

**INFORMATION AND COMMUNICATION TECHNOLOGY AND
KNOWLEDGE MANAGEMENT AT WORLD AGROFORESTRY
CENTER (ICRAF) IN KENYA**

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**A MANAGEMENT RESEARCH PROJECT SUBMITTED IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD
OF THE DEGREE OF MASTERS OF BUSINESS ADMINISTRATION,
SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI**

NOVEMBER 2014

DECLARATION

I declare that this is my original work and has not been presented for a degree in this or any other university.

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ACKNOWLEDGEMENTS

First and foremost, I want to give my thanks to Almighty God. I want to extend my heartfelt gratitude to my supervisor Mr. J.T Kariuki for guiding me through the project phase of my studies, all my lecturers and staff of University of Nairobi for their support and contribution in this project, my family for their valuable advice, the entire staff at World Agroforestry Centre (ICRAF) for taking time to fill in information that I needed.

DEDICATION

I dedicate this project to my family who supported me in all regards through my personal development. Thank you for believing in me.

ABSTRACT

The recent past has seen a growing interest in knowledge management and use of Information and Communication Technologies (ICT). In the process of creating, accumulating and disseminating knowledge, Information and Communication Technologies (ICT) plays a very important part. The objective of the study was to determine the role ICT has played in enhancing knowledge management at ICRAF and challenges the organization faces in knowledge management. The study employed descriptive survey design in which primary data was collected using questionnaires. The collected data was analyzed using SPSS. Using primary data collected from 125 employees at the headquarters in Nairobi Kenya, the researcher found that more than three quarters of ICRAF staff understood what knowledge management is and that they are aware that the processes of capturing, cataloguing, storing and sharing on information are paramount to preserving institutional memory. There was a prevalence of use of ICT in managing knowledge with more than half of the knowledge in the organization originating from ICT based sources and a similar portion of information and knowledge in the organization stored in ICT based systems. The study established that ICT has a major influence on knowledge management practices in the organization with systems being well integrated and information found to be up to date and trusted. The research identified poor organization structure, poor organization incentives in staff compensation and recognition, inadequate organizational learning, insufficient staff training and awareness and poor time management as major challenges to knowledge management at ICRAF. The study recommends that training staff on IT systems and introducing incentives to organization learning will contribute towards the success of knowledge management in the institution. The study also recommends that introducing a networked organization structure will improve communication among staff and improve trust. Integration of ICT in each of the knowledge management processes will foster and sustain knowledge management in the organization in the long run.

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LIST OF ABBREVIATIONS

CGIAR	Consultative Group on International Agricultural Research
DBMS	Database Management Systems
HR	Human Resources
ICRAF	International Centre for Research in Agroforestry
ICT	Information Communication and Technology
IT	Information Technology
KM	Knowledge Management
NGOs	Non-Governmental Organizations
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The world today is driven by a knowledge economy, run by knowledge workers and as the world's economy grows exponentially, the knowledge gained becomes invaluable to the organizations (Ghoshal, 2002). Top performing global companies such as Microsoft and Toyota and local ones such as Safaricom and Equity Bank have achieved their market position due to their capability to implement systems to harness and manage their knowledge. In such companies, knowledge is a recognized and well managed asset, which is given priority in all organizational functions. With most organizations investing in Information Communication and Technology (ICT) it is evident that getting information is no longer a problem, thus the biggest challenge facing organizations today is figuring out how to capture, store, retain, and share knowledge (Maier, 1997). Cameron (2000) noted that knowledge is power, but without adequate management of that knowledge, the consequences for organizations could be devastating. Information Communication and Technology (ICT) can be a helpful tool for effective knowledge management and can facilitate knowledge transfer in both time and space dimensions (Shahid, 2011). According to Hendricks (1999) ICT can significantly impact knowledge management in organizations by enhancing the knowledge sharing, storage and creation process.

1.1.1. Information Communication and Technology

Jobs in recent years have been transformed to knowledge work with the staff being referred to as knowledge workers (Ghoshal, 2002). This means that people's jobs depend more on their knowledge than their manual skills. Consequently creating and sharing knowledge are among the most crucial activities of every person in every single field. Dealing with knowledge is the main theme of Knowledge Management (KM), technology plays a significant role in KM as it disseminates knowledge from one person to another with the help of networks and other systems which are being used in organizations these days. Information, Communication and Technology (ICT) can be defined as technologies that

facilitate communication, processing and transmission of information by electronic means (Davies, 2006). The adoption and use of ICT to enhance and facilitate KM has brought to focus the urgent need to come out with new methods, tools and techniques in the development of KM system frameworks, knowledge processes and knowledge technologies to promote effective management of knowledge for improved service deliveries. ICT enables and provides the infrastructure and tools to support knowledge management and thus a crucial asset in the success of KM (Hendriks, 2001). The studies by Ruggles, (1997) and Scott, (2000) associated knowledge management with the development of ICT. They revealed how new technologies are able to influence the traditional ways of understanding organizational behaviors and their effect on how organizations tackle the challenges of managing knowledge in a knowledge society. According to Duffy (2001) Information systems can directly influence the knowledge management processes and also indirectly affect knowledge management by affecting factors such as structure and culture which, in turn, influence knowledge management.

1.1.2. Knowledge Management

Knowledge has been described as information combined with experience, context, interpretation, and reflection (Polanyi, 1966). Knowledge can be classified into two types, tacit and explicit knowledge (O'Dell & Grayson, 1988). Tacit knowledge consists of all the intangible elements, it is the unwritten, unspoken knowledge that is gathered through one's emotions, experiences, insights, intuition, observations and internalized information. This type is difficult to write down or transfer, for example, emotional intelligence or body language. Explicit knowledge on the other hand is a tangible type such as codified knowledge formalized in physical form, such as that found in documents and databases. Both explicit and tacit knowledge must create returns and solve today's problems within an organization.

Knowledge Management (KM) is a new field that emerged 15 to 20 years ago when it was realized that organizations were unable to fully utilize the knowledge they possessed. It was through KM that firms acquired this vital asset and harnessed it in order to cost effectively manage innovation, decision making and problem solving needed to maintain and develop a competitive edge. Therefore, Knowledge Management is defined as a

discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving and sharing all of an enterprise's information and knowledge assets (Duhon, 1988). Information assets are those resources such as databases, documents, policies and procedures while knowledge assets are previously un-captured expertise and experience in individual's workers minds.

Knowledge management practices are already active in the present day with most organizations having repositories of knowledge in form of business processes, best practices, management information systems, culture and norms (IMKA, 1990). However in most organizations, knowledge is unrecognized, uncatalogued and difficult to access but with revolution of technology, the growth of the knowledge management industry has increased, therefore refining the processes of creation, collection, organizing, storing and sharing of knowledge.

1.1.3 World Agroforestry Center (ICRAF)

The World Agroforestry Center (ICRAF) is a Consultative Group on International Agricultural Research (CGIAR) Consortium Research Centre. ICRAF's headquarter is in Nairobi, Kenya, with five regional offices located in Cameroon, India, Indonesia and Peru. The center's vision is a rural transformation in the developing world as smallholder households strategically increase their use of trees in agricultural landscapes to improve their food security, nutrition, income, health, shelter, social cohesion, energy resources and environmental sustainability. The Centre's mission is to generate science based knowledge about the diverse roles that trees play in agricultural landscapes, and to use its research to advance policies and practices, and their implementation that benefit the poor and the environment. This is achieved through building livelihoods by generating knowledge, choice and opportunities, improving landscapes and their sustainability and by transforming agroforestry impacts to large-scale through policy, innovations and partnerships.

Knowledge Management (KM) is an integral part of ICRAF's corporate strategy and is clearly defined in one of its six operational goals. Towards enhancing accessibility of its science and knowledge management, ICRAF formed a Knowledge Management unit in

June 2012 to provide knowledge sharing and support services to the Center. The KM unit brings new accessibility, tagging and cross-referencing approaches to the knowledge base of the Centre and focuses on connecting people to people, people to content and content to content. Knowledge management at ICRAF seeks to distill and synthesize explicit and tacit knowledge, strengthen knowledge management in the science domains and regional offices, facilitate KM skills development for ICRAF staff, and set up an ICT-based knowledge platform for recording, storing, retrieving, and sharing knowledge within and outside ICRAF. Despite these efforts by management, there are still knowledge management challenges faced by the institution.

1.2 Statement of the problem

The principal goal in knowledge management is to generate and share knowledge more efficiently in an organization. Organizations must identify and engage various practices to make this knowledge more available and ensure workers have access to it. Knowledge capital that firms accumulate is a strong strategic issue and thus management of knowledge assets has become crucial (Jean-Louis, 2010). Dunford (2000) in his study on various consulting firms, found that one of the primary issues was to ensure that organizations come up with knowledge sharing incentives to encourage knowledge transfer between employees. This indicated that knowledge transfer is a fundamental part of knowledge sharing and that for knowledge capital to be built, organizations need to share knowledge and transfer this knowledge within organizational networks (Hassan et al. 2006, Armbrrecht et al. 2001, Kwak et al. 2004). In order to manage knowledge effectively, organizations should create a knowledge sharing culture consisting of trust, firms should emphasize trust to people and to knowledge content (Huang, 2010). Khoda et al. (2012) in his study on knowledge management in the wildlife conservation sector in Kenya, established that knowledge sharing and standardization of technology and procedures for information transfer is important for strategic decision making. The case study by Makenzie (2010) on health care organizations established that knowing where to find useful data can help health institutions deliver better services to the public. Establishing systematic and organization-wide systems and letting other knowledge workers know what data was available can improve service delivery tremendously. The studies on global consulting firms and local

ones on wildlife sector and healthcare organizations in Kenya show that there is a lack of a knowledge management framework within which corporate knowledge management policies on creating, storing, and sharing information is based. While firms use both ICT and non-ICT based methods for disseminating knowledge and information, ICT plays an important role in capturing, processing, managing, and disseminating information. Therefore, assessing the influence of ICT in knowledge management in the context of an institution's culture, structure and infrastructure will identify gaps that exist in achieving the full potential of using these ICT-based KM systems.

ICRAF is a knowledge organization, and organizational learning and knowledge management are critical functions in the delivery of the strategy. However, despite the organization setting up a knowledge management unit, KM is still a challenge with a wanting knowledge warehouse such that knowledge does not stay within the organization when staff members change departments or leave. There is a gap between people and people, people and content, content and content. This is a key issue affecting ICRAF presently and forms part of the knowledge management problems currently experienced.

The study therefore sought to investigate the effect of ICT on knowledge management at World Agroforestry Centre (ICRAF) in Kenya guided by the following questions:

1. Has ICT enabled knowledge management at ICRAF?
2. What challenges is ICRAF facing managing its knowledge?

1.3 Research Objectives

The research objectives were;

- a. To investigate if ICT has enabled Knowledge Management at ICRAF.
- b. To determine the challenges faced in knowledge management at ICRAF.

1.4 Value of the study

The study produced evidence-based and methodological assessment of the importance of ICT in enabling knowledge management at ICRAF. This will help management in their decision making and consequently assist in reducing the gap currently felt between people

and access to knowledge content thus improving productivity between the Center's knowledge workers.

The study can serve as a source of literature for future researchers looking into broader questions of knowledge management in non-profit research organizations like ICRAF. Other stakeholders may find materials in this study useful in developing policies in knowledge management in their organizations.

In conclusion, the study will generate greater awareness among non-governmental organizations on the importance of having a proper knowledge management framework and the possible benefits of ICT on organization's success and sustainable growth in the ever changing economy that is the world today.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents past studies on Information Communication and Technology (ICT) and knowledge management in organizations. It also explores the theoretical foundation fronted by various authors in relation to knowledge management (KM) and ICT.

2.2 Information and Communications Technology

Adeya (2002) defines Information and Communication Technologies (ICTs) as ‘electronic means of capturing, processing, storing and disseminating information’ embedded in networks and services that affect the local and global accumulation and flows of public and private knowledge. A significant part of an individual’s working and personal time is spent recording, searching for, and absorbing information so for quality information to be availed easily, an information system is necessary ((Lucas, 1987). According to Olson and Gordon (1998), quality information is the most vital tool for decision making, people collect data, record it and manipulate it in various ways to produce meaningful information to make the right decisions.

Different information systems influence organizations in different ways. Gillet (1976) recognised that ICT plays a crucial role in the field of research and development with the improvement of the digital computer credited with the rapid growth of operational research. Muchiru (2003), established that ICT has played a major role in changing the way of work in manufacturing industries in Kenya where he noted that ancient procedures that were used in the production and distribution of goods and services have been drastically replaced with new and more efficient ones in line with customer requirements. Wambugu (2010) on the impact of ICT on commercial banks, found that ICT was a key tool in service delivery, one which has reduced congestion in banking halls significantly. She also noted that ICT facilitated the introduction of new delivery channels in the form of ATMs, Mobile Banking, Electronic Cash Transfers and the like. She concludes that the efficiency brought about by

ICT in banks has enabled easy access to customers and staff records, data on assets of the organization as well as in the front office operations.

Since ICT has had a lot of impact in many organizations, different functions in an organization adopt and apply ICT in different speeds and to different extents. Lelei (2007) found that there is a gradual process of embracing ICT and may take several years for all functions of an organization to exploit it at an equal level. He also noted that not all organizations achieved their ICT goals due to high cost of implementation, high cost of ICT staff, resistance to change, high expectations from ICT and other vested interests.

2.3 Knowledge Management

The strategic management of knowledge is of great significance to the success of any organization. Bell (1999) found that in today's knowledge economy, organizations are more and more aware of the need for a knowledge focus in their organizational plans. A study by Beijerse (1997) showed that only 20% of the knowledge in a company was in use and that, 60% of the company's finances were spent on a yearly basis reinventing things that already existed. Thus, successful incorporation of knowledge management is crucial to a company's productivity as people understand better how to use knowledge and have more influence on knowledge creation. Creation of new knowledge by combining knowledge with resources as well as a change in organizational structure and culture can enhance an organization's performance (Armbrecht, et al., 2001).

Dunford (2000) stated that knowledge management in an organization has the ability to lower cost, offer superior service, increase workforce efficiencies and improve decision making. He noted that knowledge sharing seems to be one of the main practices of knowledge management which involves the use and creation of value from organizational knowledge.

One of the considerations in establishing an organizational knowledge management strategy is the type of focus or orientation it has. In general, there are two broad approaches to knowledge management. Mason and Pauleen (2003) identified one approach that focuses on the 'hard' aspects of knowledge management while the other looks at the 'soft'

aspects of it. They found that the ‘hard’ aspect of knowledge management looks at the deployment and use of ICT systems to enable knowledge management activities within the organization. The goal of this ‘hard’ approach to knowledge management is to increase access to knowledge through enhanced methods of access and reuse through hypertext linking, databases and searches (Malhotra, 2000, Tiwana, 2000; Turban & Aronson, 2001). New information technologies like networks, groupware, data mining and data warehouses are key solutions that drive this approach (Sveiby, 1997, Tiwana, 2000). The ‘hard’ view is based on the idea that voluminous amounts of knowledge harnessed through technology will make knowledge management work in the organization (Malhotra, 2000; Sveiby, 1997; Tiwana, 2000; Turban & Aronson, 2001).

The soft approach, also known as the human strategy, emphasizes knowledge sharing via interpersonal interaction. According to Mason & Pauleen, (2003) this strategy utilizes dialogue through social networks including professional groups and teams. It helps share knowledge through person-to-person contacts. The goal of this strategy is to attempt to acquire internal and opportunistic knowledge and to share it informally (Tiwana, 2000).

It is argued that both the “soft” and “hard” aspects are crucial for organizations to survive in competitive and continuously changing global business markets (Hlupic et al., 2002). In a nutshell, effective KM requires a holistic approach that addresses the culture, structure and people. Evidently, Choi et al (2008) determined that if organizations want to succeed in carrying out knowledge management practices, they should consider both social and technical drivers for effective KM implementation.

2.4 ICT Contribution to Organization Knowledge Management

Since the early days, the use of ICT for knowledge management (KM) has been stressed. However, studies have shown that there were a few researchers who disagreed on the effect of ICT on KM. Holsapple (2005) argued that KM was strictly a human and social phenomenon. He viewed KM to be about human relationships, interpretations, processes, resources, and culture. He came up with the exclusive perspective which argued that KM has little or nothing to do with technology and ICT is only concerned with information or data, but never with knowledge. However, the exclusive perspective ignored other

important long recognized abilities of ICT such as storage, generation, application, and distribution activities of KM (Newell, 2003). Lamporoulis (2007), in his study on several organizations, revealed that technology is vital for all knowledge processes and that employees see technology as an enhancer in their efforts to produce knowledge. He concluded that technology had a role to play in KM by facilitating quick and easy knowledge retrieval. KPMG (2000) surveyed 423 organizations in the UK, mainland Europe and the US and found that 93% of them used ICT as a main knowledge sharing facilitator. Further studies have shown that technology allows national and intra-organizational sharing (Tushman, 2004), provides tools for executing different tasks and creates a unified managerial system for knowledge transfer (Katz et al, 2009). This proves that technology is a major driving force in the diffusion of knowledge management ideas (Cabrera, 2002)

Haridía (2013) studied the role of ICT in KM in India and found that although India is a developing country, organizations have seen the importance of KM and have invested in ICT infrastructures to facilitate it. However, investment in ICT is not enough, since organizations must also be IT competent. Gunasekaran et al (2001) defines IT competency as how the firm uses ICT to satisfy the firm's information needs. He differentiated IT competency into IT knowledge, IT operations, and IT infrastructure. All three aspects must be present for firm to achieve IT competency for KM. India's organizations are competent in IT and thus KM practices are highly adopted and widely practiced.

In Kenya, ICT impact on knowledge management has been felt immensely. In the agricultural sector, the Kenya Agricultural Information Network (KAINet) was formed with the sole purpose of consolidating agricultural data and information to promote information exchange and access among stakeholders in the agricultural sector. Its vision is to make public domain agricultural information and knowledge in Kenya accessible to all. In order to achieve this, the network has established a national electronic repository base to ensure consistency in agricultural information. They have built institutional ICT strategies as a priority for all information and knowledge sharing activities under KAINet.

A study by Ujunju (2012) on the role of ICT support towards processes of KM in institutions of higher learning, revealed that ICT use in management is highly embraced and this improves KM practices. This positive acceptance by staff on embracing ICTs in their duties, simplifies work and makes it easier for universities' staff to enjoy their work and hence generate quality decisions for the running of their universities. Another study by Odongo (2013) comparing knowledge management practices in the rural agricultural setting in Kenya, revealed that although face to face interactions dominate knowledge dissemination, the use of mobile phones and radio to transfer the knowledge has increased. Agricultural information is now being disseminated through short message systems by extension agents and farmers associations. She identified information needs and infrastructure as important factors which influence use of ICT for knowledge management among the small holder farmers.

For ICT to be effective in knowledge management, it must be integrated in all of KM's processes. The framework developed by Berger (1999), showed there are four knowledge processes active in an organization that ICT can play a role in. The first, knowledge creation involves developing new content or replacing existing content with the firm's tacit and explicit knowledge (Pentland, 1997). Berger (1999) stated that by providing a forum for interaction among organizational members through computer mediated communication such as social media it could increase interaction among organizational members for sharing ideas, establishing dialog, eventually enabling individual to arrive at new insights or more accurate interpretations than if left to crack information on their own.

The second process is knowledge storage/retrieval also classified as organizational memory (Stein et al, 1995). Empirical studies have shown that organizations create knowledge and learn but also lose track of the knowledge acquired (Hendriks, 2001). Knowledge repositories provide what might be termed as the 'long-term memory' of organizational knowledge management systems. Tools such as data warehouses, content and document management systems, database management systems (DBMS) and query languages are effective tools in storing and accessing organizational memory.

The next process is knowledge transfer. Singley (1989), defined transfer at the individual level as how knowledge acquired in one situation applies (or fails to apply) to another. Knowledge transfer can happen at different levels in an organization, between individuals, groups and the whole organization. Individuals contact within an organization is usually limited to immediate co-workers, thus expanding one's connections to a bigger network is central to the knowledge diffusion process as they are exposed to new ideas (Robertson et al 1996). As communication lies at the heart of a knowledge transfer process, ICT can improve the efficiency by increasing the speed of transfer, removing barriers, providing access to information, improving processes and locating knowledge carriers and seekers (Hendricks, 1999). Tools used in knowledge transfer include intranets, extranets, web servers, browsers, knowledge repositories, portals; and communication and collaboration technologies such as email, telephones, internet telephone, fax machines, chat rooms and video conferencing (Fei, 2011) These tools create a forum that facilitates contact between the people seeking knowledge and those with access to the knowledge.

Finally for knowledge to be practical it has to be applied. Knowledge application deals with the understanding and use of it in a way that will improve the strategic decision making of a firm. An important aspect of the knowledge-base theory of the firm is that competitive advantage resides in the application of knowledge and not in the knowledge itself (Grant, 1996) ICT can support knowledge application by embedding knowledge into organization culture and norms. Organization procedures can be changed so that systems become part of organizational routines.

2.5 Knowledge Management Challenges

One of the major knowledge management challenges is embedding KM into organizational culture. Culture can prevent people from sharing and disseminating their know-how in an effort to hold onto their individual viability. Staff members may regard others in a competitive way therefore tend to hoard their uniquely possessed knowledge at the expense of sharing. They may also look suspiciously at the knowledge shared by others and be unwilling to learn. Therefore, building trust, supporting open dialogue and teamwork is the first step to effective KM (Ford, 2001).

Capturing formal and informal aspects of knowledge and storing them as part of organizational memory is a big issue. Davenport et al. (1998) argued that most employees get information from other channels apart from IT systems. He stated that two-thirds of employee information is gotten via face to face or phone conversations and the remaining through documents outside the organizations that are not usually in a computer system. Hence a number of specific policy areas regarding articulation and codification of tacit knowledge into explicit knowledge so that it can form a repository of corporate memory need to be addressed by ICT. Creating a best practice of capturing knowledge and reusing it within the organization is a key issue. Organizations can establish a culture of encouraging employees to store useful email content within a central knowledge base. There are various tools that can be integrated with email systems to capture email interactions and share knowledge on email content.

Organization structure can impede success of KM in organizations. The structures should be in line with the organizational vision, mission and goals; and encourage organizational learning as well as support personal interactions of employees through effective communication (Anantatmula, 2009). A team based, non-hierarchical, self-organizing organizational structure is the most effective way for knowledge sharing (Gold et al 2001). Claver-Cortés et al (2001) found that flexible organisational structures play an important role in successful KM implementation by decentralizing the decision making process through facilitating communication processes across all organisational levels. Wang et al (2007) noted that the structure of knowledge-based organizations must be created in higher levels of structural dimensions. This level includes trust-based relationship, externally-oriented interactive relationship, emotionally- inclusive relationship.

Lack of institutional capacity and trained human resources that can disseminate knowledge quickly is a hindrance to the efficiency of KM. Employees create knowledge within the organization and a significant part of the organizational knowledge is saved in their minds thus a small change in their task positions can impose a fundamental effect on its total performance (UN, 2008). In order to stay ahead in the market, firms need to identify the core competencies or integrated skill sets that distinguish them from competitors and add value to their customers (Bohlander, 2001).

The choice and design of technology tools to be used in KM is a big challenge. No single technological package is able to cover all needs of a knowledge management system (Hahn & Wang, 2007). Firstly, knowledge systems rely on sophisticated infrastructure such as massive databases and fast networks in order to be effective. Connectivity issues and inadequate computer equipment can hinder advancement of KM (Kenny et al. 2000). Secondly, ICT systems have to be well designed and user-friendly to simplify knowledge diffusion. A study done by Davenport et al. (2000) found that people working in an ICT setting by default are keener to adopt computers as a means for knowledge sharing. Thus, technology can be accepted for KM use if it is a function of perceived relevance, system accessibility, and management support (Ericsson & Avdic, 2003). Bridging the gap between ICT and human behavior is a challenging task in KM (Wang et al. 2007) as the system's success or failure is dependent on the employees' acceptance of it, as well as their motivation to implement it.

A study done by Mosoti et al (2010) on knowledge management in Kenya revealed that KM, though practiced is not well understood by organizations. The findings indicated that most of the challenges faced by organizations in Nairobi are on to creation and implementation of KM Practices as part of organizational culture, organizational strategy and organizational structure. Though most organizations confirmed that they use IT, it was noted that there is need for a synergy with other enablers of KM such as organizational culture, organizational strategy and organizational structure. Yusuf et al (2014) researched on KM practices in the national treasury in Kenya. The study revealed that organizational structures in the government are hierarchical thus hindering the sharing of information, and the existing organizational culture does not encourage sharing among employees. Furthermore, inadequate skills in information technology and computer networks to facilitate sharing of knowledge hindered knowledge management practices efforts and lack of defined responsibilities for knowledge management (KM) initiatives affected execution of KM in organizations.

Mararo (2013) conducted a study to find out if insurance companies in Kenya are using knowledge management tools as a means of attaining competitive advantage in the industry. It was discovered that although policies and procedures for knowledge retention

existed, the management of most firms had not fully embraced it in their cultures, thus the KM tools are underutilized and undervalued and as such are not effective helping firms gain competitive advantage in the insurance industry.

Another study of knowledge management and performance of commercial banks in Kenya by Maseki (2012) revealed that the banking industry has well established knowledge systems. Management have embedded KM practices in all processes of the organization from human resources to product development and service delivery. This has enabled the industry to respond faster to emerging business issues, create new business opportunities easily and improve business processes.

Knowledge management in Kenya has yet to reach its prime. Industries operating in a volatile environment with a rapidly changing and high level of competition like the banking industry have adopted KM in their practices. Although this adoption is also seen in other industries, there is evidence that organization culture hinders the effectiveness of KM in organizations in Kenya. Organizational politics, ethnic diversity, emotions and values do not favor organizations in Nairobi to capture tacit knowledge and transform it to explicit knowledge (Mosoti et al 2010).

2.6 Theoretical foundation of the study

This study is based on three main theories namely complexity theory, knowledge based theory of the firm and diffusion of innovations theory.

Complexity theory states that critically interacting components self-organize to form evolving structures showing a hierarchy of emergent system properties. It attempts to demonstrate why the whole universe is greater than the sum of the parts and how all its components come together to produce order as the system learns, evolves and adapts (Barclay & Dann, 2001) . A study done by Barclay et al (2001) applied complexity theory in knowledge management practice by showing that the KM environment is an active one that learns, adapts and evolves as development proceeds. According to Bodhanya's (2009) it was observed that part of this complexity was on how an employee can follow his own agenda but add to the organizations knowledge structures. From this, he concluded that,

organizations and its agents are in a constant process of evolution therefore understanding the relationship between the whole system and its parts as it changes is vital. In summary complexity theory has led to knowledge strategies shifting from an ordered, rational, analytical and fixed approach to a self-organizing, learning, adapting and evolving dynamic approach.

The knowledge based theory of the firm according to Grant (1996), argues that the primary role of the firm is the coordination of knowledge through instruments such as routines and group problem solving. He further adds that, employees are constantly generating and sourcing knowledge but for it to make an impact on organizational performance, it needs to impact on organizational capabilities such as decision making and problem solving. There is need to understand the processes through which the firms access and utilize their knowledge possessed by their employees. As proposed by Nonaka (2000), knowledge acquired needs to be shared widely within the organization, stored as part of the company's knowledge base and finally utilized by those engaged in new products and technologies.

The diffusion of innovations theory (Rogers, 2003) claims that media and interpersonal contacts provide information that influences a person's opinion and judgment. Rogers's theory highlights the significance of understanding an organizations culture and information infrastructures to manage knowledge management challenges. He defines diffusion as the communication on innovation through certain channels over time among users of a social system. It is the decision within a company to make use of a new idea that characterizes innovation diffusion adoption. Knowledge based diffusion in an organization is a process where complex knowledge, ideas and processes are bundled together in certain ways such that technology suppliers can provide solutions to organizational problems (Newell, 2003). It is through this process that the right information is disseminated to the right person at the right time. Knowledge can be diffused through dialogue, decision, manuals and electronic methods. This diffusion depends on the interpretation and communication by the various stakeholders involved in a way that meaning and validation of the knowledge itself is not lost (Martinez-Brawley, 2009). The theory therefore demonstrates that communication links and acquisition of knowledge to integrate and deploy technology play a central role in organizational knowledge management.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents details of the research methodology that was used in conducting the study. It explains the research design, research population, data collection and data analysis.

3.2 Research Design

The study adopted a descriptive survey design. Descriptive study was chosen as it is usually the best method for describing the characteristics of the population and present a picture of the specific details within the social setting of the organization without manipulating the environment.

3.3 Population of the Study

The population of the study consisted of all employees of ICRAF headquarters in Kenya. There were 125 employees at the head office in Nairobi. Given the number of employees at the head office, no sampling was conducted.

3.4 Data Collection

The study used primary data, which was collected directly from the respondents through the use of a questionnaire. The questionnaire which had both closed and open ended questions was administered via email to all employees. The questionnaire had four sections. Section A gathered bio data of the respondents, section B collected knowledge management practices in the organization, section C collected information on use of ICT in knowledge management at ICRAF, and the last section gathered knowledge management challenges.

3.5 Data Analysis

Descriptive statistics were used to analyze quantitative data. Coding was done in SPSS, analyzed and the output presented in frequencies, percentages, mean scores and standard deviation (SD) using tables. For qualitative responses, content analysis was used.

The following model was used to rate the mean scores of the Likert scale responses by coding at a scale of five.

Coding

5 - Very large extent	5 – Strongly Agree
4 - Large extent	4 - Agree
3 - Moderate extent	3 - Neither agree nor disagree
2 - Small extent	2 - Disagree
1 - Very small extent	1 - Strongly disagree

Answer Options		Mean Score
Very small extent to small extent	Disagree to Strongly disagree	1 to 2.4
Moderate extent	Neither agree nor disagree	2.5 to 3.5
Very large extent to large extent	Strongly Agree to Agree	3.6 to 5.0.

Factor analysis was performed on the knowledge management challenges identified in the study to produce small number of factors.

The researcher also conducted a chi square test to determine if there was any significant difference in the knowledge management challenges experienced among the different ages, departments and positions of employees in ICRAF.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

The analysis and interpretation of the data for this study were guided by the objectives of the study. The purpose of the research was to determine the influence of Information Communication and Technology on Knowledge Management at World Agroforestry Centre (ICRAF) in Kenya.

4.2 Response rate

Out of the 125 questionnaires administered, 82 responded. This translates into a response rate of 66%. Mugenda and Mugenda (1999) indicate that a 50% response rate is adequate whereas 60% is good and 70% is excellent.

4.3 Demographic Characteristics

To understand the demographic characteristics of the respondents, data was analyzed in terms of gender, age, years of service, and positions in the organization.

4.3.1 Distribution of respondents by gender

Table 4.1 shows that 59% of the respondents were female.

Table 4.1. Distribution of respondents by gender

Gender	Frequency	Percent
Male	34	41%
Female	48	59%
Total	82	100%

Source: Research Data (2014)

4.3.2 Distribution of respondents by age

The majority of respondents were aged 31 and 40 years at 43% while minority 7% were aged over 50 as shown in Table 4.2.

Table 4.2 Distribution of respondents by age

Age bracket	Frequency	Percent
20 – 30 years	32	39%
31 - 40 years	35	43%
41 - 50 years	9	11%
Over 50 years	6	7%
Total	82	100%

Source: Research Data (2014)

4.3.3 Distribution of respondents by years of experience

On the number of years of experience at ICRAF, the results showed that 41% of respondents had experience of 5 – 10 years. This shows that the respondents have had a good exposure to the working culture at ICRAF. They were thus appropriate in providing data relevant for the study. Results are shown in Table 4.3.

Table 4.3 Distribution of respondents by years of experience

Years of experience	Frequency	Percent
Less than 5 years	29	35.37%
5 to 10 years	34	41.46%
10 to 15 years	13	15.85%
More than 15 years	6	7.32%
Total	82	100%

Source: Research Data (2014)

4.3.4 Distribution of respondents by department

Majority of the respondents were from the research programs at 43% while the least were from Audit 2% as shown in Table 4.4. This showed that the data collected had a good representation from each department.

Table 4.4 Distribution of respondents by department

Departments	Frequency	Percent
Research Programs	35	43%
IT	10	12%
Finance	7	9%
Operations	10	12%
Communications	6	7%
HR	8	10%
Internal Audit	2	2%
Program development	4	5%
Total	82	100%

Source: Research Data (2014)

4.3.5 Distribution of respondents by position

The respondents were asked to indicate their position in the organizational hierarchy. The bulk of the respondents, 51% were in the operational level. The results are shown in Table 4.5.

Table 4.5 Distribution of respondents by position

Position	Frequency	Percent
Senior Management	9	11%
Administrator	20	24%
Head of Department	11	13%
Operational level	42	51%
Total	82	100%

Source: Research Data (2014)

4.4. KM practices at ICRAF

The responses on the definition of the term knowledge management, indicated that 76.5% of the respondents have a basic understanding of KM and the processes of capturing, cataloguing, storing and sharing expertise that are part of Institutional memory. The results are shown in Table 4.6.

Table 4.6 Knowledge Management definition

Knowledge Management definition	Frequency	Percent
Advancement of ICT	5	5.9%
Relevant information gathered from everyday activities	12	14.7%
Data and Information collected by the organization.	2	2.9%
Process of capturing, cataloguing, storing and sharing expertise that are part of Institutional memory	63	76.5%
I do not know	0	0.0%
Total	82	100%

Source: Research Data (2014)

4.5. Sources of Acquisition of Knowledge

The respondents were asked to indicate the extent to which four sources of knowledge were used in the organization. A weighted mean scale of 1 to 5 was used to make the interpretations.

Table 4.7 Sources of Acquisition of Knowledge

	N	Very Large Extent %	Large extent %	Moderate extent %	Small extent %	Very Small extent %	Mean	SD
Knowledge gained comes from searching the Internet, or through DVDs/CDs, or other ICT-supported sources	82	30.8	38.5	20.5	7.7	2.6	3.9	1.0
Staff acquire most of their knowledge by talking to fellow colleagues.	82	23.1	35.9	33.3	7.7	23.1	3.5	0.9
Staff get most of their knowledge by talking to experts outside the organization	82	10.3	30.8	35.9	15.4	7.7	2.7	1.1
Staff refer to books or publications in the library for sources of knowledge.	82	15.4	23.1	38.5	20.5	2.6	2.6	1.1

Source: Research Data (2014)

The results in Table 4.7 indicate that cumulatively 69.3% of the respondents get their knowledge from searching the Internet, or through DVDs/CDs, or other ICT-supported to a very large and large extent which averaged a score of 3.9 while the least extent referred

to books or publications in the library averaging 2.7. This means that ICT supported sources are a preferred source of knowledge in the organization. This supports Newell (2003) who revealed that knowledge acquisition, if aided by ICT, facilitates innovation and provides a forum for interaction among members.

4.6 Documentation of Information and Knowledge at ICRAF

To gain an insight on the main knowledge carriers at ICRAF, five storage media were identified to which the respondents were asked to indicate the extent each applied. Views were collected by ranking responses at a scale of five starting with very large extent to small extent as shown in Table 4.8.

Table 4.8 Documentation of Information and Knowledge

	N	Very Large Extent	Large extent	Moderate extent	Small extent	Very Small extent	Mean	SD
Information present in ICRAF is stored mostly on paper reports/files	82	12.8%	33.3%	35.9%	17.9%	12.8%	3.2	0.9
Information present in ICRAF is on people's minds	82	7.9%	18.4%	42.1%	26.3%	5.3%	2.8	1.0
Information present in ICRAF is found on social networks	82	5.3%	18.4%	36.8%	21.1%	18.4%	2.5	1.1
Information available in ICRAF is stored in company databases	82	34.2%	44.7%	18.4%	0%	2.6%	3.9	0.8
Information available in ICRAF is on Electronic media (cds, dvds and hard drives)	82	31.6%	34.2%	28.9%	5.3%	0%	3.7	0.9

Source: Research Data (2014)

The results indicate that collectively 78.9% of information present in the organization is stored in company's databases to a very large and large extent with an average of 3.9. Knowledge was found to be stored to a moderate extent on social networks (2.5), people's minds (2.8) and on paper reports/files (3.2). This shows that ICRAF prefers to use ICT to store information and knowledge. Hendricks (2011) noted that ICT based repositories are

preferred because they provide the long term memory of an institution. He found that databases are effective tools in storing and accessing organizational memory.

4. 7 Knowledge Management Environment at ICRAF

An evaluation of the current knowledge management practices at ICRAF revealed the level of agreement attached to each of statements of the current knowledge management environment as shown in Table 4.9.

The following statements had a mean of 3.6 to 5.0 hence were agreed upon; knowledge management is a collaborative effort in the organization where people can share information freely, knowledge management practices in the organization goes beyond IT to include a people-centric dimension and employees take responsibility for their own learning. In addition it was agreed that the organization provides an empowering environment for improving working knowledge of staffs, sharing tacit knowledge such as know-how and experience dominates knowledge management in the organization. The respondents also agreed that knowledge management in the organization consists of activities that transform unwritten or unspoken information into useful institutionalized knowledge and the organization includes knowledge management activities in all employees' job descriptions, key result areas or key performance indicators. Similarly there was a general consensus that people are responsive (e.g. emails and voice mail get answered in a timely manner, sharing formal, codified knowledge dominates knowledge management in the organization and privacy privileges encourage people to share knowledge.

There was neutral agreement on the fact that the organization has incentive programs which specify rewards for knowledge efforts in projects and in general (mean=3.5) and employees have unrestricted access to crucial information (mean=3.4).

These findings indicate that the knowledge management environment at ICRAF is favorable. This is evidenced by studies in the literature review that revealed that organizational structures enable knowledge sharing (Gold, et al, 2001). ICRAF has a flexible structure allowing sharing of information freely within the organization. Other

factors such as institutional capacity and trained human resources are also contributors to the success of KM in organizations (Bohlander, 2001). ICRAF has incorporated KM into employee's job descriptions and key result areas ensuring that organization provides an empowering environment for improving working knowledge of staff.

It is also seen from the responses that ICT can directly influence the knowledge management processes in this case answering emails on time and also indirectly affect knowledge management by affecting factors such as structure and culture which, in turn, influence knowledge management (Duffy, 2001).

Table 4.9 Knowledge management practices

	N	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Mean	SD
Knowledge management is a collaborative effort in ICRAF where people can share information freely.	82	31.6%	42.1%	26.3%	0%	0%	4.2	0.9
Knowledge management practices in ICRAF goes beyond IT to include a people-centric dimension.	82	23.7%	50.0%	18.4%	5.3%	2.6%	4.1	0.8
Employees take responsibility for their own learning.	82	47.4%	31.6%	18.4%	2.6%	0%	4.0	1.0
ICRAF provides an empowering environment for improving working knowledge of staffs.	82	18.4%	39.5%	28.9%	7.9%	5.3%	4.0	0.7
Sharing tacit knowledge such as know-how and experience dominates knowledge management in ICRAF.	82	21.1%	31.6%	44.7%	2.6%	0%	3.9	0.9
Knowledge management in ICRAF consists of activities that transform unwritten or unspoken information and into useful institutionalized knowledge.	82	31.6%	28.9%	39.5%	0%	0%	3.9	0.9
ICRAF includes knowledge management activities in all employees' job descriptions, key result areas or key performance indicators.	82	21.1%	55.3%	23.7%	0%	0%	3.8	0.8
People are responsive (e.g. emails and voice mail get answered in a timely manner)	82	15.8%	50.0%	28.9%	5.3%	0%	3.7	0.8
Sharing formal, codified knowledge dominates knowledge management in ICRAF.	82	13.2%	31.6%	47.4%	7.9%	0%	3.7	0.8
Privacy privileges encourage people to share knowledge.	82	21.1%	23.7%	34.2%	15.8%	5.3%	3.6	1.1
ICRAF has incentive programs which specify rewards for knowledge efforts in projects and in general.	82	15.8%	47.4%	28.9%	7.9%	0%	3.5	0.8
Employees have unrestricted access to crucial information	82	34.2%	36.8%	23.7%	2.6%	2.6%	3.4	1.2

Source: Research Data (2014)

4.8. ICT use in Knowledge Management at ICRAF

The respondents were asked to indicate whether they use ICT to share knowledge. The results are shown in Table 4.10.

Table 4.10 Use of ICT in Knowledge Management

Answer Options	Frequency	Percent
Yes	82	100.0%
No	0	0.0%
Total	82	100.0%

Source: Research Data (2014)

It was reported that 100% of the staff use ICT for knowledge sharing. This means that ICT is a vital tool for knowledge sharing at ICRAF.

4.8.1. ICT tools in knowledge management

In this section, the researcher assessed the usage of ICT tools for performing each of the knowledge management processes of capturing, storing, sharing and application of knowledge. The results are as shown in Table 4.11.

Table 4.11 Use of ICT tools in knowledge management

	N	Very Large Extent (%)	Large extent (%)	Moderate extent (%)	Small extent (%)	Very Small extent (%)	Mean	SD
In ICRAF, ICT tools are used to capture knowledge. (Video recordings, Audio recordings, Soft notes)	82	50	36	11.	2.8	0	4.3	0.8
People use IT tools to store information within ICRAF. (Databases, Physical drives, dropbox etc)	82	50	27	19.	2.8	0	4.2	0.7
IT tools are used for collaborative work/communication (e.g. calendars, video conferencing systems, communication tools) as a means of transferring knowledge	82	52	36	11.	0	0	4.4	0.8
IT tools are embedded into work routines and best practice for knowledge management within ICRAF.	82	52	27	19	0	0	4.2	0.9

Source: Research Data (2014)

The results indicated that collectively, 88.6% of IT tools are used for collaborative work and communication (mean=4.4), 86.1% to capture knowledge (mean=4.3) and 77.8% of IT tools are used to store information (mean=4.2) to a very large and large extent. It also indicated that 79.2% of IT tools are embedded into ICRAF work culture and work routines to a very large and large extent (mean=4.2). This means that ICRAF relies heavily on ICT to carry out knowledge management processes of capturing, storing, sharing and applying knowledge. Systems have become part of work procedures and subsequently a part of ICRAF's culture and norms. As evidenced by Lamporoulis (2007), technology is vital for all knowledge processes and that employees see technology as an enhancer in their efforts to produce knowledge. This proves that ICT is a major driving force in the diffusion of knowledge management in organizations.

4.8.2 IT competency at ICRAF

The respondents were asked to indicate their level of agreement with 7 statements that explored the current IT knowledge, IT operations and IT infrastructure at ICRAF. The results were shown in Table 4.12.

Table 4.12 IT competency at ICRAF

	N	Strongly agree (%)	Agree (%)	Neither or agree disagree (%)	Disagree (%)	Strongly disagree (%)	Mean	SD
ICT infrastructure (intranet, internet) is a big enabler to knowledge management.	82	77.8	19.4	2.8	0	0	4.7	0.5
Organizational e-learning is a big enabler to knowledge management.	82	41.7	44.4	11.1	2.8	0	4.2	0.8
IT systems within ICRAF have up to date information.	82	41.7	41.7	13.9	2.8	0	4.2	0.8
Information residing in ICT systems is trusted.	82	27.8	52.8	16.7	2.8	0	4.1	0.8
IT knowledge sources are well integrated.	82	30.6	44.4	19.4	5.6	0	4.0	0.9
IT tools at ICRAF are simple to use and have a user friendly interface.	82	30.6	55.6	8.3	5.6	0	4.1	0.8
IT systems provide easy access to information.	82	36.1	52.8	2.8	5.6	2.8	4.1	0.9

Source: Research Data (2014)

All these statements scored a mean between 3.6 and 5.0, indicating there was an agreement that ICT infrastructure and organizational knowledge are a big enabler to knowledge management. There was also an agreement that IT systems within ICRAF have up to date information, information residing in ICT systems is trusted, IT tools at ICRAF are simple to use and have a user friendly interface, IT systems provide easy access to information and IT knowledge sources are well integrated. This points out that ICRAF has invested in systems that are acceptable to the general population. ICRAF staff find ICT systems valuable in their day to day work and can use the information stored in them confidently. Gunasekaran et al (2001) revealed that IT competency has a direct effect on the processes of knowledge management: knowledge generation, knowledge transfer, and knowledge storage. By being IT competent ICRAF can obtain quality information and measure it in terms of accuracy, reliability, precision, and timeliness, and use it decision making.

4.8.3 Knowledge sharing tools at ICRAF

An assessment of the preferred means of knowledge sharing in the organization was done and the results tabulated in Table 4.13.

Email, journals and reports, internal databases, face to face conversations, intranet, telephone calls, virtual meetings, and portals all with a mean falling between 3.6 and 5.0 were found to be used to large extent to share knowledge in the organization. However, chat rooms and social media are used to a moderate extent to share knowledge within the organization with a mean of 2.5 and 3.5 respectively. The results show that ICT tools dominate knowledge sharing in the organization. Hendriks (2001) noted communication lies at the heart of the knowledge sharing process, and as such, ICT can improve the efficiency of communication by increasing the speed of transfer, providing access to information and improving the process of locating knowledge carriers and seekers. People prefer to use ICT to transfer knowledge because systems create a forum that facilitates contact between people seeking knowledge and those with access to knowledge. The results support KPMG (2000) whose survey of different European companies found that 93% of them used ICT as a main knowledge sharing facilitator. This shows that that technology allows organizational sharing (Tushman, 2004), provides tools for executing different tasks and creates a unified managerial system for knowledge transfer (Katz et al,

2009) further supporting that ICT is indeed a major driving force for knowledge management processes.

Table 4.13 Knowledge sharing tools

	N	Very Large Extent	Large extent	Moderate extent	Small extent	Very Small extent	Mean	SD
Internal database are used to share knowledge within ICRAF.	82	36.1%	44.4%	13.9%	5.6%	0%	4.1	0.9
Chat rooms to transfer knowledge gained within ICRAF	82	8.3%	38.9%	30.6%	8.3%	13.9%	3.2	1.2
People use telephone calls to gather/share knowledge within ICRAF.	82	22.2%	38.9%	30.6%	8.3%	0%	3.7	0.9
Internet is used by staff to share knowledge in ICRAF.	82	38.9%	38.9%	22.2%	0%	0%	4.2	0.8
Staff use email to transfer knowledge within.	82	44.4%	44.4%	11.1%	0%	0%	4.3	0.7
Departments have portals/wikis which they use to share knowledge.	82	19.4%	36.1%	30.6%	11.1 %	2.8%	3.6	1.0
Social media is the preferred means of sharing knowledge in ICRAF	82	13.9%	25.0%	13.9%	33.3 %	13.9%	2.9	1.3
Intranet is used to transfer knowledge in ICRAF	82	33.3%	33.3%	16.7%	11.1 %	5.6%	3.8	1.2
Virtual Meetings are used as a means of knowledge sharing.	82	19.4%	44.4%	27.8%	5.6%	2.8%	3.7	0.9
Journals and reports are used to share knowledge within ICRAF.	82	41.7%	44.4%	5.6%	8.3%	0%	4.2	0.9
Face to Face conversations are used to share knowledge	82	30.6%	36.1%	25.0%	5.6%	2.8%	3.9	1.0

Source: Research Data (2014)

4.9 Knowledge Management Challenges at ICRAF

To identify the challenges of knowledge management in the organization, the respondents were asked to rate sixteen identified factors which hinder knowledge management. The results in Table 4.14 show that of the challenges identified, lack of time to share knowledge, insufficient capture of information, lack of communication, low contact time and interaction between knowledge sources and recipients, hierarchical structures, low awareness of recorded knowledge, high turnover of highly skilled staff, lack of training on new IT systems and processes, poor verbal communication, lack of familiarity and experience of IT systems, poor written communication, employee's ignorance as to what technology can do and cannot do and lack of trust in people were agreed as a hindrance to knowledge management with all laying between 3.6 to 5.0 mean scores.

There was neutral agreement that lack of technical support (mean=3.5), differences in education levels (mean=3.5) and incompatibility of technology to user needs (mean=3.1) are a challenge to knowledge management in the organization.

Table 4.14 Knowledge Management Challenges

		N	Strongly agree (%)	Agree (%)	Neither agree or disagree (%)	Disagree (%)	Strongly disagree (%)	Mean	SD
1	Lack of time to share knowledge hampers knowledge management.	82	31.4	51.4	14.3	2.9	0	4.1	0.8
2	Hierarchical structures are an inhibitor to knowledge sharing in ICRAF.	82	20	60	17.1	2.9	0	4	0.7
3	Knowledge management in ICRAF is hindered by insufficient capture of information.	82	34.3	42.9	20	2.9	0	4.1	0.8
4	Lack of communication holds back knowledge management in ICRAF.	82	40	31.4	20	8.6	0	4	1
5	Low contact time and interaction between knowledge sources and recipients is a barrier to knowledge management in ICRAF.	82	34.3	42.9	14.3	8.6	0	4	0.9
6	Poor written communication hinders knowledge transfer in ICRAF.	82	22.9	34.3	28.6	14.3	0	3.7	1
7	Poor verbal communication hinders knowledge transfer in ICRAF.	82	20	42.9	22.9	14.3	0	3.7	1
8	Differences in education levels obstruct knowledge transfer in ICRAF.	82	22.9	34.3	20	20	2.9	3.5	1.1
9	Knowledge sharing and transfer in ICRAF is hampered by lack of trust in people.	82	11.4	57.1	17.1	8.6	5.7	3.6	1
10	Lack of technical support obstructs knowledge management work procedures and communication flows in ICRAF.	82	25.7	25.7	31.4	11.4	5.7	3.5	1.2
11	Knowledge sharing practices in ICRAF is hampered by incompatibility of technology to user needs.	82	8.8	41.2	23.5	8.8	17.6	3.1	1.3
12	Knowledge management in ICRAF is hindered by employee's ignorance as to what technology can do and cannot do.	82	20	45.7	17.1	14.3	2.9	3.7	1.1
13	Lack of familiarity and experience of IT systems is a barrier to knowledge management in ICRAF.	82	20.6	44.1	20.6	11.8	2.9	3.7	1
14	Knowledge management in ICRAF is hindered by lack of training of new IT systems and processes.	82	20.6	47.1	20.6	8.8	2.9	3.7	1
15	High turnover of highly skilled staff is a barrier to Knowledge management in ICRAF.	82	26.5	41.2	17.6	11.8	2.9	3.8	1.1
16	Low awareness of recorded knowledge restricts knowledge transfer in ICRAF.	82	20.6	50	26.5	2.9	0	3.9	0.8

Source: Research Data (2014)

Additional analysis was done on the knowledge management challenges. Factor analysis was performed with Kaiser's rule of retaining factors with eigenvalues larger than 1.00 used as the default. Table 4.15 lists the Eigen values associated with each factor. Eigen values greater than 1 were extracted to give five main factors.

Table 4.15. Eigen Values

Component	Eigenvalues		
	Total	% of Variance	Cumulative %
1	5.565	34.784	34.784
2	1.817	11.354	46.138
3	1.752	10.951	57.089
4	1.579	9.868	66.957
5	1.011	6.317	73.274
6	.885	5.529	78.803
7	.731	4.570	83.374
8	.612	3.824	87.197
9	.572	3.577	90.775
10	.425	2.656	93.430
11	.387	2.420	95.851
12	.251	1.566	97.417
13	.184	1.149	98.566
14	.107	.668	99.234
15	.088	.549	99.783
16	.035	.217	100.000

Source: Research Data (2014)

Varimax rotation with Kaiser Normalization was performed on the components converging in 13 iterations to produce the matrix in Table 4.16.

Table 4.16. Rotated Component Matrix

	Component				
	1	2	3	4	5
Lack of time to share knowledge hampers knowledge management.					.87
Hierarchical structures are an inhibitor to knowledge sharing in the organization.	.58				
Knowledge management in the organization is hindered by insufficient capture of information.	.81				
Lack of communication holds back knowledge management in the organization.	.75				
Low contact time and interaction between knowledge sources and recipients is a barrier to knowledge management in the organization.	.68				
Poor written communication hinders knowledge transfer in the organization.	.66				
Poor verbal communication hinders knowledge transfer in the organization.		.70			
Differences in education levels obstruct knowledge transfer in the organization.			.82		
Knowledge sharing and transfer in the organization is hampered by lack of trust in people.		.55	.61		
Lack of technical support obstructs knowledge management work procedures and communication flows in the organization.			.70		
Knowledge sharing practices in the organization is hampered by incompatibility of technology to user needs.					
Knowledge management in the organization is hindered by employee's ignorance as to what technology can do and cannot do.			.73		
Lack of familiarity and experience of IT systems is a barrier to knowledge management in the organization.				.80	
Knowledge management in the organization is hindered by lack of training of new IT systems and processes.				.72	
High turnover of highly skilled staff is a barrier to Knowledge management in the organization.		.79			
Low awareness of recorded knowledge restricts knowledge transfer in the organization.				.76	

Source: Research Data (2014)

Using the component scores, the five factors were grouped and represented as follows

Factor 1

- Hierarchical structures are an inhibitor to knowledge sharing in the organization.
- Knowledge management in the organization is hindered by insufficient capture of information.
- Lack of communication holds back knowledge management in the organization.
- Low contact time and interaction between knowledge sources and recipients is a barrier to knowledge management in the organization.
- Poor written communication hinders knowledge transfer in the organization.

This factor represented poor organization structure.

Factor 2

- Poor verbal communication hinders knowledge transfer in the organization.
- Knowledge sharing and transfer in the organization is hampered by lack of trust in people
- High turnover of highly skilled staff is a barrier to Knowledge management in the organization.

This factor represented poor organization incentives in staff compensation and recognition.

Factor 3

- Differences in education levels obstruct knowledge transfer in the organization.
- Lack of technical support obstructs knowledge management work procedures and communication flows in the organization.
- Knowledge management in the organization is hindered by employee's ignorance as to what technology can do and cannot do.

This factor represented inadequate organizational learning

Factor 4

- Lack of familiarity and experience of IT systems is a barrier to knowledge management in the organization.
- Knowledge management in the organization is hindered by lack of training of new IT systems and processes.
- Low awareness of recorded knowledge restricts knowledge transfer in the organization.

This factor represented insufficient staff training and awareness.

Factor 5

- Lack of time to share knowledge hampers knowledge management.

This factor represented poor time management.

The result of the factor analysis found that factors hindering the success of knowledge management at ICRAF were reduced to the following five significant factors; poor organization structure, poor organization incentives in staff compensation and recognition, inadequate organizational learning, insufficient staff training and awareness and poor time management.

Further analysis was done to see if there was any significant difference on the demographic categories in regard to knowledge management challenges experienced. A chi square test was performed and no relationship was found between department, age, position of the respondents and each of the knowledge management challenges as the significant value p was greater than 0.05 in each case. It is convention that if this value is less than 0.05, then the statistic is considered to be significant. This test confirms that all staff regardless of age, position or department experience the same knowledge management challenges and recommendations suggested should span across all of these categories.

The results are shown in Table 4.17 where df = degree of freedom and p = significant value.

Table 4.17: Chi square test

Demographic	Department			Age			Position		
	Value	<i>df</i>	<i>p</i>	Value	<i>df</i>	<i>p</i>	Value	<i>df</i>	<i>p</i>
Lack of time to share knowledge hampers knowledge management.	31.86	21.00	0.06	6.88	9.00	0.65	22.34	9.00	0.06
Hierarchical structures are an inhibitor to knowledge sharing in the organization.	28.67	21.00	0.12	4.56	9.00	0.87	11.88	9.00	0.22
Knowledge management in the organization is hindered by insufficient capture of information.	28.65	21.00	0.12	18.07	9.00	0.03	6.30	9.00	0.71
Lack of communication holds back knowledge management in the organization.	17.22	21.00	0.70	7.32	9.00	0.60	7.34	9.00	0.60
Low contact time and interaction between knowledge sources and recipients is a barrier to knowledge management in the organization.	26.87	21.00	0.18	2.84	9.00	0.97	7.83	9.00	0.55
Poor written communication hinders knowledge transfer in the organization.	23.12	21.00	0.34	9.92	9.00	0.36	11.20	9.00	0.26
Poor verbal communication hinders knowledge transfer in the organization.	14.81	21.00	0.83	4.40	9.00	0.88	6.32	9.00	0.71
Differences in education levels obstruct knowledge transfer in the organization.	21.59	28.00	0.80	11.68	12.00	0.47	10.21	12.00	0.60

Demographic	Department			Age			Position		
	Value	<i>df</i>	<i>p</i>	Value	<i>df</i>	<i>p</i>	Value	<i>df</i>	<i>p</i>
Knowledge sharing and transfer in the organization is hampered by lack of trust in people.	32.57	28.00	0.25	6.97	12.00	0.86	14.22	12.00	0.29
Lack of technical support obstructs knowledge management work procedures and communication flows in the organization.	28.90	28.00	0.42	9.75	12.00	0.64	7.10	12.00	0.85
Knowledge sharing practices in the organization is hampered by incompatibility of technology to user needs.	24.54	28.00	0.65	13.76	12.00	0.32	7.28	12.00	0.84
Knowledge management in the organization is hindered by employee's ignorance as to what technology can do and cannot do.	21.86	28.00	0.79	9.89	12.00	0.63	15.56	12.00	0.21
Lack of familiarity and experience of IT systems is a barrier to knowledge management in the organization.	29.46	28.00	0.39	13.76	12.00	0.32	10.96	12.00	0.53
Knowledge management in the organization is hindered by lack of training of new IT systems and processes.	32.15	28.00	0.27	11.99	12.00	0.45	7.47	12.00	0.82
High turnover of highly skilled staff is a barrier to Knowledge management in the organization.	29.42	28.00	0.39	8.45	12.00	0.75	13.28	12.00	0.35
Low awareness of recorded knowledge restricts knowledge transfer in the organization.	22.48	21.00	0.37	7.76	9.00	0.56	8.12	9.00	0.52

Source: Research Data (2014)

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the summary of the key data findings, conclusions, recommendations, limitations of the study, and also makes suggestions for further research.

5.2 Summary

The research study was aimed at determining if ICT has enabled knowledge management at ICRAF and identifying the challenges faced by the organization in managing knowledge. There was a 66% response rate which was rated a good response. The data indicated that indeed knowledge management practices are in place within ICRAF and are being used to drive the knowledge management agenda further. Results from the data collection indicated that there is a prevalence of use of ICT in managing knowledge.

The study found that 76.5% of ICRAF staff understood what knowledge management is and that they are aware that the processes of capturing, cataloguing, storing and sharing on information are paramount to preserving institutional memory.

On sources of knowledge in the organization, it was evident that ICT supported sources dominated over face to face conversations and books in this process of knowledge acquisition with 69.3% of knowledge originating from ICT based sources. This is of course supported by the fact that 78.9% of information and knowledge in the organization is stored in ICT systems and equipment such as databases and electronic media.

The knowledge management environment at ICRAF was found to be conducive for sharing information. With 73.7% staff agreeing that there it is a collaborative effort with everyone's involvement. Management support was also seen to boost this empowerment with 76% of the employees agreeing that KM is included in employee's job descriptions and key result areas. Because of this support, individual learning at 79% and people's responsiveness in sharing information at 65% had been realized in the organization.

100% of the staff we found to be using ICT for sharing knowledge. This is an indication that ICRAF relies heavily on ICT to promote management of knowledge within its employees. The study found that IT tools were largely used to capture, store and share knowledge, revealing that ICT was utilized in all processes of knowledge management.

Individual barriers to knowledge management such as such as lack of time to share, lack of trust, poor communication and low awareness on reduced knowledge dominated the general population. There was a strong consensus that organizational barriers such as lack of technology training, high turnover of skilled staff, hierarchical structures and insufficient capture of information in the organization were making knowledge management difficult. The study also identified technology barriers such as incompatibility of technology to user needs, lack of technical support and lack of familiarity with the systems to which the population agreed were a big challenge to knowledge management. Overall the five major factors that pose a challenge to knowledge management at ICRAF were poor organization structure, poor organization incentives in staff compensation and recognition, inadequate organizational learning, insufficient staff training and awareness and poor time management.

5.3 Conclusions

From the study it can be concluded that ICRAF staff are very informed on knowledge management, its practices and processes. ICRAF endeavors to create an environment in which learning can take place and in which exchange of knowledge and information is possible. The environment that ICRAF encourages creation, sharing and transfer of knowledge.

ICRAF relies heavily on ICT to carry out knowledge management processes of capturing, storing, sharing and applying knowledge with most tools used for these processes being ICT based. ICRAF is IT competent with good infrastructure to enable knowledge transfer through emails and storage through databases. IT systems are also well integrated with users being able to find information easily. Knowledge available in the organization is trusted and up to date. On the contrary, while the organization is well equipped with modern equipment and systems, staff are not aware of the capability of these systems. They

seem to be underexploiting them and are not familiar with how the systems work or how to fully utilize them for their day to day work.

ICT has a major influence on knowledge management practices in the organization. The codification of knowledge in information systems, databases and knowledge repositories does not guarantee efficient KM, but has a potential to influence it in a positive way. It is important to notice that ICT coupled with organizational elements such as organization structure, staff incentive and training, trust and organization culture is an enabler of a better collaboration among people in the organization, motivation of people in the organization and the processes of the organization.

5.4 Recommendations

To reduce the organizational barriers identified, the study recommends training of staff on systems, the information and knowledge available in the organization and how to access it easily. Training should also be done on how to utilize the resources at their disposal to manage knowledge in their departments. Staff should further be encouraged to learn skills that will enable them to exploit the ICT tools fully to their advantage in managing knowledge within the organization. Information in the institution should be made easily accessible.

Technology barriers to knowledge management can be reduced by involving staff in the design and deployment of technology. This will significantly reduce their incompatibility of their technology to their needs.

Communication and contact time should be encouraged through social networks and informal gatherings to boost trust hence makes knowledge sharing easier between people. For example having coffee breaks once a week to enable face to face conversations between all staff or planning functions where staff can bring their families helps build trust and ease any tension between them and will create a more relaxed work environment conducive for knowledge sharing. Social media can be included as an official communication medium for staff announcements.

Organization incentives can be introduced such that the organization rewards and differentiates employees fairly for the value they create. Appreciating employees' skills and rewarding them either monetary or otherwise for their knowledge efforts will boost their communication, trust and morale subsequently reducing the high turnover of skilled staff currently experienced in the organization.

The organization structure should be networked to provide opportunities for employees to interact and communicate with others, and support knowledge related actions. Organization structure should be able to handle tacit knowledge, and change it into explicit knowledge if necessary.

Organizational learning can be improved by allowing study leave for staff to further their studies. HR incentives such as a staff development fund to finance studies can be introduced. This will encourage staff to go back to school and raise their education levels to that of their peers.

Poor time management can be reduced by training staff on how to prioritize their work. Employees should take it on themselves to distinguish between urgent and important tasks and plan their work around them.

There is need for ICRAF management to embrace ICT at greater levels if it is to reduce knowledge management challenges and realize the full benefits of knowledge management. Integration of ICT in each of the KM processes will foster and sustain knowledge management in the organization in the long run.

5.5 Limitations of the Study

The study used the survey questionnaire as the only data collection instrument. There was no attempt to triangulate data from other sources such as secondary data. Future studies could attempt the cross verification by use of multiple sources and further extend the study.

5.6 Recommendation for Further Research

The study was designed as a case for ICRAF and data was gathered using questionnaire. With research institutions being purely knowledge oriented, future studies could focus on a number of research organizations in Kenya using multiple data collection approaches which can be qualitatively and quantitatively analyzed in order to test the effect of ICT on knowledge management.

ICRAF being an agricultural research organization, further studies can be done to establish how knowledge generated inside the organization is shared and transferred to the farmer using ICT enabled means.

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Appendices

Appendix I: Questionnaire.

Part A. Background Information

1. What is your gender? Male Female
2. What is your Age?
 20 – 30 years Over 50 years
 31 - 40 years 41 - 50 years
3. How many years of experience do you have working in ICRAF?
 Less than 5 years 5 to 10 years
 10 to 15 years. More than 15 years
4. What department do you work in?
 Research Programs IT
 Finance Operations
 Communications HR
 Internal Audit Program development
5. What is your position?
 Senior Management Administrator
 Head of Departments Operational level

PART B: Knowledge Management practices at ICRAF.

6. What do you understand by the term Knowledge Management (KM)?
 Advancement of ICT
 Relevant information gathered from everyday activities
 Data and Information collected by ICRAF.
 Process of capturing, cataloguing, storing and sharing expertise that are part of Institutional memory.
 I do not know
7. To what extent do you rate the following with regards to sources of knowledge at ICRAF?

	Very Large Extent	Large Extent	Moderate extent	Small extent	Very Small extent
Staff refer to books or publications for sources of knowledge.					
Staff get most of their knowledge by talking to experts outside ICRAF					
Staff acquire most of their knowledge by talking to fellow colleagues.					
Knowledge gained comes from searching the Internet, or through DVDs/CDs, or other ICT-supported sources					

8. To what extent do you rate the following with regards to main knowledge carriers (Carry most information/knowledge) in ICRAF?

	Very Large Extent	Large Extent	Moderate extent	Small extent	Very Small extent
Information present in ICRAF is stored mostly on paper reports/files					
Information present in ICRAF is on people's minds					
Information present in ICRAF is found on social networks					
Information available in ICRAF is stored in company databases					
Information available in ICRAF is on Electronic media (cds, dvds and hard drives)					

9. To what extent do you agree or disagree with each of the following statements on the current knowledge management environment at ICRAF?

	Strongly agree	Agree	Neither Agree or Disagree	Disagree	Strongly disagree.
Knowledge management practices in ICRAF goes beyond IT to include a people-centric dimension.					
Knowledge management in ICRAF consists of activities that transform unwritten or unspoken information and into useful institutionalized knowledge.					
Knowledge management is a collaborative effort in ICRAF where people can share information freely.					
Privacy privileges encourage people to share knowledge.					
Sharing formal, codified knowledge dominates knowledge management in ICRAF.					
Sharing tacit knowledge such as know-how and experience dominates knowledge management in ICRAF.					
ICRAF provides an empowering environment for improving working knowledge of staffs.					
ICRAF includes knowledge management activities in all employees' job descriptions, key result areas or key performance indicators.					

ICRAF has incentive programs which specify rewards for knowledge efforts.					
Employees have unrestricted access to crucial information					
People are responsive (e.g. emails and voice mail get answered in a timely manner)					
Employees take responsibility for their own learning.					

PART C: ICT use in Knowledge Management at ICRAF.

10. Do you use ICT in Knowledge sharing?
 Yes
 No

If you answer is no please explain why-----

11. To what extent does the following statements apply in day to day work within ICRAF?

	Very Large Extent	Large Extent	Moderate extent	Small extent	Very Small extent
In ICRAF ICT tools are used to capture knowledge. (Video recordings, Audio recordings, Soft notes)					
People use IT tools to store information within ICRAF. (Databases, Physical drives, dropbox etc)					
IT tools are used for collaborative work/communication (e.g. calendars, video conferencing systems, communication tools) as a means of transferring knowledge					

IT tools are embedded into work routines and best practice for knowledge management within ICRAF.					
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12. To what extent do you agree or disagree with the following statements with regards to ICT in ICRAF?

	Strongly agree	Agree	Neither Agree or Disagree	Disagree	Strongly disagree.
ICT infrastructure (intranet, internet) is a big enabler to knowledge management.					
Organizational e-learning is a big enabler to knowledge management.					
IT systems within ICRAF have up to date information.					
Information residing in ICT systems is trusted.					
IT knowledge sources are well integrated.					
IT tools at ICRAF are simple to use and have a user friendly interface.					
IT systems provide easy access to information.					

13. Please indicate the extent to which each of the following are used as knowledge sharing tools at ICRAF. (Modes of distributing knowledge.)

	Very Large Extent	Large Extent	Moderate extent	Small extent	Very Small extent
Internal database are used to share knowledge within ICRAF.					
Chat rooms to transfer knowledge gained within ICRAF					
People use telephone calls to gather/share knowledge within ICRAF.					
Internet is used by staff to share knowledge in ICRAF.					
Staff use email to transfer knowledge within.					
Departments have portals/wikis which they use to share knowledge.					
Social media is the preferred means of sharing knowledge at ICRAF					
Intranet is used to transfer knowledge at ICRAF.					
Virtual Meetings are used as a means of knowledge sharing.					
Journals and reports are used to share knowledge within ICRAF.					
Face to Face conversations are used to share knowledge					

Part D: Knowledge Management challenges at ICRAF.

14. Please indicate the level of disagreement or agreement with each of the statements on knowledge management challenges.

	Strongly agree	Agree	Neither Agree or Disagree	Disagree	Strongly disagree.
Lack of time to share knowledge hampers knowledge management.					
Ranked structures and formal power are an inhibitor to knowledge sharing in ICRAF.					
Knowledge management in ICRAF is hindered by insufficient capture of information.					
Lack of communication holds back knowledge management at ICRAF.					
Low contact time and interaction between knowledge sources and recipients is a barrier to knowledge management in ICRAF.					
Poor verbal and written communication hinder knowledge transfer in ICRAF.					
Differences in education levels obstruct knowledge transfer in ICRAF.					
Knowledge sharing and transfer in ICRAF is hampered by lack of trust in people.					
Lack of technical support obstructs knowledge					

management work procedures and communication flows in ICRAF.					
Knowledge sharing practices in ICRAF is hampered by incompatibility of technology to user needs.					
Knowledge management in ICRAF is hindered by employee's ignorance as to what technology can do and cannot do.					
Lack of familiarity and experience of IT systems is a barrier to knowledge management in ICRAF.					
Knowledge management in ICRAF is hindered by lack of training of new IT systems and processes.					
High turnover of highly skilled staff is a barrier to Knowledge management in ICRAF.					
Low awareness of recorded knowledge restricts knowledge transfer in ICRAF.					

Appendix II: Letter of Introduction for Data Collection



UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
MBA PROGRAMME

Telephone: 020-2059162
Telegrams: "Varsity", Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, Kenya

DATE 30/9/14

TO WHOM IT MAY CONCERN

The bearer of this letter CAROLINE KASYOKA NZUL

Registration No. DSI/79315/2012

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.


PATRICK NYABUTO
MBA ADMINISTRATOR
SCHOOL OF BUSINESS

