be developed and used in organizations, using a case organization. The KM system prototype developed and presented in this research project is for managing both tacit and explicit knowledge. The knowledge management system enables capturing of tacit knowledge through the use of discussion forums and articles onto a database which the employees can search to retrieve stored posts. From the data collected, the prototyped solution showed that if adopted and developed further, knowledge capture, storage, dissemination and sharing in organizations would be more efficient and would increase the productivity of employees.

Keywords: Knowledge, Knowledge Management, Knowledge Management System, Intranet.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Problem

As the knowledge-based economy grows exponentially, the knowledge assets become invaluable to the organizations. Effective use of knowledge in organizations is a crucial survival tactic and success in competitive global markets. Knowledge has a strong potential to problems solving, decision making, organizational performance enhancements and innovation.

The effective use of knowledge can be referred to as Knowledge Management (KM). Knowledge Management defines a systematic, explicit and deliberated building processes required to manage knowledge, the purpose of which is to maximize an enterprise's knowledge-related effectiveness and create values, Bixler & Stankosky, (2005). The knowledge management processes include collecting, organizing, clarifying, disseminating and reusing the information and knowledge throughout the organization.

Knowledge can be defined as tacit or explicit. Explicit knowledge is articulated in formal language and transmitted among individuals while tacit knowledge involves more intangible factors and is personal knowledge embedded in individual experience, Frappaolo (2002). Both tacit and explicit knowledge must give returns in order to solve today's problems within organizations.

The emphasis of knowledge management is to master crucial and up-to-date knowledge for continuous organizational improvement. A successful knowledge management has dynamic, maturity and self-growth attributes. A **dynamic attribute** means the information and knowledge flow should spread throughout the organization without hindrances. Everyone should be able to contribute to the knowledge assets. **A maturity attribute** means knowledge management should be strong enough to handle the turbulence in performance yet flexible enough to adapt to changes. Knowledge management should also align with the organizational policy, strategies, culture and structure, and provide an environment with well disciplined, value-added and relevant knowledge to generate and introduce innovative and challenging ideas. A **self-growth attribute** means knowledge management should sense potentially valuable knowledge, capturing and storing it to increase organizational knowledge assets and create new knowledge based on what an organization already has.

When there is no access to organizational knowledge and certain individual employees are excluded, there is a-disconnect between the management and the employees regarding implementation of strategies that the organization is trying to achieve. Employees with no access to information or who have been deprived the platform to share their views and opinions are faced with the challenge of only knowing what they need to deliver but are never in the light on what the organization is intending to achieve and the rationale behind the decisions made.

David Khoza (2008) notes that it is the goal of every organization to adopt strategies that build organization-wide customer orientation and knowledge management to ensure that the organization produces products and services that better meet the customer expectations and will have a competitive edge in the market. To effectively achieve and execute these strategies, the organization needs to offer better mechanisms to generate, share, manage and communicate information. Organizations also need to find ways of empowering their employees in a manner that will enable employees to share their ideas and opinions on various matters in the organization.

Mphidi et al (2004), reports that the intranet has emerged to be one of today's most effective tool for knowledge management. They are mostly used to communicate to the employees and to post information specific to an organization. They are used to share internally various types of information in the organizations, such as telephone directories, staff procedures and quality manuals, staff bulletin or newsletters etc Boca et al (2006). Muller (2002) reports that companies adopt intranets to improve internal communication, distribute information and enable more employees to access legacy systems. Intranet plays a central role in many companies, expanding the advantage of knowledge in the organization, Edenius & Borgerson (2003). Therefore, intranets as a knowledge management system are key tools that offer new ways to manage, communicate date, information, and knowledge in an organization, Guether (2003).

In this information and knowledge era, organizations possess knowledge that enables them to improve their performance. Different scholars have measured the contribution of the knowledge management using various models. Gold et al. (2001) examined empirically the issues of effective knowledge management from the perspective of organizational capabilities. They discovered that knowledge infrastructural capability and knowledge process capability are the drivers of organizational effectiveness.

1.2 Problem Statement

Many organizations are experiencing the digital age which is characterized by widespread communication and collaboration through websites, blogs, emails, facebook, twitter and other web applications their employees are exposed to. In the digital age, information sharing is very common and there is little or no regard to protection and hoarding. Therefore, it is necessary for organizations to ensure that there is a secure environment for disseminating knowledge amongst its employees.

When experts leave an organization, they leave with their skills and expertise which is a huge loss to the organization which has heavily invested in them.

Knowledge in organizations exists in both tacit and explicit forms. While explicit knowledge is found in written formats, tacit knowledge exists in the individuals head. This is knowledge gained from experiences and exposure to certain skills. Therefore, there is the need for organizations to find a way to harness tacit knowledge from their employees by providing an environment that encourages sharing and transfer of this knowledge.

Tacit knowledge is difficult to capture and is largely ignored in traditional knowledge management systems. Irick (2007) emphasizes that the interplay of tacit and explicit knowledge is a critical factor in an organization's knowledge management. Effective knowledge management will require the management of not only the easy to understand and capture explicit knowledge but also the hard to explain, difficult to capture tacit knowledge.

The aim of this research is to explore how knowledge management systems enhance access, sharing and development of tacit/explicit knowledge in organizations and to develop a knowledge management system platform to illustrate effective knowledge management in Nairobi City Water and Sewerage Company.

1.3 Objectives of Study

The objectives of this study are:

1. Explore the application of Knowledge Management Systems.
2. Explore how KMS enhances access and sharing of knowledge in organizations.
3. Design, build, and evaluate a prototype system to enhance knowledge management at Nairobi City Water and Sewerage Company.

1.4 Research Questions

- What are the main sources of knowledge for employees?
- How do employees share knowledge amongst themselves?
- How does KMS influence knowledge capacity (explicit and tacit) of the employees?
- How has the use of the KMS prototype affected knowledge transfer and sharing?

1.5 Significance and Justification of the Study

There is a trend in organizations to harness knowledge from employees using new developments on the intranet technology. Holtz (2008) reported that Intel has established a wiki called Intelpedia – modeled on the Web phenomenon Wikipedia- where employees contribute their knowledge of all things in Intel. Other issues that justify the development of a computer-based communication platform include:

- Advancements in web technologies where different platforms can be linked using a common interface.
- A taking to social networks on the web which leads to a demand for information sharing
- Need to harness knowledge from the employees to give the organization competitive advantage.

Therefore, this research study will help to demonstrate that organizations can use intranets as one of the most simple, cost effective and robust tools in gathering, sharing and disseminating knowledge between employees and other stake holders within the organization, and develop knowledge management systems. The importance of this research study is to help organizations harness both tacit and explicit knowledge from its employees.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter entails a background of what other researchers have done in regards to knowledge management systems. This will help in filling in the gaps that earlier studies had missed or were probably unable to establish.

Concepts of knowledge and knowledge management are not very familiar as compared to data and information, yet both data and information are very vital components in an organization. Data can be defined as the raw facts, measurements and statistics while information is organized or processed data that are timely and accurate, Hoffer et al (2002); Watson(2001). Knowledge is information that is contextual, relevant and actionable. Knowledge enables the user of the information to make a sound decision or learn from the presented information. Having knowledge means that it can be exercised to solve a problem, whereas having information may not have the same ability to use the information to the same degree. While data, information and knowledge may all be viewed as assets to an organization, knowledge provides a higher level of meaning about data and information.

For any organization to provide services, knowledge management is critical. Information as a resource is not always valuable, knowledge as a resource is valuable because it focuses on what is important, Hoffer, Prescott and McFadden (2002).

2.1 Knowledge Management Concepts

Information is becoming ever more important in our economy now, and most businesses take that knowledge can confer competitive advantage. Knowledge is a function of data, information and experience, while knowledge management is the process used to manage organizational knowledge that is relevant to the employees within the organization to conduct business activities.

According to Herschel et al (2005), knowledge management is described as a systematic process of finding, selecting, organizing, distilling and presenting information in a way that improves an employee's comprehension in a specific area of interest. It also helps an organization to gain insight understanding from its own experience. Knowledge management is also defined as systematically capturing, sharing, using and creating knowledge to add value to the organization, Balcombe (1999); Mphidi & Snyman (2004). Shanhong (2002) also defines knowledge management as effectively identifying, acquiring, developing, resolving, using, storing and sharing knowledge to create an approach for transforming tacit knowledge to explicit knowledge.

Boca et al (2006) defines knowledge management as techniques and tools for collecting and disseminating knowledge within an organization, while all of the above description or definitions of knowledge management are consistent, and have the objectivity of sharing knowledge within an organization to help the organization and its members to gain insight understanding from knowledge that is captured or developed within an organization to create value.

For the purposes of this research study, knowledge management is described as a systematic process of capturing, sharing, using and creating knowledge to add value to the organization.

Gold, Malhotra, and Segars (2001) examines the issue of effective knowledge management from the perspective of organizational capabilities. This perspective suggests that a knowledge infrastructure consisting of technology, structure, and culture along with knowledge process architecture of acquisition, conversion, application, and protection are essential organizational capabilities or "preconditions" for effective knowledge management. The results provide a basis for understanding the competitive advantage of a firm as it enters a program of knowledge management.

Cui et al. (2005) also mention that knowledge management capabilities consist of three interrelated processes: knowledge acquisition, knowledge conversion, and knowledge application (Gold, Malhotra, & Segars, 2001). Knowledge is not only an important resource for a firm, but also it serves as a basic source of competitive advantage (Gold, Malhotra, and Segars 2001). Therefore, knowledge management capabilities refer to the knowledge management processes in an organization that develop and use knowledge within the firm.

2.1.1 Knowledge Management Approaches

According to Byounggu Choi et al (2002), there are two main knowledge management approaches:

- **Human strategy approach**

It reflects a human orientation or focus in terms of knowledge management. This strategy emphasizes knowledge sharing via interpersonal interaction and it utilizes dialogue through social networks including occupational groups and teams.

It helps share knowledge through person-to-person contacts. This strategy attempts to acquire internal and opportunistic knowledge and to share it informally.

- **System Oriented strategy approach**

This strategy emphasizes the capability to help create, store, share and use an organization's explicitly documented knowledge. It emphasizes codifying and storing knowledge. Typically, knowledge can be codified via information technology. Codified knowledge is more likely to be reused. The emphasis is on completely specified sets of rules about what to do under every possible circumstance.

Table 1: Features of Human and System Strategy adapted from Byounggu Choi et al (2002)

Strategy	Features
Human	- Emphasizes dialogue via social networks and person to person contacts - Focus on acquiring knowledge via experienced and skilled people - Attempts to share knowledge informally
System	- Emphasizes coded knowledge in knowledge management - Focus on codifying and storing knowledge via information technology - Attempts to share knowledge formally.

2.2 Knowledge Management Processes

Knowledge management is focused on capturing the expertise of organizations and individuals and on the disposal and application of this expertise in order to maximize the benefits. Knowledge management helps to bring the right knowledge to the right people at the right time, thus enabling them to make the best decisions. Knowledge management involves the analysis of available and required knowledge and the subsequent planning and control actions to develop knowledge assets so as to fulfill organizations objectives.

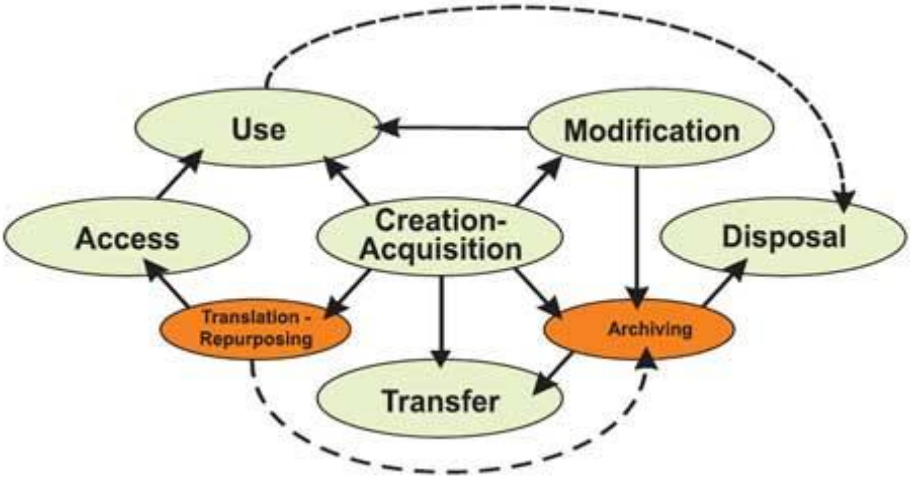


Figure 1: Knowledge Management Processes.

Source: Bergeron (2003): "Essentials of knowledge management"

i) Creation or acquisition: Knowledge is created or gathered by knowledge workers.

ii) Modification: Knowledge is modified in order to suit immediate or future needs.

iii) Use: The knowledge is employed for specific, useful purpose

iv) Archiving: Knowledge is stored in a form and format that will survive in time and will still be accessible and usable for knowledge workers in organizations.

v) Transfer: Transfer or communication of knowledge from one person or place to another.

vi) Translation/repurposing: Knowledge is translated from its original form into a new form more suitable for new purpose.

vii) User access: Provision of limited access to knowledge workers according to their position in the company and their needs.

viii) Disposal: It is important to identify which information/knowledge to keep and which to destroy.

The main sources of knowledge management within the organization are the employees who gather data and information through interaction with the organizational environment, such as reports, policies, company strategy, mission and vision, product information, market information etc.

The information from various sources are then evaluated by individuals who then apply knowledge, technology and human intuition or intelligence to process the information or data to result in organizational knowledge which can be stored, retrieved and shared within the organization to improve business performance.

2.3 Knowledge Management System Technologies

Knowledge management is more a methodology applied to business practices than a technology or a product. Nevertheless, information technology is crucial to the success of every knowledge management system. Information Technology enables knowledge management by providing the enterprise architecture upon which it is built. Knowledge Management Systems (KMS) are developed using three (3) technologies:

1. **Communication**: They allow users to access needed knowledge and to communicate with each other.
2. **Collaboration**: They provide the means to perform group work. Groups can work together on common documents at the same time or in different places. This is important especially for members of community of practice working on knowledge contributions
3. **Storage and Retrieval**: This technology originally meant using a database management system to store and manages knowledge. This worked well in the early days for storing and managing most explicit knowledge and even explicit knowledge about tacit knowledge. However, capturing, storing and managing tacit knowledge usually requires a different set of tools. Electronic document-management systems and specialized storage systems (knowledge repositories) that are part of collaborative computing systems fill this void.

2.3.1 Technologies that Support Knowledge Management

There are various technologies that support knowledge management systems as shown in the figure below:

Table 2: Technologies supporting Knowledge management Systems

Technology	Description
Workflow	Consists of an orchestrated and repeatable pattern of business activity enabled by the systematic organization of resources into processes.
Intranets	A network contained within the enterprise. It's used to share information and computing resources among employees as well as facilitate group working.
Extranets	A private network that uses Internet technology and the public telecommunication system to securely share part of business's information with external sources, e.g. suppliers, customers, vendors etc.
Document Management	Management of electronic documents, a system to search, edit, distribute, retrieve, archive, and manage the complete lifecycle of documents.
Decision Support Systems	A computer-based information system that supports business or organizational decision-making activities.
Data Warehouse	A large store of data accumulated from wide range of sources within a company and used to guide management decisions
Groupware	Software that supports multiple users working on related tasks in local and remote networks.
Web Conferencing	It is a service that allows conferencing events to be shared with remote locations.
Project Management	The planning and organization of an organization's resources in order to move a specific task, event or duty toward completion.

These technologies correlate to four main stages of the Knowledge Management life cycle as discussed later in this chapter:

1. Knowledge is acquired or captured using intranets, extranets, groupware, web-conferencing and document management systems.
2. An organizational memory is formed by refining, organizing, and storing knowledge using structured repositories such as data warehouses.
3. Knowledge is distributed through education, training programs, automated knowledge based systems, expert networks.
4. Knowledge is leveraged for further learning and innovation via mining of the organizational memory and application of expert systems such as decision support systems.

2.4 Knowledge Management Life Cycle Models

2.4.1 Wiig Model

Wiig's model is based on the principal "if we want to have useful and valuable knowledge", these must be organized. Knowledge should be organized according to the way it will be used. This model also addresses the problem referring to how relevant knowledge can be, coming from a specific source. The source can be: minds of people or knowledge bases (tacit or explicit). According to Wiig (2004), another important aspect refers to the relations between different objects of knowledge. Very few elements are completely disconnected.

Dalkir, (2011) cites that Wiig's model attempts to define different levels of internalization of knowledge and therefore could be seen as a refinement of the fourth Nonaka and Takeuchi quadrant of internalization. The levels of internalization span the classifications of novice, beginner, competent, expert and master.

The table below defines the degree internalization of the Wiig model.

Table 3: Degrees of internalization of Wiig Model

Level	Type	Description
1	Novice	Extremely low consciousness (even not at all) about knowledge and the way it can be used.
2	Beginner	He knows about knowledge existence and where it can be obtained, but he doesn't know the way it can be used.
3	Competent	Knows, but the possibility of using knowledge is limited.
4	Expert	He keeps the knowledge in mind, understands where can be applied, works with knowledge without external intervention.
5	Master	Completely internalization of knowledge; a master has a profound understanding about the events in his environment.

Source: Wiig, K: "People-focused knowledge management: How effective decision making leads to corporate success", Butterworth-Heinemann, 2004.

2.4.2 Hierachical Spiral Model of Knowledge Management

This model according to Sun & Hao, (2006) is a hybrid model borrowing from Sun's waterfall model of knowledge management and Nonaka's Spiral model of knowledge management. The major process stages of the hierarchical spiral model are extracted from the waterfall model.

The processes are divided and categorized into five main processes and eleven sub-processes from a hierarchical point of view, which form a spiral within three main processes. The model provides a guideline between the different phases of knowledge management activities.

The main process of the hierarchical spiral model includes knowledge selection, knowledge creation, knowledge sharing and knowledge preservation and retention. **Knowledge selection** identifies knowledge needs by understanding and selecting useful knowledge from the existing repository. This supports reachability of knowledge and filters the useful knowledge from an organization's existing knowledge making it easy to search and find. The selection process has several sub-processes such as knowledge identifying, understanding, discovering and retrieving.

Knowledge creation supports generation and creation of knowledge. The development of new knowledge in an organization focuses on creating new products, better ideas, more efficient services or new skills. This is desirable if the existing knowledge does not meet the needs.

Knowledge sharing is regarded as the core process of knowledge management and is fulfilled after existing knowledge has been identified or new knowledge has been created. It is performed by distribution and utilization of the knowledge that has been selected or generated from the organization and acquired outside. When sharing knowledge, new knowledge is often created by combining the shared knowledge and existing knowledge (Davenport and Prusak, 2000). The new knowledge has to be stored in the fourth main process of knowledge preservation and retention.

Knowledge preservation aims at retention of knowledge assets. The new valuable knowledge has to be stored from time to time. This is accomplished by efficient storage media to access knowledge, to prevent valuable expertise from disappearing. Knowledge needs to be updated frequently because the knowledge becomes obsolete rapidly in the knowledge society.

The sub-processes demonstrate how these main processes have been done in detail and also show the relationship between the processes.

The hierarchical spiral model is extensive with five main processes and eleven sub-processses. This is advantageous in that the model provides for a detailed and thorough depth of knowledge management implementation. The limitation is that it may demand for a long period on the implementation as the process is followed.

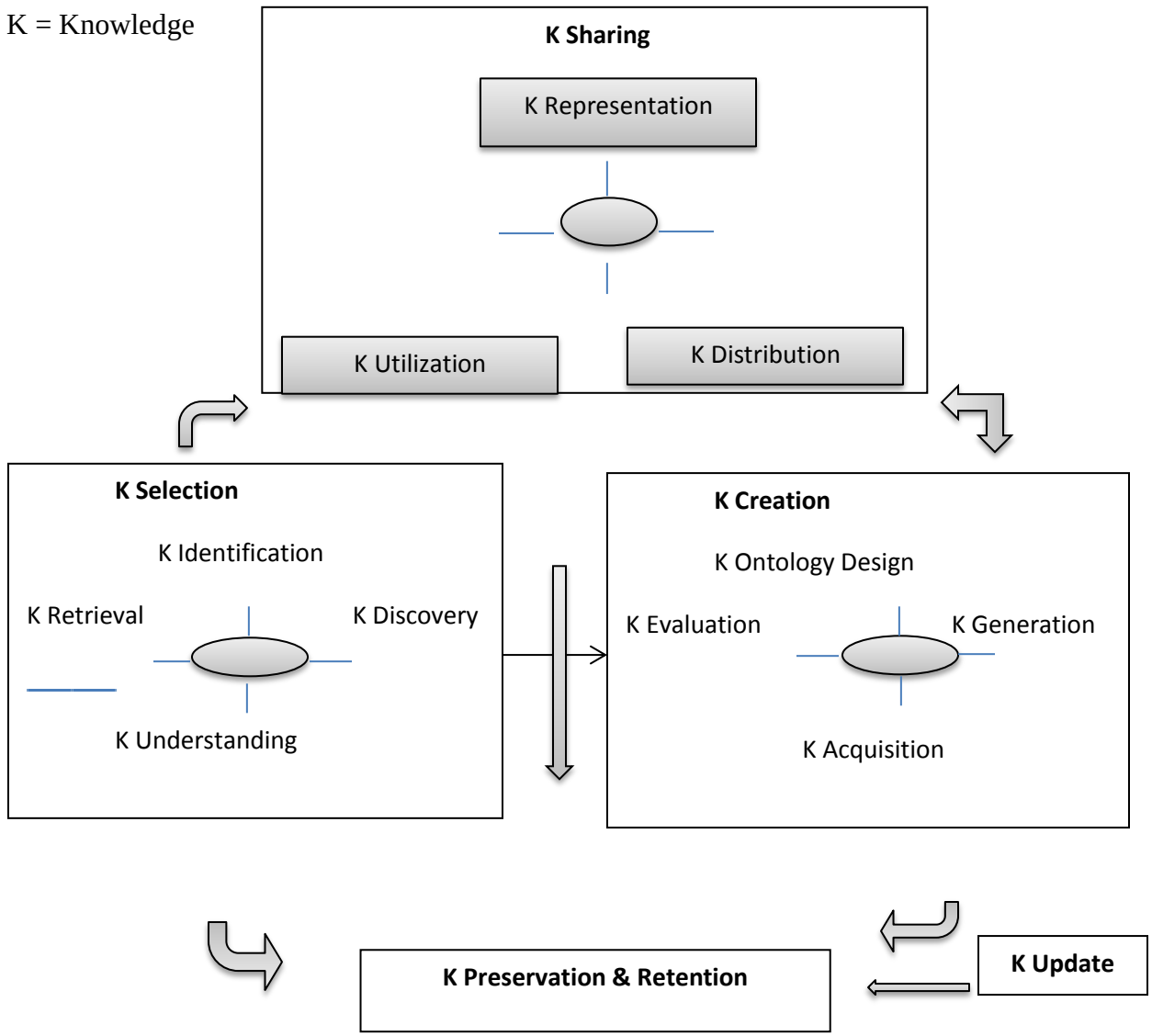


Figure 2: The Hierachical Spiral Model for Knowledge Management

Source: Sun, Z and Hao, G (2006) , "*HSM: a Hierachical Spiral Model for knowledge management, in proceedings of the 2nd International Conference on Information Management and Business (IMB2006), Sydney Australia, 13-16 February 2006, pp. 542-551*.

2.4.3 A Spiral Model of Knowledge Management

Nissen (2002) and Nonaka (2004) propose a spiral model of dynamic interaction between tacit and explicit knowledge and characterize four processes namely, Socialization, Externalization, Combination and Integration. These processes enable individual knowledge to be amplified and effect organizational knowledge crystallization. Nissen and Levitt (2002) adapt Nonaka's spiral model to a dynamic model of knowledge flow. This model describes how knowledge flows through the modern organization and what managerial interventions can be made to enhance knowledge flow. The model embeds the knowledge flow to organization's everyday work flow to distribute knowledge through the organization.

The model also describes continuous and routine flows that comprise the bulk of organizational knowledge work. This flow is characterized by four enterprise processes: socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit), and internalization (explicit to tacit).

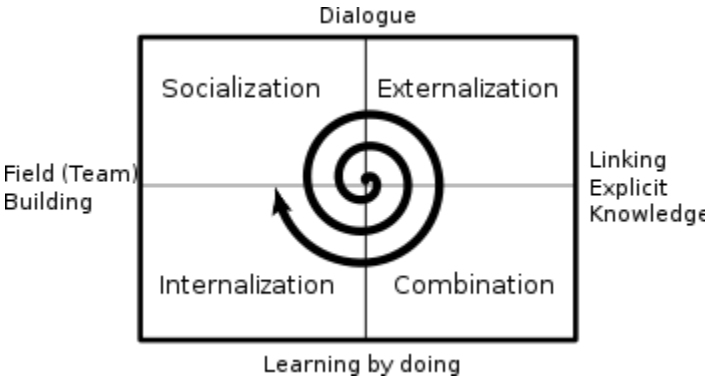


Figure 3: Nonaka's and Takeuchi Knowledge Spiral Model

Source: Nonaka, Ikujiro; von Krogh, Georg (2009). "*Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Creation Theory*". *Organization Science* **20** (3): 635–652.

2.5 Knowledge Management Systems Research Frameworks

There are various research frameworks that have been proposed to guide research into knowledge management systems. These include:

2.5.1 General Systems Framework

This framework treats a knowledge management system as any other information system. These systems can be studied in terms of their inputs, processes and outputs. In other words, a systems approach can be used to provide a basis for research programs in KMS. The General SystemsFramework is shown in the figure below. It shows the three components of the framework, that is, inputs e.g knowledge, people, tools, process and outputs,

The advantage of this framework is its simplicity and inclusiveness. All major components for KMS can be included in this model. The disadvantage is it does not highlight the importance of knowledge bases/repositories, or the critical nature of knowledge transfer between people.

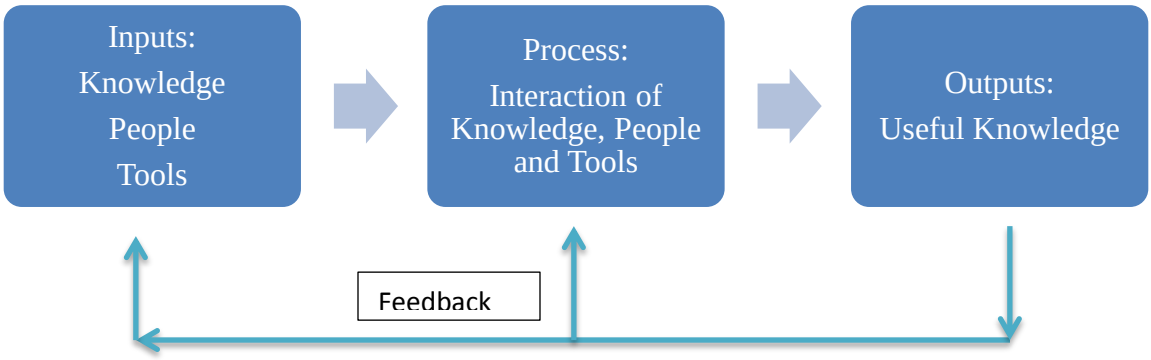


Figure 4: General Systems Framework for Knowledge Management Systems

Source: www.business.queensu.ca/kbe

2.5.2 KM Consulting Methodology

KM Consulting Methodology was been designed to ensure a proper, comprehensive, systematic and consistent approach to successful management, Ron Young (2005). It embraces a holistic approach to the strategic, cultural, people, process and technology issues.

KM Consulting methodology ensures detailed attention is given to the critical success factors in successfully implementing knowledge management programs. This may include:

- Identification of the critical knowledge areas
- A knowledge sharing culture
- Enabling knowledge technologies
- Proper KM education
- Natural and flourishing knowledge-led communities
- Aligned rewards and recognition
- Measures to gauge the business and KM benefits

The KM Consulting Methodology proposes the phase approach as described below:

- Stage I: Plan refers to the knowledge management strategic planning phase
- Stage II: Develop is the phase whereby an organization transforms itself to a KM enabled company based on the company-specific KM value proposition derived in Stage I.
- Stage III: Operate is the phase in which an organization rolls-out a company-wide implementation plan with a holistic approach to KM.
- Measurement of the level of leveraging of knowledge assets with a KM effort.
- Training of both the knowledge workers to the new processes and technologies as well as of the staff to take up new knowledge-related roles.

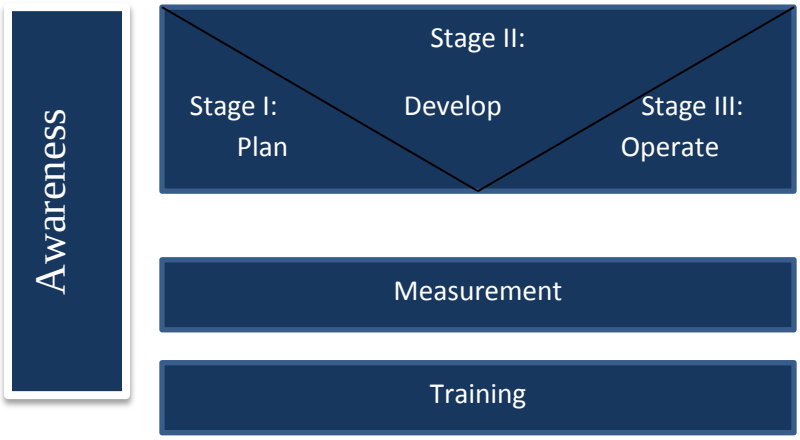


Figure 5: KM Consulting Methodology Overview

Source: Knowledge-Management-online.com

2.5.3 The Knowledge Management Process Model by Botha et al (2008)

The model attempts to offer a more realistic overview of the KM process. The three broad categories overlap and interact with one another and the focus of the model is on the managerial initiatives. This model also includes the creation of new knowledge as a specific KM initiative.

The model shows which of the three categories are more people oriented and which are more technology focused. According to this model, organizations tend to approach knowledge sharing as a technological challenge rather than organizational and social challenge.

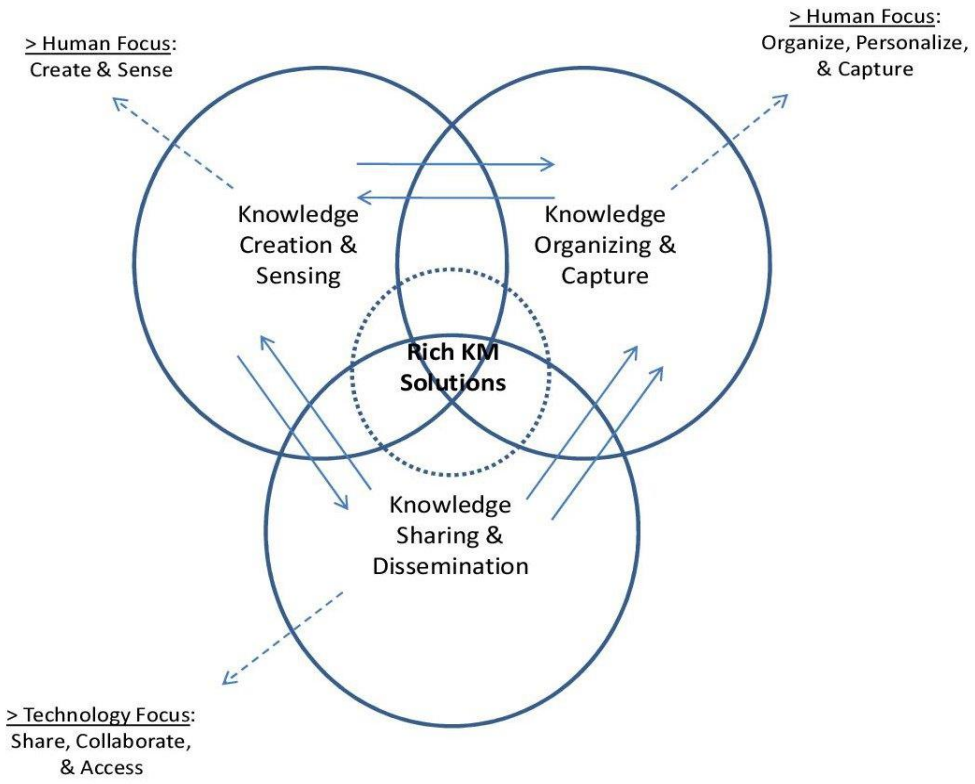


Figure 6: The KM Process Model by Botha et al (2008).

Source: www.knowledge-management-tools.net

This research developed a system prototype that is computer web-based and takes into consideration the management of both tacit and explicit knowledge. The research made reference to the hierarchical spiral model and the Knowledge management process model looked at earlier. The Hierarchical spiral model as a knowledge management tool captures both tacit and explicit knowledge .

The system developed presents a knowledge management platform that identifies, captures, stores, avails and maintains organization's knowledge. The system has as its input both explicit and tacit knowledge which the system manages. This knowledge is output to the employees of the organization who then use it to make decisions and take action.

The goal of this system is to enable employees to have ready access to the organization's documented base of facts, sources of information, and solutions by connecting an organization's employees to each other. It also makes provision for the employees to engage each other in discussions which will result in new knowledge being developed and also transfer of skills and experiences between the employees.

2.6 Developments in Use of KMS for Dissemination of Knowledge and Information

2.6.1 Case studies:

According to Holtz (2008), Wachovia – the fourth largest bank in the U.S. is building a wiki that is called **Wachopedia** and also it is coming up with an internal social network, a Facebook-like utility that will allow employees to share information, photos, videos and documents. They will also be able to form groups around subjects that interest them.

Holtz also records that Dell, IBM and a host of other companies are also beefing up the opportunity for employees to find and interact with one another through social networking applications offered by companies with names such as Leverage Software and Select Minds.

Knowledge Extract, Profiling and Sharing Network (KEPSNET) is a knowledge management framework to support the management of tacit knowledge comprising competencies and experiences in a project group (Marzanah et al., 2020). KEPSNET captures tacit knowledge through concept maps. Users interact with the system through a provided user interface menu. KEPSNET allows for knowledge retention through knowledge capture, knowledge retrieve through compare and profiling and knowledge reuse through knowledge recommendations and networking. KEPSNET is a greater framework for the management of tacit knowledge but fails as a knowledge management tool as it does not encompass entire knowledge management of both tacit and explicit knowledge.

The International Livestock Research Institute (ILRI) has implemented a knowledge management platform that includes a collaboration environment for collaborating within the organization and with its partners, information centers where staff share what they know through journals and monographs, training and learning center and internet cafes accessible both to ILRI staff and to the authorized public.

Okemwa (2006) indicates that the KM initiatives at ILRI have not exhaustively been able to capture the largely tacit knowledge comprising the ethno-veterinary knowledge in the sub-saharan African region which would greatly improve its services by utilization of traditional human husbandry practices and indigenious medicinal plants. He also notes that the ILRI implementation of the KM also lacks standards, techniques and methods for audit knowledge. He finally recommends that more sources of knowledge need to be identified and tools defined.

Newsmate is a mobile knowledge management system designed for Journalists. It is a prototype for supporting knowledge sharing and expertise location in both office and field locations. It is mostly geared on connecting Journalists for knowledge sharing. The Document management aspect is not substantial.

Saroch & Barmash (2007) present a knowledge management system. The system's goal is management of knowledge found in proposals. This helps organizations to easily locate past proposals inorder to help in future proposal writing. The system is anchored on the organization's document management and collaboration. It does tacit knowledge sharing through similar grouped communities of practice via discussion boards, talk platforms and online chats. However, this system lacks a way of tapping into and codifying the expertise and experiences of the workers.

Corporate Memory (CoMem) is a prototype knowledge management system for the managing of engineering designer's internal and external knowledge, Frutcher and Demian (2002). CoMem groups the sets of project memories into a corporate memory and then supports external knowledge reuse from this memory through three modules. The **overview module** supports the designer to find reusable knowledge in external repositories. It is implemented as a tree map where each term is color-coded by its relevance to the user's design task. The **project explorer module** identifies related items in the corporate memory and visualizes these related items to help the user better understand why the item in question was designed the way it was. The **evolution history explorer module**presents the versions of the selected item, and the team interactions and rationale driving this evolution. It draws from the effectiveness of storytelling and explores how to visualize version histories. Generally, CoMem knowledge management prototype system through its three modules of overview, project context explorer and evolution history explorer supports the three processes of internal knowledge reuse namely find, explore evolutionary history and explore the project context.

CoMem in this way is a knowledge management system intended to support effective knowledge reuse through faster searches and provision of contextual information. CoMem is primarily developed for use by architecture, engineering and construction firms. Tacit aspect of knowledge management is lacking in CoMem.

The Army Intelligence Comprehensive Analysis Tool (AICAT), an Intelligence Center online application provides the capability to analyze and assess the Army Intelligence Information including processes and organizations in a more timely and efficient manner, Wesley et al (2008).. AICAT provides the Army Intelligence Community with a repository to store, maintain, query, and report on intelligence, surveillance, and integration requirements and related doctrine, organization, training material, leadership and education, personnel and facilities information. The system also provides a location to capture statistical, assessment, and modeling and simulation products. AICAT has proved to be a useful tool on many fronts. It was originally developed as an internal tool to support the research requirements of the Integrated Intelligence, Surveillance and Reconnaissance Force Development Test and Experimentation, its utility on a larger scale was apparent from the beginning.

The Military Intelligence Network (MI NET) is a knowledge management site that is used by the military community to easily publish, manage, organize and discuss a wide range of content through one website. It applies the concept of social networking to knowledge management acting like the military's professional forum. Users share what they know and find what is needed by having subject matter experts answer their questions timely. Users quickly share ideas, lessons learned which is actually transfer of knowledge. Responses given to request range from simple textual replies to tools like standard operation procedures, powerpoint presentations, or other documents. According to Dustin Cloos (2008), MI Net as a knowledge management system which operates on the concept of 'people factor' needs to be coupled with the technology factor' for effective impact of knowledge on people. As a knowledge management platform, MI Net is effective in that it embodies the concept of providing the right knowledge to the right people at the right time through asynchronous collaboration of the novices and the experts. The challenge of MI NET is to have an instant connection between the person in need of the information and the subject matter. Unless this is pre-arranged then it can pose as a challenge.

This research study will attempt to develop a computer based system prototype (intranet) that presents a knowledge management platform that identifies, captures, stores, avails and maintains organizational knowledge. It takes into consideration the management of both tacit and explicit knowledge.

The goal of this system is to enable employees to have ready access to organization's documented base of facts, sources of information, and solutions by connecting employees to each other and delivering the right information to the right people at the right time.

This research will make reference to the MI NET knowledge management system while at the same time try to improve on its weaknesses. The system makes reference to the Knowledge management process model by Botha et al as the methodology concept for the prototype.

Research shows that the majority of existing knowledge management technologies have emerged from a document management approach. This relatively relates to the management of explicit knowledge. This majorly arises from the confusion between information management and knowledge management. Most people relate these to mean the same thing. If we follow the document management approach, then in reality only explicit knowledge will be managed leaving out the tacit knowledge which is also crucial to the organization. Knowledge management incorporates both tacit and explicit knowledge. *Pena-Mora et al (2000)* states, there exists the limitation to the management of tacit knowledge. A limitation also exists in taking into account the interactions, skills, interests, intuitions, motivations and competencies in an organization or a group. Therefore, this research study will try to incorporate both aspects of tacit and explicit knowledge management in the system prototype.

2.7 Proposed Conceptual Model:

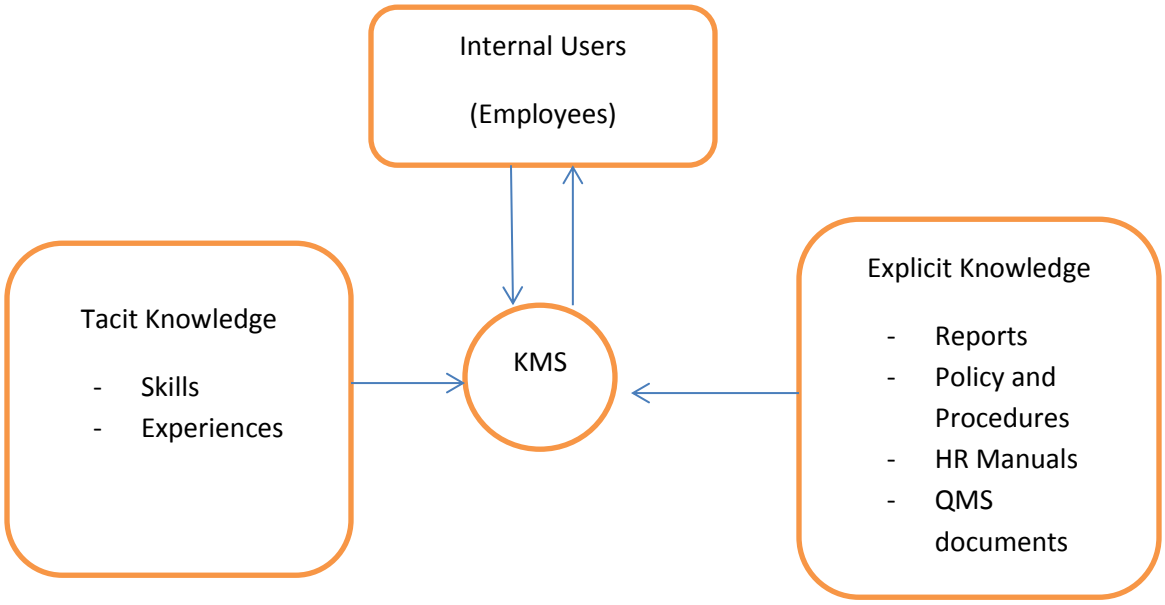


Figure 7: Conceptual Model

The knowledge management system manages both tacit and explicit knowledge. It has its main user as the employees of the organization who are authenticated and authorized to access and utilize the resources availed by the system.

The tacit knowledge is managed in the system where the employees are able to share ideas, experiences and their skills therefore creating new knowledge which builds the knowledge management repositories while the explicit knowledge is availed to the users for reference purposes and also enables them to make better decisions.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Adapting to MI NET and Knowledge Management Process Model by Botha et al (2008), this section presents an overview of the methods and procedures used in the study. It covers System Analysis and design, population, sample and sampling techniques, data collection and analysis.

3.1 Research Design

A research design is the conceptual structure within which a research is conducted. It is the overall strategy that is chosen to integrate the different components of a study in a coherent and logical manner thereby ensuring one effectively addresses the research problem. It constitutes the blue print for the collection, measurement, and analysis of data.

A survey-based study will be conducted to collect data on the current processes involved in the sharing of information amongst the Nairobi City Water and Sewerage employees. This will involve the users of the various departments in understanding how information is passed on to them and how that information assists them improve their work value.

The analysis of the current state will also involve a review of the systems in place for communication and how effective they are to the organization.

3.2 Data Source

Nairobi City Water and Sewerage Company consists of more than 2000 employees and it is widely distributed into various geographical regions. According to Mugo (2008), there are six fundamental reasons for sampling instead of doing a census and these are; economy, timeliness, large size of the populations, inaccessibility of some population, destructiveness of observation and accuracy. Therefore, in consideration of this, a population sample is chosen over the census. Mugo (2008) further describes a sample as a set of respondents selected from a larger population for the purpose of survey.

Individual organizational members who will represent their respective departments will be targeted. Individuals will be randomly chosen to participate in the survey.

Due to the nature of the study which requires the work related activities of the participants in the survey to rely on effective use of knowledge to execute their tasks effectively. Therefore the targeted participants are those within the following professional streams; IT, Engineering, Billing human resources, customer care and ISO.

3.3 Sampling and Sampling Technique

Diamantopoulos and Schlegelmilch (2006) describes various sampling methods that can be used to obtain a population sample, namely; convenience sampling, judgemental sampling, quota sampling, snowball sampling, random sampling, stratified sampling, etc.

Leedy and Ormrod (2005), also hinted that researchers often overlook the practical issues related to availability of data or the availability of respondents.

Diamantopoulos and Schlegelmilch (2006), describes a convenient sample as sample members that are chosen on the basis of being readily available and accessible to the researcher.

Therefore, taking all this into consideration a convenience sampling method was deemed adequate for this study to ensure sufficient data collection.

3.4 Data Collection

The focus of the study was on knowledge sharing and transfer by use of knowledge management systems. Therefore the primary data from the parties involved is crucial. Primary data will be collected via use of questionnaires. However, secondary data from the relevant publications, manuals, procedures was also collected to augment the studies.

The total duration for distributing and receiving back the questionnaires from all the respondents was two weeks. One week for distributing the questionnaire and one week for follow-up. The respondents were given a maximum of one week to return the questionnaires to avoid pressurizing them. It is important to note that two questionnaires will be distributed; one to assess the views of users on knowledge management and the various knowledge management efforts in use while the second questionnaire will assess the response of the users after use of the

prototype system. The first questionnaire will guide on the development of a prototype for the knowledge management system.

3.5 Data Analysis Techniques

Data collected during survey will be analyzed using qualitative methods to determine the relevance of the research questions. MS- Excel spreadsheet will be used for appropriate analysis of the data. The findings will be presented in form of tables, pie charts and bar graphs. The Excel sheet is attached in the Appendices.

3.6 SYSTEM ANALYSIS and DESIGN

A detailed study of knowledge management systems was conducted, such as COMem, MI Net, KEPSNET and Newsmate among others. These systems were assessed to determine their merit and demerits and also to familiarize myself with their shortcomings in terms of knowledge management. Requirements were determined by analysis of the questionnaire feedbacks from various employees.

3.6.1 Knowledge Creation and Sensing

According to the Knowledge Management Process model by Botha et al (2008), for knowledge to be managed it has to be created and sensed. **Knowledge creation** according to Nonaka's SECI model is about continuous transfer, combination and conversion of the different types of knowledge as users practice, interact and learn. **Knowledge Sensing** involves filtering what is important and useful to build knowledge.

The knowledge created needs to add value to the everyday work of the user. For knowledge to be created it needs to be harvested and this begins by enabling the experts to verbalize their tacit knowledge thereby making it explicit.

The process followed was identification of the knowledge and capture the knowledge. This process can also be identified as knowledge audit which identifies the sources of knowledge required in-order for the knowledge management system to be useful to the users.

Knowledge creation and sensing was done through the use of discussion forums and articles where experts can share ideas and experiences through discussions of various topics.

3.6.2 Knowledge Organizing and Capture

The second phase in the Knowledge Management process model is the knowledge organizing and capture. This follows knowledge creation and sensing and therefore the created knowledge needs to be organized and captured in a manner that is easily accessible and retrievable to the users.

Explicit knowledge in the departments is found in the documentation materials, while tacit knowledge is managed by the expert personnel.

Knowledge Capture

For knowledge to be managed it needs to be identified or audited and then captured for storage. Knowledge capture is also referred to as knowledge harvesting. Most of the knowledge was obtained from research data.

The project process followed was identification of the knowledge, elicit the knowledge and then capture the knowledge. This is also referred to as knowledge audit. This process identifies sources of knowledge required in-order to solve the business problem the prototype system attempts to address.

Identification of the knowledge in the organization was done through analysis of feedback from questionnaire distributed to the respondents. Sample questions and an analysis of the response given are displayed in the Appendix section. The organization's documents were also reviewed.

Knowledge Organization

The knowledge captured needs to be organized. Explicit knowledge in the organization is found in documentations and in limited network folders. Tacit knowledge in the organization was found to be handled by experts who do not have forums for sharing the information.

Explicit knowledge in the organization is found in form of manuals, QMS procedure, Report, User manuals, Customer care charter, etc while tacit knowledge was managed by the respective experts.

Explicit knowledge

Explicit knowledge was found to largely exist in document formats. A document management approach is chosen to manage this knowledge.

A document management approach is a repository that is used to store, organize and track documents. It provides storage, metadata, security, indexing and retrieval of the documents. Document management systems are enablers in the process of knowledge management. Knowledge management is involved in gathering, storing and sharing of the right information to the right people at the right time; the document management system ensures that the information is available to the user when needed.

The documents module is where the employees will be able to access their documents stored in the system. The documents are provided in soft copy then they are uploaded in the system for access.

The prototype system provides the following functionality for this module:

- Upload document
- Download document
- Search document

The documents are uploaded to a central place by the administrator of the system to make them available to the entire organization.

Tacit Knowledge

Tacit knowledge in the organization was rarely shared and so was retained in the experts head. Although not easy to capture and manage as compared to explicit knowledge, researchers have explored ways of sharing tacit knowledge. These would include expert systems, concept maps, mentoring etc.

This research project captures tacit knowledge in form of discussion forums and articles which captures the posts by the various users and stores it for future referencing.

Articles

All the articles are captured in a database. A search shows the author of the article and the other employees are able to make comments on the various articles.

Discussion Forum

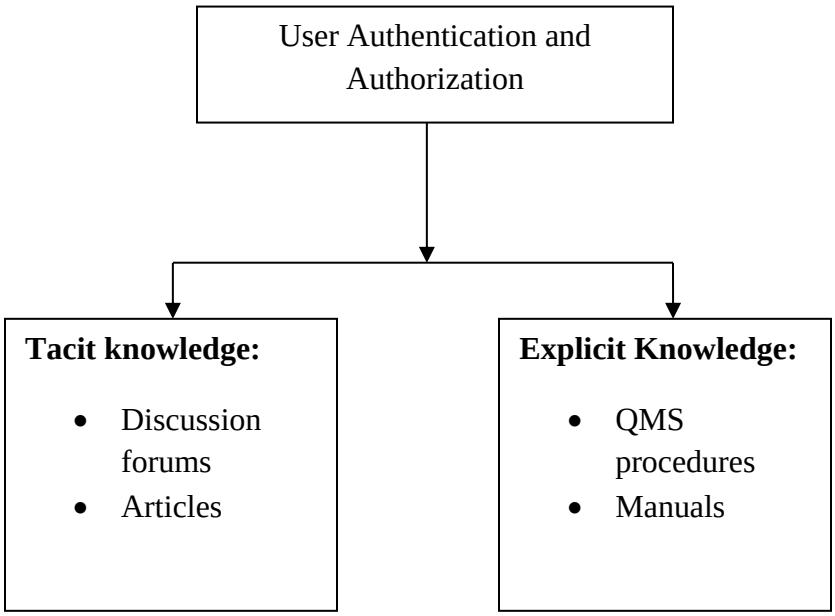
The system provides a discussion forum which the employees are able to access organization wide or department-wise in-order for them to discuss various issues and topics of interest in the organization. The comments posted on the forum are captured and stored in a database.

3.6.3 Knowledge Sharing and Dissemination

This is the third phase of the knowledge management process model and it focuses on the technological aspect of the model in order to provide sharing, collaboration and access to knowledge repositories. Collaboration is working with each other to do a task and achieve shared goals. Collaboration allows for better communication within the organization and it is a way of coordinating different ideas from numerous people to generate a wide variety of knowledge.

Data will be stored in a repository where employees are able to retrieve it when need be and make reference.

3.6.4 The knowledge management system modules



The various proposed modules are attached in the appendix section.

CHAPTER FOUR

IMPLEMENTATION AND TESTING

4.1 Implementation Tools

This was achieved using the following tools:

PHP

The programming language used for the implementation of the intranet prototype is PHP. PHP is a scripting language and was chosen for this system because of its ability to create dynamic web pages very fast. The intranet is a web based system and the users can access it via a web link. This translates to having an internet connection. PHP is also available as an open source software.

PHP modules are easily integrated with the Apache web server. Microsoft excel have been used to analyze the questionnaires.

Database Management Software

MySql is the DBMS of choice for this system. It is a fast multi-threaded and multi-user robust database management system. MySQL enables the system information to be managed from a single database file with separate tables. It is also compatible with PHP and is also an open source software. Mysql as a Database Management Software also enables creating of robust databases. PHPMyadmin is also used for ease of graphical user interface based administration of the databases.

Web Server

Due to the Web application nature of the intranet, it needs to run on a web server in order for it to be accessible to all the employees throughout the organization. Apache is the web server of choice for this prototype.

All the above named tools (PHP, Apache, MySQL and PHPMyadmin) are downloaded from the internet using the XAMPP package.

Graphical User Interface

The GUI is developed using the PHP, a professional HTML editor widely used for the designing, coding and developing of web pages, websites and web applications.

Features of the System:

The system features will include:-

- Log on by Users
- Knowledge Repository
- Search for articles and forums
- Discussion forums.
- Documents access

Resources Required

a. Hardware and Software
    - PHP as the scripting language
    - MySQL as the Database
    - Apache as the web server
    - Ms Excel for analysis.
    - Internet services to access online materials

b. Materials and costs:
    - Questionnaires
    - Transport costs
    - Stationery and printing services
    - Laptop

c. Accessibility

There will be need to access:-

- Management for the research domain in order to get authorization to distribute questionnaires to employees in various departments in the research domain.

Financial resources – budget:- The researcher will sponsor themselves to carry out the research and development of the prototype.

4.2 Testing

The knowledge management system prototype was accessed by using the link http://192.168.0.86/knowledge3/kw_index.php. The link points to the test server where the application is uploaded.

Software testing is an investigation conducted to provide users with information about the quality of the product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Software testing can be stated as the process of validating and verifying that a computer program/application/product:

- Meets the requirements that guided its design and development
- Works as expected
- Can be implemented with the same characteristics
- Satisfies the needs of stakeholders.

Software testing is mainly divided into white and black box testing. White box testing tests the internal structures or workings of a program as opposed to the functionality exposed to the end-user while black box testing examines the functionality without any knowledge of internal implementation. The testers are only aware of what the software is supposed to do and not how it does it. This project adapted black box testing to test the prototype.

4.3 Discussion of Results

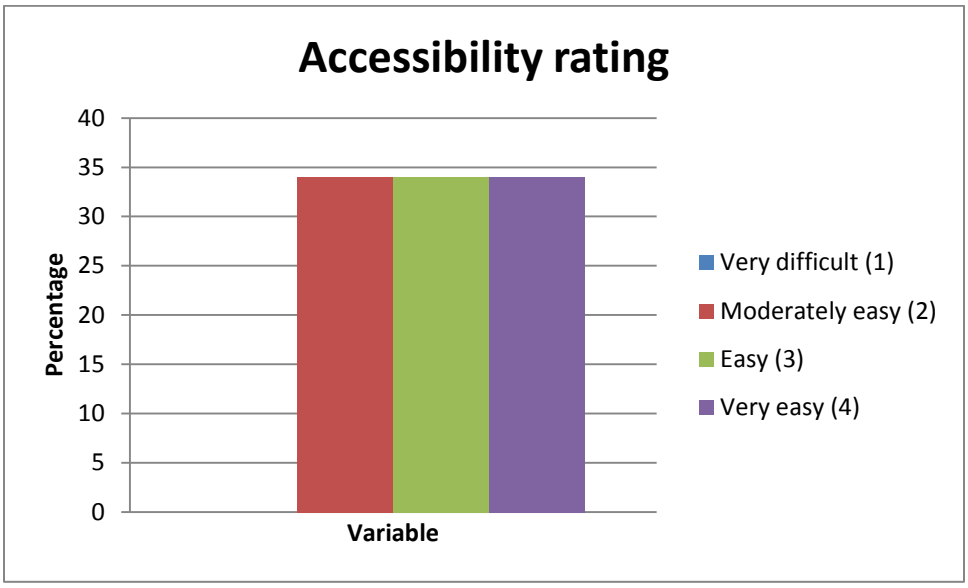
A discussion of the results from the testing phase is as follows:

Did you find the user interface of the intranet friendly?

100% of the respondents found the user interface was friendly.

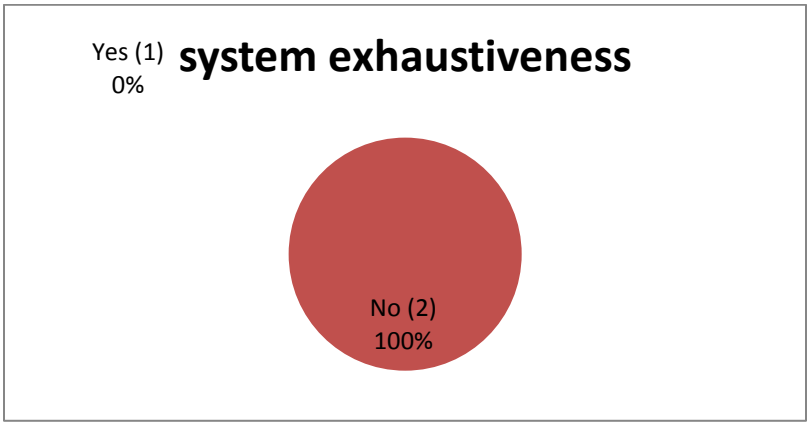
How would you rate the whole system in terms of accessibility?

34% of the respondent found the system to be moderately easy, 34% found it easy to access information and 34% found it very easy to access.



Is the system exhaustive?

Most respondents desired to see more content in the system so more functions are recommended as the prototype development progressed.

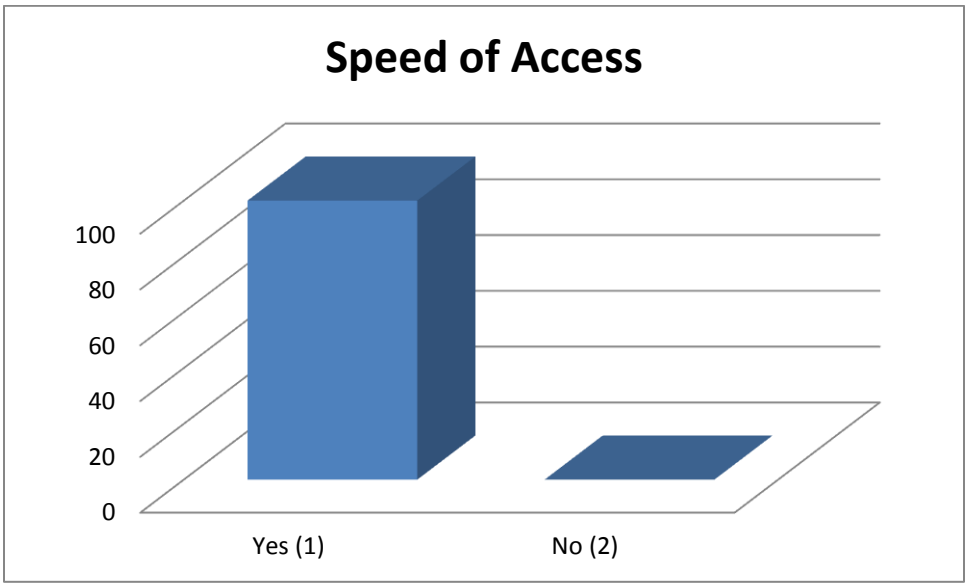


How long did you take to access required information?

All the respondents were able to access the system within 10 – 20 minutes.

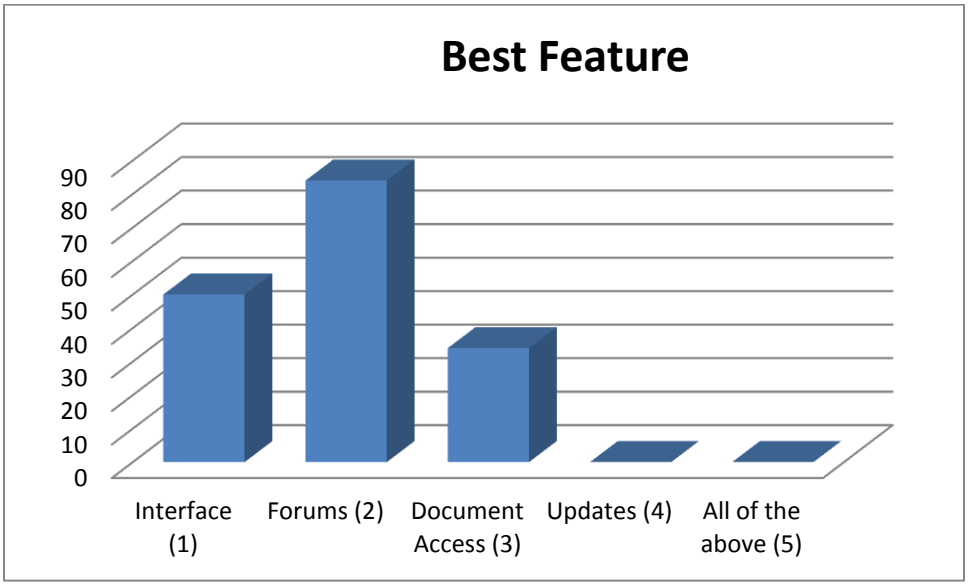
Did you experience significant speed in accessing information using the knowledge management system?

All the respondents experienced significant speed in accessing information making information retrieval easy.



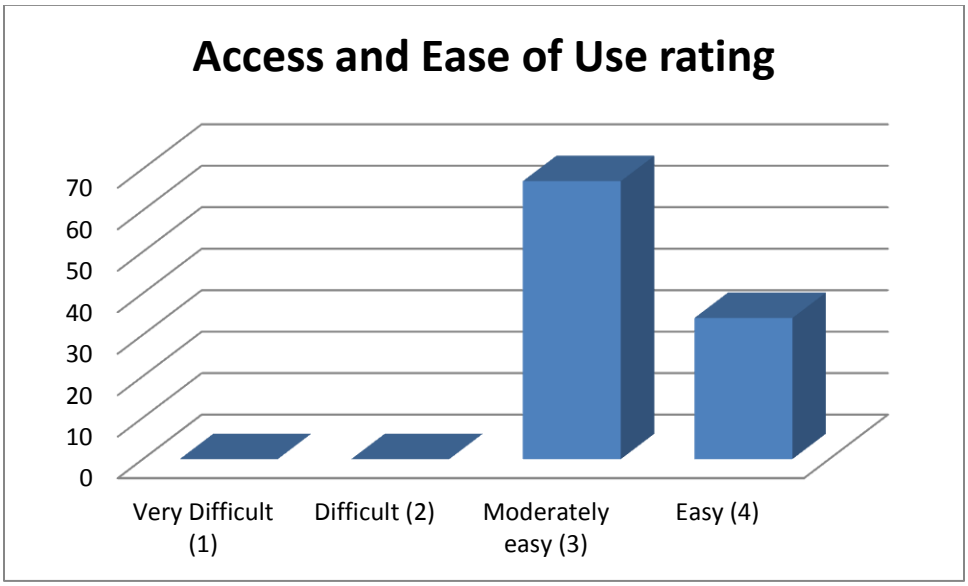
What according to you is the best feature of the system?

50% of the respondents liked the interface, 84% liked the discussion forums and 34% liked the documents access module features.



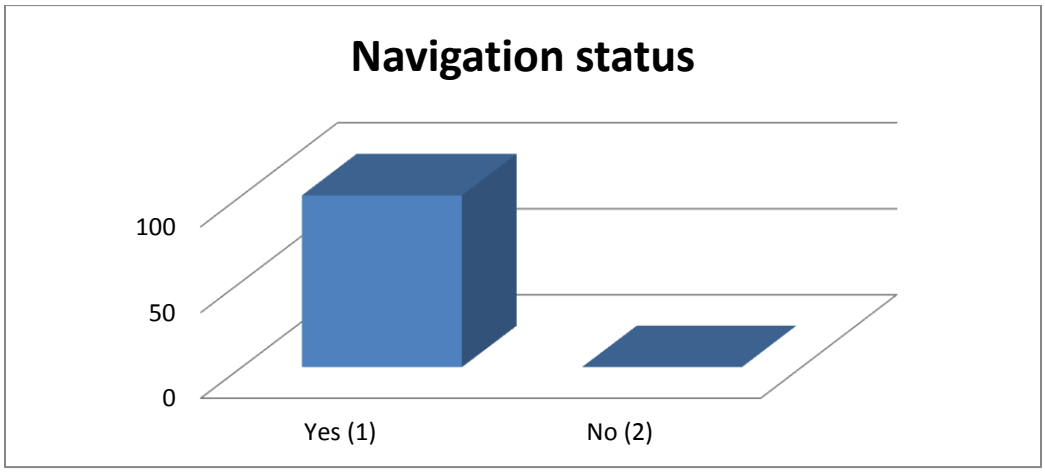
How would you rate the whole system in terms of access and ease of use?

67% of the users found the system moderately easy to use while 34% found them easy to use and access information on it. A system that is easy to navigate and use encourages the employees to engage one another there building new knowledge in the organization.



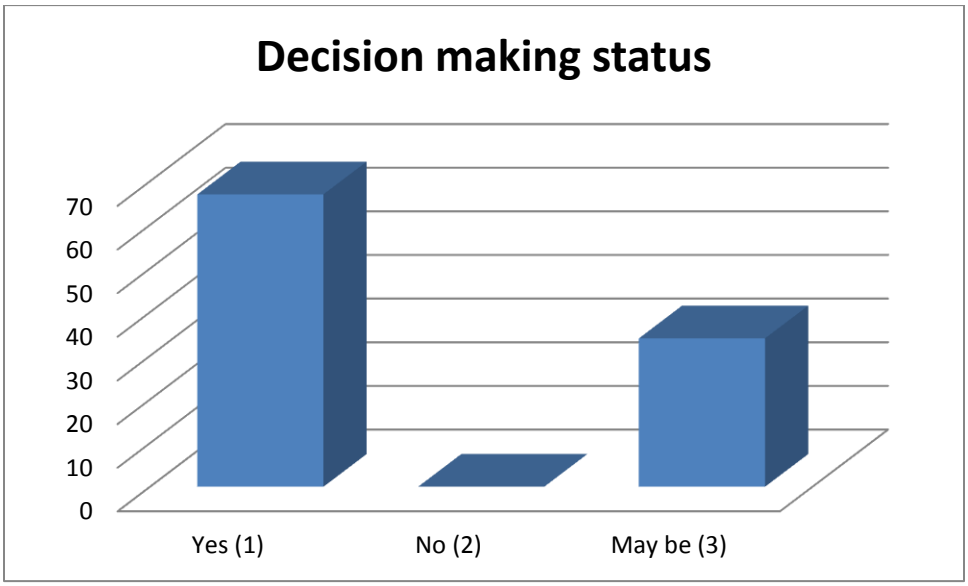
Are you able to navigate through the system with ease?

100% of the respondents found it easy to navigate through the system modules. Ease of access will encourage the users to share and transfer information with each other therefore improving the competence and skills levels in the organization.

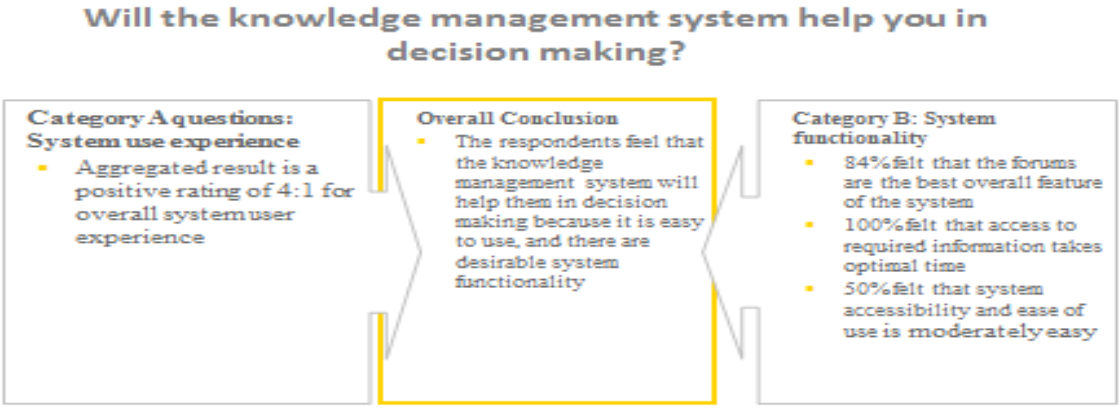


Will the knowledge management system help you in decision making?

67% of the respondents affirmed that the knowledge management system would assist making decisions while 34% were not sure if the system would assist. This indicates that the knowledge management system prototype assisted the employees in making crucial decision based on the information provided.

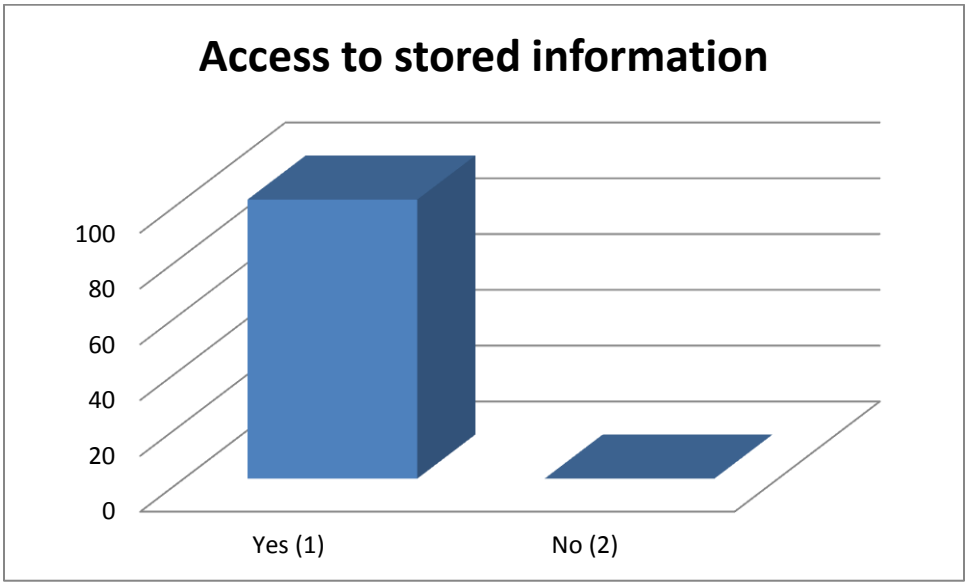


This was further analyzed using Correlation analysis and the following were the findings.



Did you experience any improvement in accessing stored information?

100% of the users were able to access information stored in the repository with ease. This shows that the system has enabled the users to access the required information when needed.



4.3.1 Sample Knowledge Management web pages.

Sample forums and discussions

Figure 8: Sample forums and discussions page

Sample Documents page

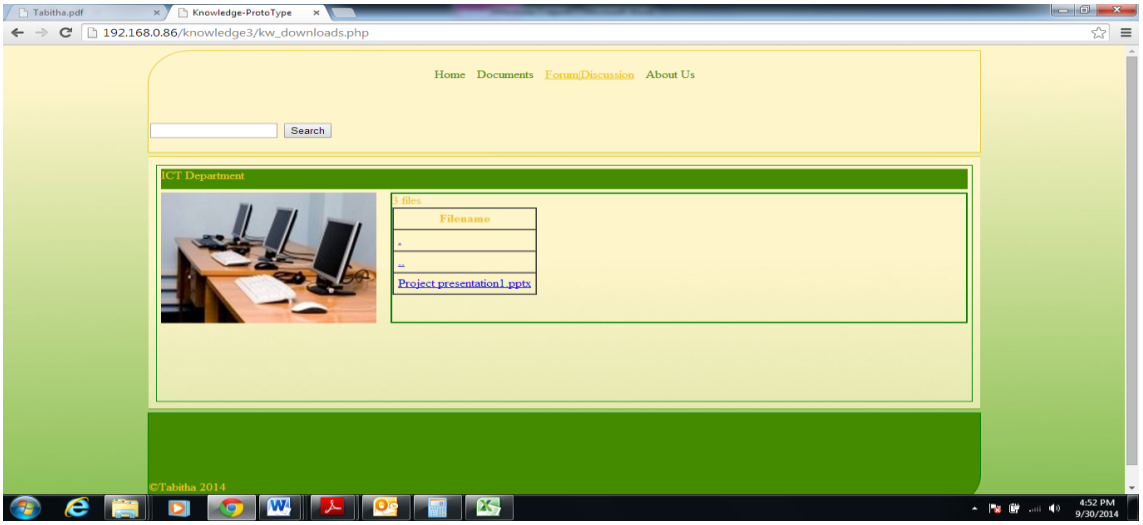


Figure 9: Sample Documents page

Sample Forums and discussions with comments

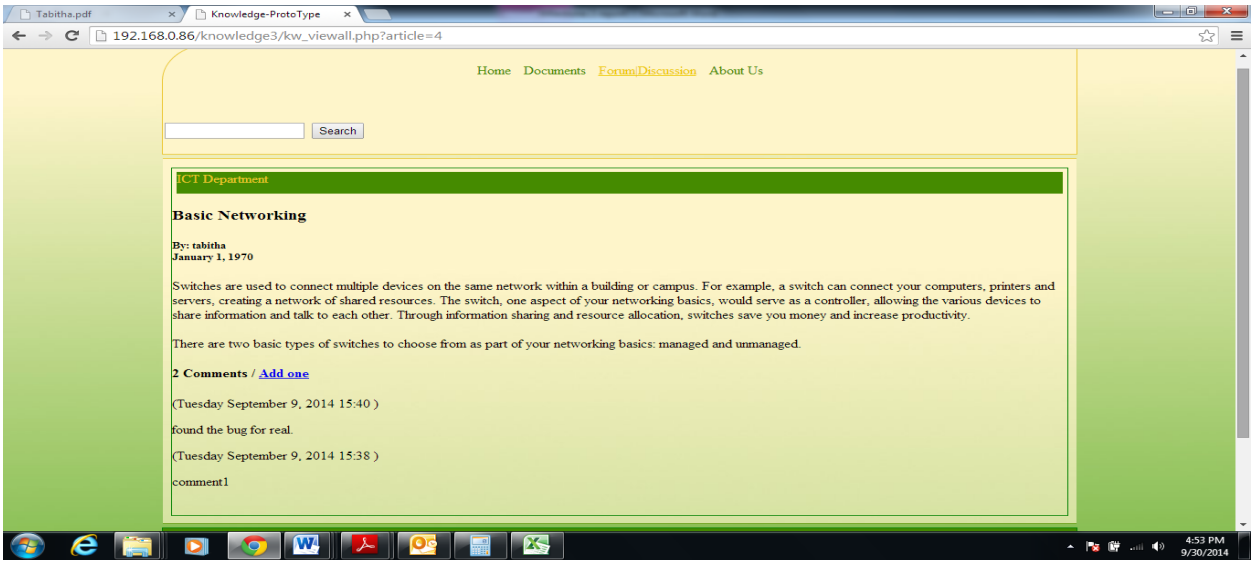


Figure 10: Sample Discussions with comments

Sample Search Results

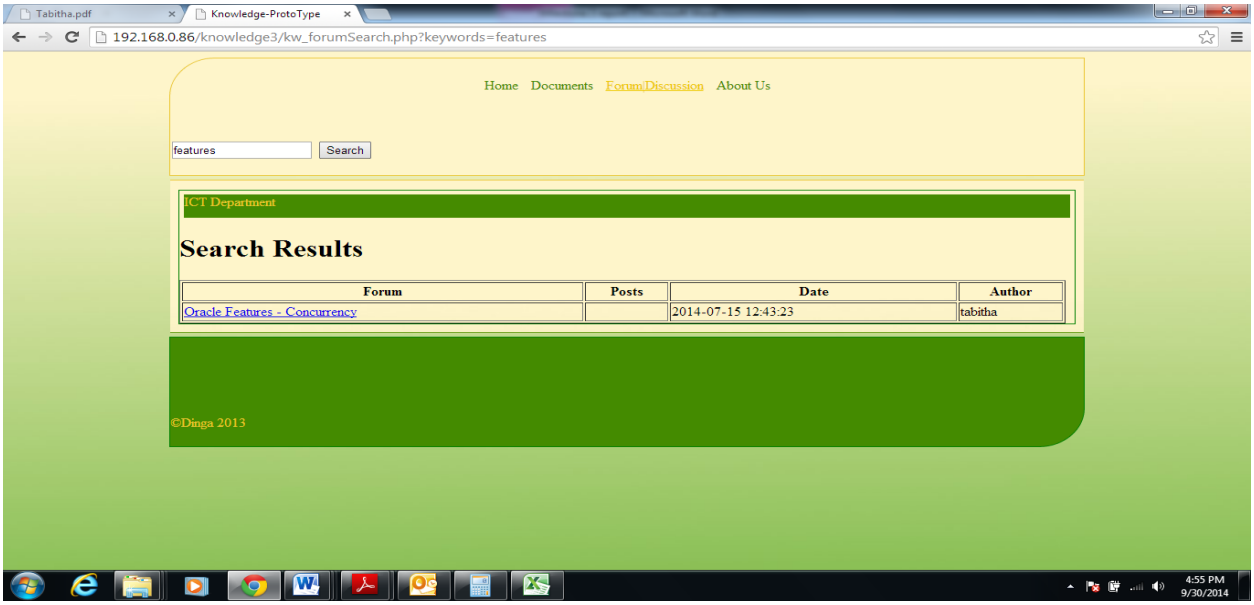


Figure 11: Sample Search results page

CHAPTER 5

DISCUSSIONS & RECOMMENDATIONS

The purpose of this research as cited in section 1.2 of this thesis, is to explore how Knowledge Management Systems enhance access, sharing and application of tacit and explicit knowledge in organizations and to develop a knowledge management system platform to illustrate effective knowledge management in Nairobi City Water and Sewerage Company.

The study made reference to the Knowledge Management Process Model as the guiding framework that emphasizes on i) Knowledge creation and sensing ii) Knowledge organization and capture and iii) Knowledge sharing and dissemination.

The main emphasis is that technology is just an enabler to achieve knowledge management and organizations should take advantage of the developments in technology to achieve proper knowledge management.

The research problem was broken down into three (3) main objectives detailed in section 1.3 above.

The first objective was "*Explore the application of knowledge management systems*". In-order to accomplish the above objective, the following research question needed to be explored "What are the main sources of knowledge for employees?"

The research results indicate that 35% of the employees obtain their knowledge from external sources such as conferences and 42% of the employees access their information from stored documents. This indicates that the employees spend a lot of their time in these ventures in-order to learn new skills and accessibility to information is quite rigid. Previous studies for example, the MI Net site shows that the knowledge management system is an effective tool for sharing of information in a timely manner.

The second objective was "Explore how a knowledge management system enhances access and sharing of knowledge". 78% of the respondents indicated that they access and share knowledge through formal procedures such as reports, organizational procedures and company publications. These are therefore filed and stored and can easily be tampered with or even lost. It can therefore be deduced that the knowledge management system will enable the employees to access their

reports, organizational procedures in a better and fast manner since they will be accessed from a central repository. This has been achieved in systems like CoMem discussed previously in the case studies section, whereby it enables faster retrieval and reuse of contextual information stored in the system.

The third objective was "Design, build and evaluate a prototype system to enhance knowledge management in Nairobi City and Sewerage Company".

The researcher developed a prototype to implement a knowledge management system in the organization. According to the feedback from the users who tested the system, 54% of the respondents thought the system had a good interface, 34% thought it had a good feature for accessing their documents since they were easily retrievable. 67% of the respondents rated affirmed that the knowledge management system would assist them in making decisions through the discussion forums and the shared documents.

These results also compare greatly to the documented literature of previously done knowledge management systems. The MI Net system provides the right information to the right people at the right time but faces a big challenge in having an instant connection with the required audience. This can lead to lack of timely communication. The CoMem knowledge management system encourages reuse of information and faster searches and retrieval of contextual information but faces a big challenge in managing tacit knowledge. The KMS by Saroch & Barmesh focuses capturing knowledge found proposals but it faces a codifying the expertise and experiences of workers. The KMS captures tacit knowledge through discussion forms, talk platforms and online chats.

Therefore, from the sampled results we can infer that a knowledge management system would be very appropriate for the organization since documents will be managed from a central location and made available to the user whenever needed. The discussions forum module in the system will help the employees engage one another in various topics of interest therefore sharing and transferring skills and experiences. This in a way is mentoring one another and in the end the organization benefits from the gained knowledge of the employees.

5.1 Limitations of the Project

A fully fledged knowledge management system is robust involving lots of strategies and practices. To implement such a system for maximum use and benefit requires a lot of time and resources. Time allocated for this academic project was time bound in the midst of all the challenges and commitments one has. There is so much that could be done given more time and resources. However, taking into consideration that this is a prototype system, it can be redesigned, remodeled, extended and customized to grow to the bounds the customer requires to meet the needs of their organization.

The feedback from the selected respondents in the research study shows that most experts find it difficult to transfer their knowledge and mentor others either due to fears of losing their jobs or replacement. Therefore, it's important for the organization to offer incentives.

5.2 Contributions to body of knowledge:

While a lot of research work related to Knowledge Management systems has been carried out, the implementation of tacit knowledge management still proves to be a big challenge. A lot of effort has been put in trying to ensure that both explicit and tacit knowledge is captured in knowledge management efforts.

Organizations create a lot of useful knowledge on a day to day basis through its activities, in the form of lessons learnt from past experiences, collective decision making, unique organizational resources, skills and capabilities and interaction between the employees. These factors can help the organization develop and create distinctive knowledge resources and capabilities through the use of a Knowledge Management System.

However, it has been proven in previous research studies (like in the case of Co Mem knowledge management system by Frutcher and Demian (2002), which lacks in management of tacit knowledge and also Newsmate system that faces challenges in managing documents), that most organizations are ineffective in capturing knowledge and more importantly tacit knowledge. This has led to major losses in terms of information, resources, time and man power.

The findings in this study highlight the fact that organizations face a lot of challenges in managing the vast amounts of knowledge and especially tacit knowledge which resides in the mind of people. The organizational structure and culture contributes a lot in the transfer and sharing of information amongst the employees.

Organizations need to start harnessing tacit knowledge (i.e. knowledge residing in the heads of individual employees), by creating a culture of knowledge creation and knowledge sharing among employees. Organizations can also offer incentives to experts in various fields in order to encourage mentoring and make them feel secure in their jobs. The intranet is one of the many tools that can be used by most innovative and successful organizations for knowledge management purposes.

5.3 Recommendations for future work

Kruger and Snyman (2005) propose that knowledge management requires the concurrent management of four domains namely; culture, content, process and infrastructure.

Effective management of knowledge in order to influence knowledge creation activities in the setting of an organization, the senior management needs to play a key role in encouraging employees to create and share knowledge. A knowledge management strategy must be created by the management that will be supported throughout the organization.

ICT infrastructure such as emails, intranet, extranet, internet etc, must be designed and implemented to ensure that they effectively support knowledge management activities such as storing, archiving, searching, access control to sensitive information and information dissemination throughout the entire organization, to improve its business execution processes.

The management should encourage the culture of sharing information between employees and ensure that the employee efforts to create and share knowledge are recognized and rewarded appropriately. The management must coordinate knowledge creation activities to encourage and motivate functional areas, departments and teams to take ownership and create knowledge base resources in areas of their specialty and publish the information in order to keep the organization up-to-date and abreast with current organizational information and activities.

The employees must also take the initiative to screen and extract useful information from the knowledge management systems in place. Employees must also interact across disciplines in the organization to encourage innovation and synergy with other members of the organization.

Expert systems as a knowledge management tool would help guide the employees on who possesses what skills and expertise within the organization to ensure that when decisions are made, relevant people are involved in the decision making process to improve the quality of decisions taken by the organization.

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2 www.business.queensu.ca/kbe

Appendix A: Data Collection Questionnaire

QUESTIONNAIRE
KNOWLEDGE MANAGEMENT

Please assess to what extent the following statements related to knowledge management apply to NCWSC.

Name (Optional) _____

Department _____

A. Knowledge Organization and Capture

Rate the answers from 1 to 5 (as 5 is the most important)

1. Where is most of the information that you need to do your work located or stored?

   In paper-based documents ____
   In our team member's head ____
   In our central information system ____
   Workstation computer ____
   Filing cabinets ____

2. How did you acquire most the skills/expertise that you have been using in your job over the past 1 year?

   In this organization ___
   Self-learning ___
   Formal training ___
   Previous job ___
   Mentoring ___

3. How often do you make use to documented procedures to do your work when you are stuck?

Constantly _____

Very often _____

Quite often _____

Not often/rarely _____

Never _____

Please tick {√}where applicable for each of the following statements

B. Knowledge Creation and Sensing

1. Our employees obtain a good extent of new knowledge from external sources

Seminars ☐

Conferences ☐

Training ☐

Subcription Journals ☐

Expert networks ☐

2. Our employees obtain a good extent of new knowledge from business partners (e.g. suppliers, clients).

Suppliers ☐

Customers ☐

Contractors ☐

None of above ☐

3. In their work, our employees rely on experience, skills and knowledge.

True ☐ False ☐

4. In their work, our employees rely on written sources.

Projects documentation ☐ Instructions ☐

Reports ☐ Minutes ☐

Procedures ☐

C. Sharing and Dissemination

1. Our employees share their knowledge orally at meetings or informal gatherings

True ☐ False ☐ Not Aware ☐

2. Our employees share their knowledge through formal procedures (e.g. project reports, organizational procedures and instructions, reports and company publications).

True ☐ False ☐ Not Aware ☐

3. Our highly skilled staff (experts) have mentoring sessions to transfer knowledge to others

True ☐ False ☐ Not Aware ☐

4. In our organization, ICT tools are used to support collaborative work (e.g. calendars, video conferencing systems, intranet, document management system etc).

True ☐ False ☐ Not Aware ☐

5. The collaboration tools in place in our organization enable effective work.

True ☐ False ☐ Not Aware ☐

6. Which technologies have you implemented in your organization?

a) Internet [ ]
b) Intranet [ ]
c) Extranet [ ]
d) Groupware [ ]
e) Decision Support System [ ]
f) E Commerce [ ]
g) Knowledge Management Software [ ]

7. How significant is the role that effective KM can play in achieving the best results w.r.t the following in your organization?

a) Improving competitive advantage [ ]
b) Improving customer focus [ ]
c) Better decision-making [ ]
d) Employee development [ ]
e) Improving quality [ ]
f) Innovation [ ]

Thank You.

Questionnaire Data Analysis

Questionnaire Administration

The questionnaires were distributed to the respondents according the procedure in section **3.1.4.** The research survey questionnaires were distributed to 50-individuals from various departments. The respondents were reminded twice to return the completed forms within the timeframe (one week). The distribution and collection process took two weeks.

Response Rate

All questionnaires were captured onto a spreadsheet for analysis purposes. The number of responses with their percentages relative to the originally distributed questionnaires is indicated in Table 6 below.

Table 6: Variables, Frequencies and Percentages relative to questionnaire distribution

Variable	**Frequency**	**Percentage**
Total Questionnaire distribution	50	100%
Returned	22	44%
ICT	2	4%
Billing	4	8%
Human Resources	3	6%
ISO	3	6%
Customer Care	2	4%
Usable response	14	28%

The graphical representation of the response status is as below:

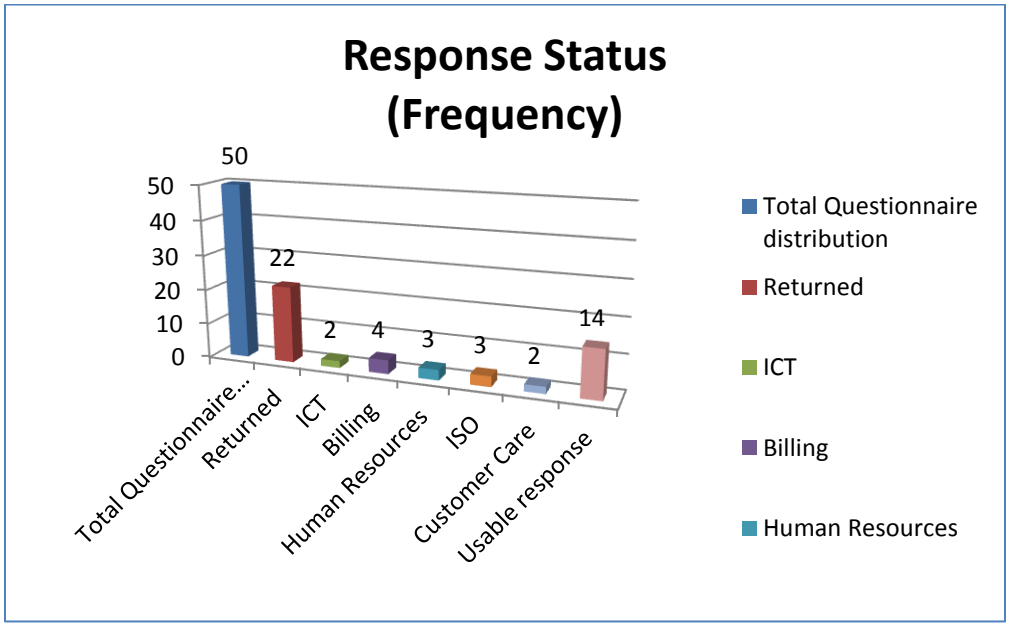

Figure 8: Graphical representation of Response status (Frequency)

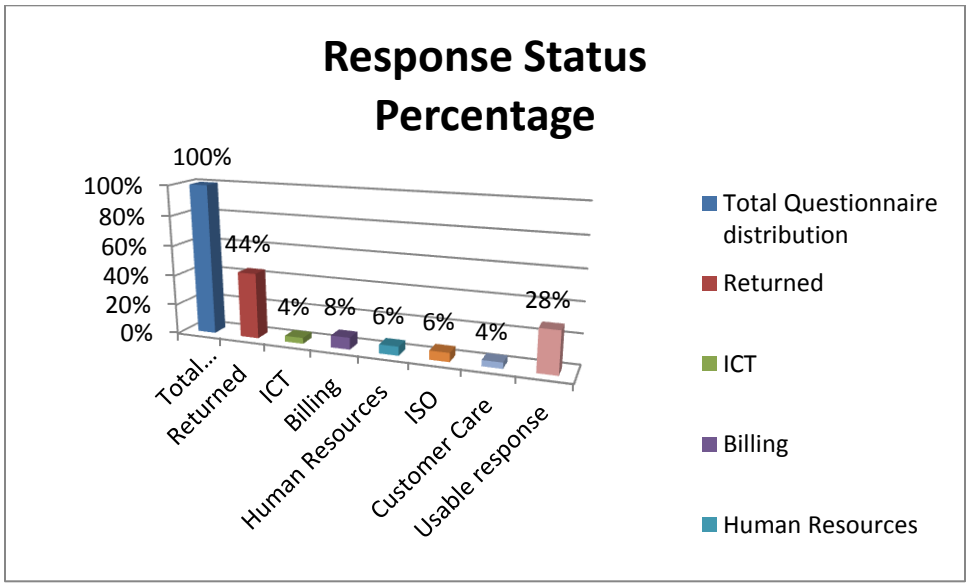

Figure 8: Graphical representation of Response status (Percentage)

Table 6 and Figure 7 above indicate the response demographics of the questionnaires. Out of the fifty (50) questionnaires that were distributed, only twenty two (22) questionnaires were returned. Of the twenty two (22) that were returned, two (2) were from ICT, four (4) were from Billing, three (3) were from Human Resources, three(3) were from ISO and two (2) were from customer care.

From the twenty two (22) questionnaires returned, only fourteen (14) were usable and had valid data because the respondents had not filled them properly.

Appendices B: User Testing Questionnaire

QUESTIONNAIRE

KNOWLEDGE MANAGEMENT SYSTEM

USER TESTING

Please take a few minutes to fill in the questionnaire below to enable me understand your views on the knowledge management system.

Name (Optional):_____

Department:_____

1. Did you find the user interface of the intranet friendly?
   a) Yes (1)
   b) No (2)

2. How would you rate the whole system in terms of accessibility?

   a) Very difficult (1)
   b) Moderately easy (2)
   c) Easy (3)
   d) Very easy (4)

3. Is the system exhaustive?

   a) Yes (1)
   b) No (2)

4. How long did you take to access required information?

   a) 10 – 20 minutes (1)
   b) 30 – 1Hr (2)
   c) 2 Hrs (3)
   d) Never (4)

5. Did you experience significant speed in accessing previous information using the Knowledge Management System?

   a) Yes (1)
   b) No (2)

6. What according to you is the best feature of the system?

   a) Interface (1)
   b) Forums (2)
   c) Document Access (3)
   d) Updates (4)
   e) All of the above (5)

7. How would you rate the whole system in terms of access and ease of use?

   a) Very Difficult (1)
   b) Difficult (2)
   c) Moderately easy (3)
   d) Easy (4)

8. Are you able to navigate through the system with ease?

   a) Yes (1)
   b) No (2)

9. Will the knowledge management system help you in decision making?

   a) Yes (1)
   b) No (2)
   c) May be (3)

10. Did you experience any improvement in accessing stored information?

   a) Yes (1)
   b) No (2)

User Testing Analysis

#	Question	Answer Options	Respondent's Feedback: Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	important	Comment
1	Did you find the user interface of the intranet friendly?	Yes (1)	1	1	1	1	1	1	100	*100% of the respondents liked the interface.*
		No (2)							0	
2	How would you rate the whole system in terms of accessibility?	Very difficult (1)							0	*34% found the system accessibility moderately easy*
		Moderately easy (2)	2					2	34	
		Easy (3)		3	3				34	*34% found the system accessibility easy to use*
		Very easy (4)				4	4		34	
3	Is the system exhaustive?	Yes (1)							0	
		No (2)	2	2	2	2	2	2	100	100% of respondents required more from the system in terms of content
4	How long did you take to access required information?	10 – 20 minutes (1)	1	1	1	1	1	1	100	All users could access data in within 10- 20 minutes
		30 – 1Hr (2)							0	
		2 Hrs (3)							0	
		Never (4)							0	
5	Did you experience significant speed in accessing previous information using the Knowledge Management System?	Yes (1)	1	1	1	1	1	1	100	
		No (2)							0	All users could access data fast

6	What according to you is the best feature of the system?	Interface (1)		1			1	1	50	50% liked the interface, 84% liked the Forums and 34% liked the documents access
		Forums (2)	2	2	2		2	2	84	
		Document Access (3)		3		3			34	
		Updates (4)							0	
		All of the above (5)							0	
7	How would you rate the whole system in terms of access and ease of use?	Very Difficult (1)							0	67% rated the access and ease of use as moderately easy while 34% found it easy.
		Difficult (2)							0	
		Moderately easy (3)	3	3		3		3	67	
		Easy (4)			4		4		34	
8	Are you able to navigate through the system with ease?	Yes (1)	1	1	1	1	1	1	100	All users found it easy to navigate through the system
		No (2)							0	
9	Will the knowledge management system help you in decision making?	Yes (1)	1	1	1			1	67	67% affirmed that the system will help in decision making while 34% were not sure.
		No (2)							0	
		May be (3)				3	3		34	
10	Did you experience any improvement in accessing stored information?	Yes (1)	1	1	1	1	1	1	100	All users found it easy to access stored information
		No (2)							0	

Appendix C:

1) **List of Figures**

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- **Figure 4:** General Systems Framework for Knowledge Management Systems
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- **Figure 7:** Conceptual Framework
- **Figure 8:** Sample Forums and Discussions page
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- **Figure 10:** Sample Forums and Discussions with Comments
- **Figure 11:** Sample Search results

2) **List of Tables**

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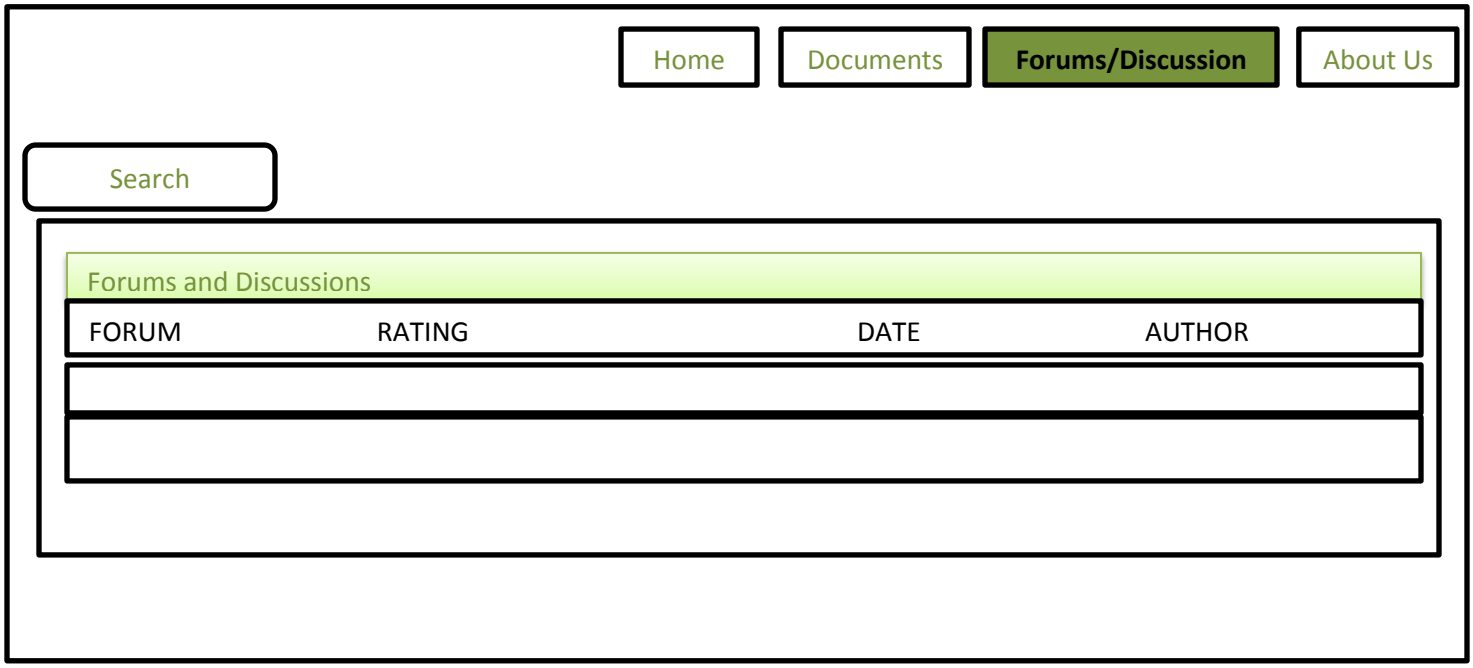
- **Table 2:** Technologies supporting Knowledge management Systems
- **Table 3 :** Degrees of internalization of Wiig Model

Appendix D: Module Structures

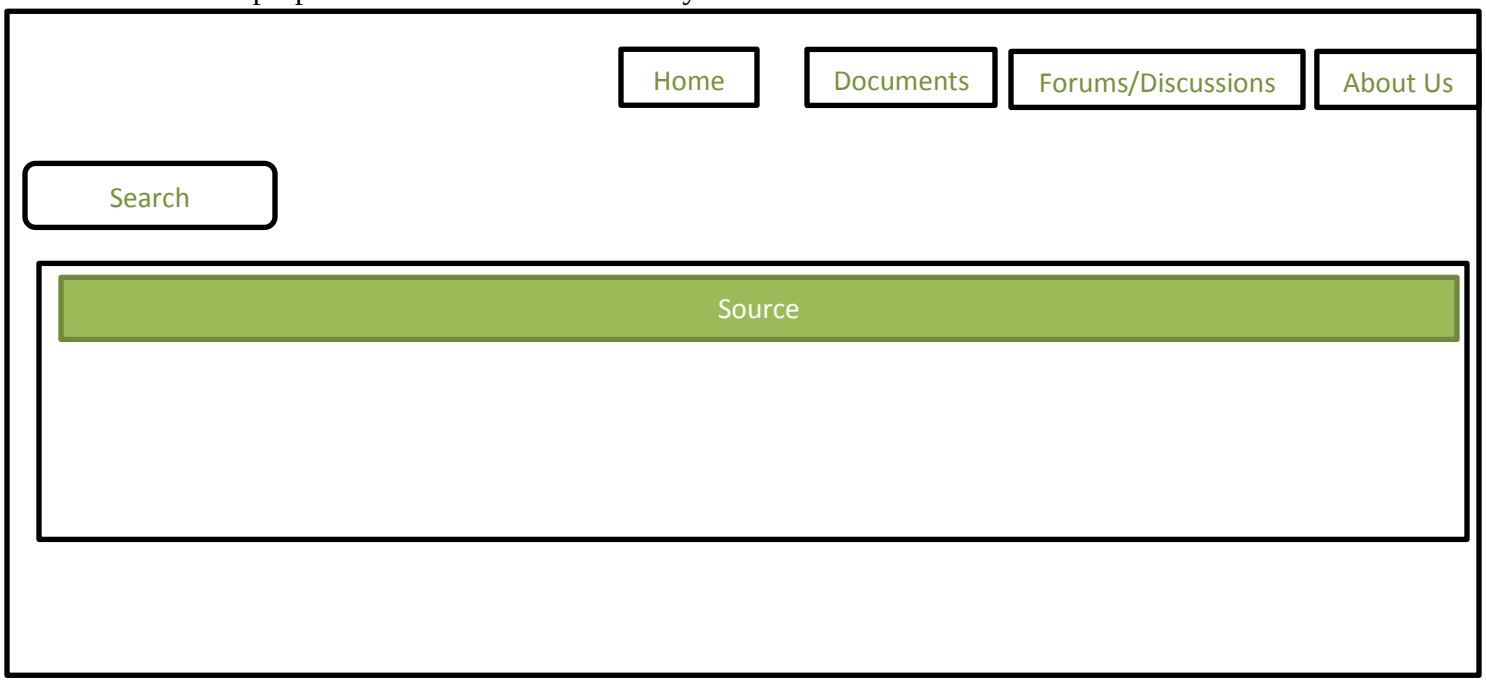
Forums Module:

Below is the proposed Forums window.



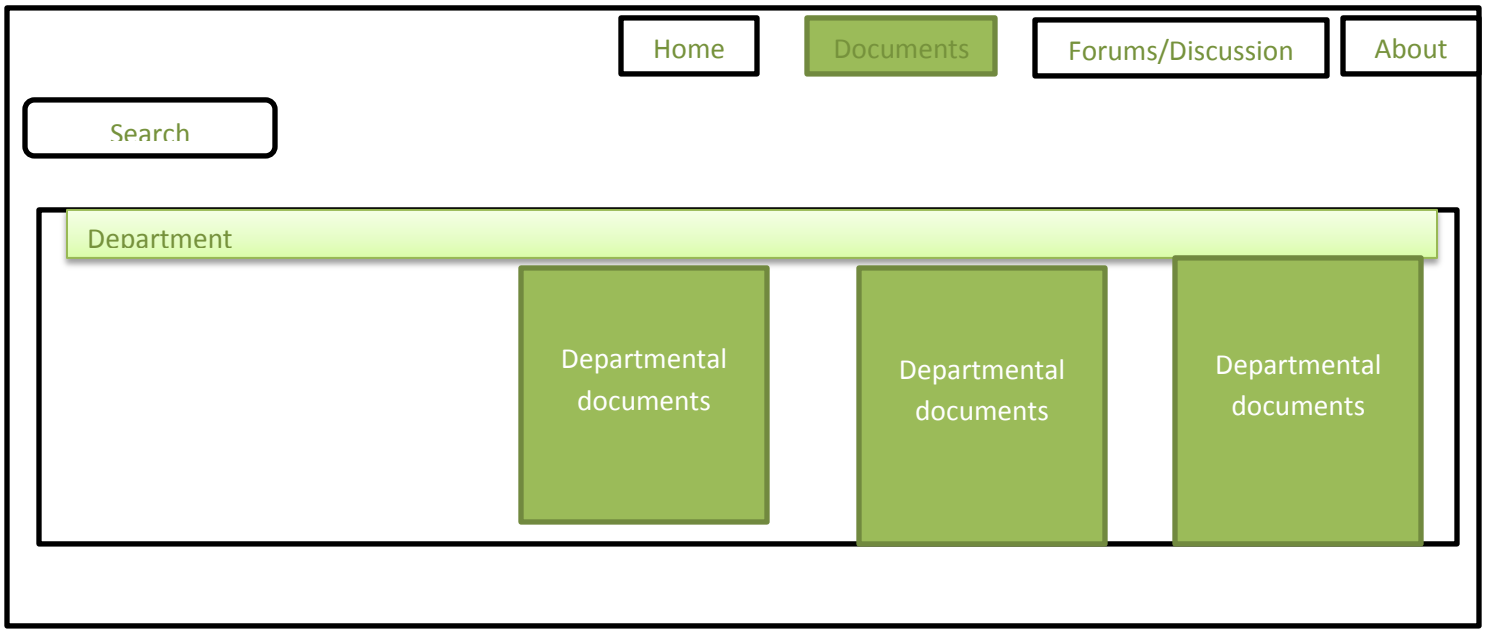
Articles Module:

Below is the proposed articles window in the system.



Documents Module

Below is the proposed Documents module window:



APPENDIX: E

Tabitha Mbete Ngei

P.O. Box 1913-00100

Nairobi.

Dear Sir/ Madam,

RE: REQUEST FOR DATA COLLECTION FOR RESEARCH STUDY

I am a student at the University of Nairobi, pursuing a Masters degree in Computer Science. As part of the requirements, am expected to do undertake a research project and submit before my graduation.

I have chosen to research on Knowledge Management Systems focusing on Nairobi City Water and Sewerage Company. My aim is to look understand how your organization manages knowledge and propose a web-based system to help you do that. It is in this view that I have put together a questionnaire to help me achieve this objective. Kindly allow me to carry out my study within your organization. All the information collected will be used solely for the purpose of this study.

Thank you for your kind consideration

Kind Regards

Tabitha Mbete Ngei

APPENDIX F: SAMPLE CODE

Loggin in code

```
<?php session_start(); ?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
 "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
 <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en" >

<title>login</title>
<head>
<link      rel="stylesheet"      href="knowledge.css"      media="all"
type="text/css" />
</head>

<body>
 <div id = "banner"><p></p>

 </div>

 <div id = "menu">

 </div>

 <div id = "mainContainer">

  <div id = "mainContentArea">
  <div id = "login">
       <form method="post" action="kw_transact_user.php">
<h1>Member Login</h1>
<p>
Email Address:<br>
<input type="text" name="email" maxlength="255" value=""/>
</p>
<p>
Password:<br>
```

```
<input type="password" name="passwd" maxlength="50"/>
</p>
<p>
<input type="submit" class="submit" name="action" value="Login"/>
</p>
<p>
Not a member yet?<br> <a href="useraccount.php">Create a new
account!</a>
</p>
<p>
<a href="forgotpass.php">Forgot your password?</a>
</p>
</form>
      </div>
  </div>

 </div>

  </body>
</html>
```

Code for searching

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
 "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
 <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en" >
 <title>Knowledge-ProtoType</title>
<head>
 <link rel="stylesheet" href="knowledge.css" media="all"
type="text/css" />
</head>


<body>
```

```
<div      id="aDefinition"   style="top:1px;   left:1px;   width:65px;
height:40px; padding:6;"class="infoboxstyle">
Read more about the systems the company deployed such as Perpay, CMS
and MMRS among others.
</div>

<div id="nav-menu">
 <div id="main-menu">
<ul>
<li><a href="kw_index.php">Home</a></li>
<li><a href="">Documents</a></li>
<li><a class="active" href="forums.php">Forum|Discussion</a></li>
<li><a href="#">About Us</a></li>
</ul>
</div>
<div id="navright">
<form method="get" action="kw_forumSearch.php">
<input id="searchkeywords" type="text" name="keywords"
<?php
if (isset($_GET['keywords']))
{
echo ' value="' . htmlspecialchars($_GET['keywords']) . '" ';
}
?>
>
<input id="searchbutton" class="submit" type="submit" value="Search">
</form>
</div>
</div>

<div id="content">
      <div id="container">

    </div>

      <div id="mini-content1">
```

```
     <div id="bar-one">ICT Department
     </div>

 <?php
 require_once 'kw_conn2.php';
 require_once 'know_outputs.php';
 $result = NULL;
if (isset($_GET['keywords']))
{
$sql = "SELECT id_forum FROM kw_forums WHERE MATCH (title,section)
AGAINST ('" . $_GET['keywords'] . "' IN BOOLEAN MODE) " .
"ORDER BY MATCH (title,section) AGAINST ('" . $_GET['keywords'] . "'
IN BOOLEAN MODE) DESC";

$result = mysql_query($sql, $conn) or die('Could not perform search; '
. mysql_error());
}
echo "<h1>Search Results</h1>\n";
if ($result and !mysql_num_rows($result))
{
echo "<p>No articles found that match the search terms.</p>\n";
}
else
{

       $row1 = mysql_fetch_array($result);
       $art = $row1['id_forum'];
        $sql = "SELECT ar.*, usr.first_nm FROM kw_forums ar LEFT OUTER
JOIN kw_users usr ON ar.id_author = usr.id_user WHERE ar.id_forum =
$art";
       $result2 = mysql_query($sql,$conn);
        echo "<table border='1' width = '970'>
 <tr>
 <th>Forum</th>
 <th>Posts</th>
 <th>Date</th>
```

```
 <th>Author</th>
 </tr>";

  while($row3 = mysql_fetch_array($result2)) {
  echo "<tr>";
  echo   "<td><a   href=\""   .      $row3['id_forum']   .   "\">   "   .
htmlspecialchars($row3['title']) . "</a></td>";
  echo "<td>" . htmlspecialchars($row3['comments']) . "</td>";
  echo "<td>" . htmlspecialchars($row3['date_submitted']) . "</td>";
  echo "<td>" . htmlspecialchars($row3['first_nm']) . "</td>";
  echo "</tr>";
  }
  echo "</table>";
}

  ?>

    </div>

</div>

<div id="footer">
<p>&copy;Tabitha 2014</p>
</div>

</body>
</html>
```