THE EFFECT OF ICT APPLICATION ON COMMUNICATION EFFICIENCY IN THE MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

BY:

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DECLARATION

This research project is my original work and has not been presented for an award of a degree in any other university or institution.

Sign:……Date:…. …….

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K50/81651/2012

Declaration by Supervisor

This research proposal has been presented for examination with my approval as university supervisor.

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DEDICATION

I dedicate this work to my hubby, my best friend Emmanuel, my daughter Avery Porsha, my loving parents and my siblings for the moral and financial support.

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First and foremost I thank God who has continuously given me strength and resources to do this research. Secondly, I thank my family for being patient with me during my study. There are many people who participated and supported me in this endeavor that I wish to acknowledge and appreciate. I would particularly acknowledge Mr. J. Oranga, who diligently supervised the processing of this work. He was not only an encouragement but also patient with me in every stage of this work, he undertook the supervisory role and made me believe I could do it and with his comments and criticism, he prepared me to do and complete this work. Finally I acknowledge the support provided to me by the staff at MOEST during this study.

ABSTRACT

The study was on the effect of ICT application on communication efficiency in government offices: A case of Ministry of Education, Science and Technology. The objectives of the study were:(i) To establish the effect of ICT on information sharing among employees at the MOEST, (ii) To evaluate the effect of ICT on the efficiency of decision making process at the MOEST, (iii) To assess the impact of ICT on the knowledge sharing and management among employees at the MOEST and (iv) To determine the impact of the ICT use on the cost effectiveness of the communication among the employees at the MOEST.

The study was guided by the theory of diffusion of innovation of information technology and socio-technical systems theory of acceptance.

The study was based on a survey design. Questionnaires were administered to collect data from the respondents who were stratified into three groups comprising of the senior management, the middle level management and junior employees.

The findings indicate that the adoption of ICT at MOEST has had an overall positive effect on the sharing of information among employees, the efficiency of making decisions and the knowledge sharing and management. However, ICT has increased the cost of purchasing of communication equipment. The research recommends that further studies should be carried out to investigate the effects of ICT on the communication efficiency of the MOEST and its customers. A wholesome understanding of ICT and communication efficiency at the ministry can only be understood if the customers served by the MOEST can be considered in the study.

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LIST OF ABBREVIATIONS AND ACRONYMS

EMIS - Education Management Information System

GOK- Government of Kenya

ICT - Information Communication Technology

IS - Information system

IT - Information Technology

MoE - Ministry of Education

MOEST - Ministry of Education Science and Technology

NICTP - National Information and Communication Technology Policy

NMLs - New Millennium Learners

OECD - Organization for Economic Co-operation and Development

SITES - Second Information Technology in Educational Study

UN DESA - United Nations Department of Economic and Social Affairs

UNDP- United Nations Development Programme

UN-ESCWA - United Nations Economic and Social Commission for Western Asia

DEFINITION OF CONCEPTS

E-government: The system of government where services are offered to the employees and the citizens using digital means.

Information Communication Technology: The system of communication devices that includes radio, television, computer and network hardware and software.

Communication: Is the process of passing information from the sender to the recipient through media.

Decision Making: The process of coming up with an agreement over the course of action to take in an organization.

Knowledge Management and Sharing: The process that involves capturing, developing, sharing and effectively using the organizational knowledge.

CHAPTER ONE
INTRODUCTION

The background of the study gives an overview of the ICT and its use in the improvement of communication, introduces the concepts of E-Governance in general and in Kenya, the ministry of Education, Science and Technology ,the problem statement defines the reasons why the study was carried out and the research objectives and questions have also been discussed.

1.1 Background of the Study

Information and Communications Technology (ICT) refers to technology used to handle information and aid communication. It also refers to the amalgamation of computing and telecommunications technologies, including the Internet, which are the matrix within which information and digital media are created, distributed and accessed. Its features comprise basically of: Information access and dissemination over the Internet and wireless computing. Communication features including landline and mobile telephones, wireless communication, voice over Internet communication or voice mail and facsimile. Computer hardware such as computers, printers, scanners, faxes, modems, networks and software which includes programs for accounting, spreadsheets, data processing enterprise resource planning systems (ERP) among others (Bloomfield et al, 1997).

Rodriguez & Wilson (2000) opine that ICT is the set of activities which facilitate, by electronic means, the processing, transmission and display of information. According to United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2001), ICTs refer to technologies people use to share, distribute, gather information and to communicate, through computers and computer networks. Bakkabulindi (2002) observes that ICTs are of two major types namely; ICTs for converting or processing

data into information such as adding machines, calculators, typewriters and computers; and ICTs for communication of data and or information from one place to another: These include telegraph, telephone, telefax and computer networks. ICT is a primary component of communications in organizations today.

ICT and its unremitting innovations have improved much efficiency in current day living (Dwived, 2005; Gupta, 2011). Corporate communication is therefore defined as a company's voice and image developed on the world stage consisting of various audiences. ICT is increasingly used as a strategic tool to more efficiently support any organizational priorities and program delivery through efficient communications.

Organisations must continously change due to ongoing changes in the environment (Donaldson, 1996). In trying to improve the perfomance of the organisation, the foocus has shifted over the past years from the organisational level towards the inter- organisational level. (malone, 1991), (MacGrath, 1994)

The swift development of Information Technology (IT) in industries today has both opportunities and problems. IT presents many opportunities in that companies have used it to help them gain a competitive edge. It also presents challenges in the management of IT has at the same time a major problem to several companies. In effect, cost-effective deployment and usage of IT resources has become a strategic success factor for business firms (Deeds, 1999). Firms, in a time of increasing worldwide competition and limited economic resources, are determined to create proficient organizational structures that include cost-effective information system (IS) functions (Earl, 1996). Organizations are therefore keen and

prepared to try any modern technology when they look at the convolution and need for critical attention demanded by IT management (Schubent, 2007).

ICT has definitely brought some benefits for a number of organizations. The high and growing level of demand for ICT products in the country further demonstrates the extent to which ICT has infiltrated the Kenyan market. The business benefits of using ICT include safeguarding of the systems, access to latest technology and realization of competitive advantage (F., 1984). Malone (1998) adds his thoughts to this debate by stating that ICT systems and networks allow small businesses to tap into the global reservoir of information, expertise and financing that used to be available only to large firms.

ICT was conceptualized by a number of researchers as electronic machines, devices, and their `applications that have both computing and communication capabilities. For example, Child (1987) defined ICT as technologies and applications which combine the data-processing and storage powers of computers with the distance-transmission capabilities of telecommunications. Similarly, Huber (1990) defined 'advanced IT' as devices that transmit, manipulate, analyze, or exploit information, in which a digital computer processes information integral to the user's communication or decision task. Examples of ICT are electronic mail, conferencing technologies, electronic bulletin boards, file transfer, collaboration technology, shared electronic databases, electronic data interchange, the fax, voice mail and the telephone. The last three, although often being classified exclusively as communication technologies, are enlisted here because they are pervasive, and are increasingly acquiring computing capabilities. These technologies are touted to enhance communication in an organization.

The relationship between ICT and organization structure dimensions was investigated by Whisler (1970). He found that a reduction of hierarchy layers was associated with the use of computers in the insurance industry. Centralization was also found to relate to ICT, although in a diversified fashion. The link between ICT and decentralization at the operational level was discovered in railroad management and in city departments of human resources. Overall decentralization was related to ICT in manufacturing, small newspaper organizations and in a hospital. However, it was also discovered that ICT related to increased centralization at the executive level in the insurance industry (Whisler, 1970). All these decentralized functions work well because of the improvement in the way that the managers communicate with their employees.

1.1.1 The concept of E-Governance

E-governance is generally regarded as a way of providing government services electronically, usually by relying on the Internet infrastructure to reduce the physical character of customer transactions (Esteves et al, 2008). The concept can also mean a reliance on Internet-based applications to enhance efficiency (Ladner,et al, 2008). As well as managing the customer transactions, E-governance is also important in the management of communication within the government offices.

According to the World Bank (2008), e-Governance refers to the use by government agencies of information technologies such as Wide Area Networks, the Internet, and mobile computing that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management.

An improvement in the communication between the employees in a government office can lead to more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and cost reductions.

UNESCO (2014) defines e-Governance as the exercise of political, economic and administrative authority in the management of a country's affairs, including citizens' articulation of their interests and exercise of their legal rights and obligations. E-Governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities. This definition visualizes the use of the electronic medium in the exercise of authority in the management of a country's affairs along with articulation of citizens' interests leading to greater transparency and efficiency.

E-Governance facilitates interaction between different stakeholders in governance. These interactions may be described as follows: government to government, government to citizens, government to business and government to employees (Bhatnagar, 2004). In government to government, Information and Communications Technology is used not only to restructure the governmental processes involved in the functioning of government entities but also to increase the flow of information and services within and between different entities. This kind of interaction is only within the sphere of government and can be both horizontal that is between different government agencies as well as between different functional areas within an organization, or vertical i.e. between national, provincial and local government agencies as well as between different levels within an organization. The primary objective is to increase efficiency, performance and output.

In government to citizens, an interface is created between the government and citizens which enables the citizens to benefit from efficient delivery of a large range of public services (Bhatnagar, 2004). This expands the availability and accessibility of public services on the one hand and improves the quality of services on the other. It gives citizens the choice of when to interact with the government from where to interact with the government and how to interact with the government. The primary purpose is to make government, citizen-friendly.

In Government to Business, e-Governance tools are used to aid the business community – providers of goods and services – to seamlessly interact with the government (Bhatnagar, 2004). The objective is to cut red tape, save time, reduce operational costs and to create a more transparent business environment when dealing with the government. The government to using initiatives can be transactional, such as in licensing, permits, procurement and revenue collection. They can also be promotional and facilitative, such as in trade, tourism and investment. These measures help to provide a congenial environment to businesses to enable them to perform more efficiently.

In government to employees, government is by far the biggest employer and like any organization, it has to interact with its employees on a regular basis. This interaction is a two-way process between the organization and the employee. Use of ICT tools helps in making these interactions fast and efficient on the one hand and increase satisfaction levels of employees on the other (Bhatnagar, 2004). This study concentrated on the use of the ICT in the light of the interaction between the government and its employees.

E-governance is about reform in governance, facilitated by the creative use of ICT. It is expected that this would lead to better access to information and quality services for citizens, ICT would make available timely and reliable information on various aspects of governance. In the initial phase, information would be made available with respect to simple aspects of governance such as forms, laws, rules, and procedures later extending to detailed information including reports, public database, and decision making processes. As regards services, there would be an immediate impact in terms of savings in time, effort and money, resulting from online and one-point accessibility of public services backed up by automation of back end processes. The ultimate objective of e-Governance is to reach out to citizens by adopting a life-cycle approach that is providing public services to citizens which would be required right from birth to death.

Simplicity, efficiency and accountability in the government: Application of ICT to governance combined with detailed business process reengineering would lead to simplification of complicated processes, weeding out of redundant processes, simplification in structures and changes in statutes and regulations. The end result would be simplification of the functioning of government, enhanced decision making abilities and increased efficiency across government all contributing to an overall environment of a more accountable government machinery. This, in turn, would result in enhanced productivity and efficiency in all sectors.

1.1.2 E governance in Kenya

ICT has provided means for faster and better communication, efficient storage, retrieval and processing of data and exchange and utilization of information to its users, be they individuals, groups, businesses, organizations or governments. With growing computerization

and increasing internet connectivity, communication has improved with more and more users motivated to modifying their ways of doing things in order to leverage the advantages provided by ICT. The increasing use of ICT by governments has primarily been spurred by a trend where many governments are reforming their public sector in order to meet the aspirations of their citizens and their employees. The provision of services electronically by the government calls for an appropriate use of ICT for advancing the goals of the public sector and towards creation of an enabling environment for social and economic growth. However, while e-Governance continues to be touted as an initiative critical for the transformation of government, the multiple interpretations and general vagueness of E-governance as a concept has been noted, partly due to lack of an in depth recognition of its complex political and institutional environments (Yildiz, 2007).

The use of ICTs and the adoption of various management approaches in the public sector in developing countries such as Kenya are underway with the promise of actively participating in globalization processes geared towards contributing towards national development (Avgerou, 2001). The Kenyan government, for example, has been involved over the years in computerization projects in different departments. More recently these efforts have been galvanized under the banner of e-governance, which has increasingly been identified within the government's development framework as an instrument for achieving economic prosperity (Waema and Mitulla, 2007). For instance, the Kenya e-governance secretariat was set up in 2004 under the office of the president to be an oversight body to galvanize all ICT projects within government aimed at enhancing service delivery of all the ministries. The Ministry of Information and Communications was set up in 2004 for the first time in the history of Kenya, mainly to handle the wider universal access goals to enable the citizens

actively participate in a global economy which is increasingly knowledge-based (GOK-NICT, 2006).

Kenya, a developing country in Eastern Africa, has been attempting to implement a broad-based public reform program partly founded on an e-government vision which was officially articulated in 2004 (GOK-EGS, 2004). The policy documents detailed a number of initiatives aimed at improving communication within government agencies, between government and business, and between government and citizens. The national ICT policy suggests that the focus should be on redefining the relationship between government and citizens with the objective of empowering them through increased and better access to government services. That this will have the effect of making the government more result oriented, efficient and citizen centered. The other policy document, the 2007 Draft Freedom of Information Policy's explicit vision is to make Kenya a knowledge-based Society. This is to be partly achieved by ensuring maximum access by all Kenyans to information held by public authorities to enable the country to transition to a knowledge-based (GOK-FIP, 2007). This vision, as articulated in the policy statements is a macro-level exercise, while the implementation occurs at the meso-level of government ministries, parastatals and departments. This research intended to contribute to the appraisal of the emerging vision of e-governance by seeking clarity on the possible meanings that e-governance implementers at the *meso* level attach to the vision.

1.1.3 The Ministry of Education Science and Technology (MOEST) in Kenya

The E-governance Strategy, which was adopted in 2004, emphasizes transformation of government services from manual to digital-based operations. The government's specific objectives include improved coordination of government agencies to reduce duplication of efforts and to enhance efficiency in utilization of resources, to improve the competitive

position of the country through provision of timely information and delivery of services, reduce transaction costs, and to engage citizens and the private sector through digital and on-line service provision (MoE, 2006).

The Ministry of Education in collaboration with development partners identified adoption of Information and Communication Technology as one of the priority areas in its program. ICT in the education sector can broadly be categories in e-governance which aims at mainstreaming ICT in all government operations and service delivery; EMIS-(Education Management Information Systems) which aims at facilitating education managers and administrators with accurate and timely data for better and informed decision-making; and E-Learning which aims at mainstream ICTs in the teaching and learning process (MoE, 2006).
The existing education policy on ICT is imbedded in three documents namely; E-Governance Strategy, National ICT Policy and Sessional Paper No. 1 of 2005 which is a Policy Framework for Education, Training and Research. The vision of the MoEST is to facilitate ICT as a universal tool for education and training. In order to achieve this vision every educational institution, teacher, learner and the respective community should be equipped with appropriate ICT infrastructure, competencies and policies for usage and progress. It calls for recognition of the fact that ICT provides capabilities and skills needed for a knowledge-based economy. MoEST's mission is to facilitate effective use of ICT to improve access, learning and administration in delivery of education programmes and services. The principal objective is to integrate ICT in the delivery of education and training curricula (MoE, 2006).

1.2 Problem of the statement

The emergence of Information and Communications Technology (ICT) has provided means for faster and better communication, efficient storage, retrieval and processing of data and

exchange and utilization of information to its users, be they individuals, groups, businesses, organizations or government agencies. With growing computerization and increasing internet connectivity, communication has improved with more and more users motivated to modifying their ways of doing things in order to leverage the advantages provided by ICT. The increasing use of ICT by governments has primarily been spurred by a trend where many governments are reforming their public sector in order to meet the aspirations of their citizens. The main objective why the government is advocating for ICT integration into the services offered by public institutions and organisations is to create e-governance, increase productivity through efficiency and effectiveness and promote service in those organizations (Thioune, 2003).

Kenya, just like many other developing countries, has joined the race of adopting e-governance but largely depends on designs of Information Technologies from the industrialized nations (Kirlidog, 1996). The Ministry of Education is one of the governmental organisations that have embraced the use of ICT to improve and enhance their service delivery through efficient operations within the organisation (GOK-NICTP, 2006). One of the best methods of improving efficiency of the service delivery by the ministry is through having proper internal management. Communication is an important aspect of management. As such, it is essential to understand the communication efficiency and its antecedent factors in a ministry. The adoption of ICT by MOEST was hoped, among other things, to improve the efficiency of communication within the organization. Several studies have been carried out with an aim of relating the adoption of ICT to improvement in operations in various organizational entities. However, Omwenga (2003) points out that there is inadequacy of quantitative and qualitative of research in the area of educational integration of ICT.

Hoogeweegen et al (1999) carried out a study that was intended to investigate the relationship between the adoption of ICT and the meta-management in virtual organizations. In the study, the authors stated that the adoption of modular network design helped virtual organizations develop and allocate production tasks among the employees. The same ICT was useful in the assessment and adjustment of tasks and the allocation procedures. From this study, it is clear that the adoption of ICT can help in the scheduling activities of an organization. Scheduling has an element of communication. A successful scheduling process partly depends on the efficiency of communication. Even though this study brought out the importance of ICT in allocation and assessment of tasks, it has not dwelt on the issue of communication efficiency. Still, the study does not focus its study on the ICT use in the government offices.

Arvanitis & Loukis (2009) carried out an investigation of the effects of ICT on workplace organization and labor productivity in sampled Greek and Swiss firms. In the results, the researchers found out that in both countries, there was a positive relationship between the adoption of ICT and the improvement in the workplace organization. However, the Swiss firms were found to have more benefits in using the ICT than the Greek firms. This study is important and can contribute to understanding the problem of this study. However, it falls short of information about the communication efficiency in the studied firms.

The studies discussed in this section are all essential when it comes to relating the adoption of ICT to the efficiency of operations in an organization. However, they do not answer the question to the Kenyan case. This study intended to fill the knowledge gap by investigating the effects of the adoption of ICT to the intra-organization communication efficiency at the MOEST.

1.3 Objectives of the Study

The study is based on one general objective and four specific objectives.

1.3.1 General Objective

The general objective of this study is to investigate the effect of ICT application on the intra-organizational communication efficiency at the MOEST.

1.3.2 Specific Objectives

The study was guided by the following specific research objectives:

i. To establish the effect of ICT on information sharing among employees at the MOEST.
ii. To evaluate the effect of ICT on the efficiency of decision making process at the MOEST.
iii. To assess the impact of ICT on the knowledge sharing and management among employees at the MOEST.
iv. To determine the impact of the ICT use on the cost effectiveness of the communication among the employees at the MOEST.

1.4 Research Questions

The study sought to answer the following research questions:

i. What is the effect of ICT on information sharing at the MOEST?
ii. How does ICT affect the efficiency of decision making processes at the MOEST?
iii. How does ICT impact on the knowledge sharing and management at MOEST?
iv. How does ICT impact the cost effectiveness of communication at the MOEST?

1.5 Significance of the Study

Public institutions and organizations are sensitized by the government to integrate ICT in their service delivery. To enhance this, the government is investing in ICT strategies and implementation in public organizations. However the poor results and inefficiency arising

from public organizations is pushing the government to reconsider their ICT strategies and implementation methods. This study will provide information on the effect of ICT application on the intra-organizational communication efficiency in MOEST. The results may be used by the government for policy implementation in a bid to improve their ICT strategies in public organizations.

This study will provide information on among other issues, to establish effect of ICT on information sharing, assess the effect of ICT on decision making, to assess the effect of ICT on knowledge sharing and management and lastly, determine the impact of the ICT use on the cost effectiveness of the communication. This information may be used by the management of MOEST in identifying policies and strategies that will work best in bid to enhance their service delivery through ICT.

The impact of ICT in the operations of an organization has received a lot of concentration lately with numerous studies being carried out on the effectiveness of ICT in the management, productivity and service delivery. However, few studies have centered on the effect of ICT on efficiency of communication within the organizations. This study will therefore attract researchers and academicians who are in need of educating more and providing solutions to the impact of ICT communication. The information from the study may also form basis for literature for other researchers and academicians who are willing to carry out studies in the same field in Sub Saharan Africa and lastly, the study may be a starting point for further studies on ICT and communication efficiency within organizations.

1.6 Scope of the Study

All the departments at the MOEST were targeted with a view to establish the effect of ICT application on efficiency of intra-organizational communication. The study focused on all the employees who were drawn from different levels of management and different departments.

1.7 Limitations of the Study

The study targeted departments at MOEST yet communication involves parties outside the organization such as public and non-governmental institutions and other government institutions. This may limit generalization of the study findings to other government and non-governmental institutions. Busy schedule of department heads was also a challenge on data collection. The researcher used emails to collect data from the respondents.

CHAPTER TWO
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter presents a review of the available literature related to the purpose of study. It looked at the literature in view of research objectives and how it affects communication efficiency in organizations.

2.2 Information and Communications Technology (ICT)

Advanced ICT changes the ways in which production, coordination activities, and data processing are carried out (Uhlenbruck et al., 2003). ICT also reshapes business practices in ways of gathering and analyzing information, developing strategic visions, finding the best approach for process redesign, and allowing collaborative teamwork (Akhavan et al., 2006)

Intra-organizational dynamic capabilities are examined from the perspectives of organizational innovativeness, organizational learning, and knowledge sharing. With organizational innovativeness, members within enterprises tend to learn, share information, and take reasonable risks in using ICT (Al-Qirim, 2007) to improve competitive advantages and grasp market opportunities (Bock et al., 2005). Organizational innovativeness positively affects new technology acceptance (Bock et al., 2005).

Organizational learning is the process of how individuals create and organize knowledge, and then transform that knowledge into part of the knowledge system in a group (Garcia-Morales et al., 2007). It involves knowledge acquisition (Uhlenbruck et al., 2003), information distribution, information interpretation, and organizational memory (Huber, 1991). The capacity of organizational learning helps enterprises to maintain or improve their performance (Uhlenbruck et al., 2003) by reducing the cost, assisting in strategic renewal,

coping with the environmental changes (Garcia-Morales et al., 2007), and recognizing market opportunities (Lumpkin, 2005). It also encourages productivity growth (Hjelmervik and Wang, 2007). Enterprises that value continuous learning tend to adopt ICT to help members learn quickly and efficiently (El Sawy, 1982). The ICT-facilitated learning culture speeds up adoption process and helps line personnel quickly incorporate ICT to daily operating procedures and activities (Baily, 1996).

Knowledge sharing within a firm enhances problem-solving capacity, performance, and profitability (Bhatt and Grover, 2005). By sharing useful information and experience, company members can successfully accomplish their tasks and sustain competitive advantages (Teece et al., 1997). Knowledge exists in two primary forms, the first of which is explicit knowledge, which is diffusible in formal language and easily expressed, stored, and reused (Ko et al., 2005). The second is implicit knowledge, which is tacit and cannot be articulated. It is personal know-how and related to pattern recognition, technical skills, and perspectives. The essence of this kind of knowledge may be difficult to capture and communicate to others (Ko et al., 2005). By sharing implicit and explicit knowledge on new ideas and innovation, company members efficiently obtain practical experience and apply modified routines in the process of business operation much faster and with greater ease (Cepeda and Vera, 2007). Firms with this kind of dynamic capability can quickly realize inadequacies in practice, and compensate for such inadequacy by adopting ICT (Zahra et al., 2006).

2.3 Utilization of ICT in Education Sector

The computer and internet technologies have opened a new door to change human life. Children in the twenty-first century might choose to access the internet first when they

encounter a question. Many practitioners and policy makers in the field of education, therefore, started to pay attention to ICT use in relationship with improving the performance in school, as well as out-of-school settings. Three ways of using ICT for the performance improvement in school settings have been lately identified by various researchers (Heo and Kang, 2009; Smaldino et al., 2008). First, ICT could be used to improve teaching and learning. Teachers may use ICT for presenting, assessing and monitoring and students for acquiring, sharing and constructing knowledge and skills. Second, ICT is used to enhance the administrative work such as grading and keeping records in schools. Automation in administrative services using ICT could be beneficial to all stakeholders. Third, ICT could be used as learning content in relationship to the students' information literacy.

Many efforts have been made to adopt information and communication technology (ICT) to promote learning excellence in various educational settings (Valentine et al., 2005). Although teachers, school administrators and policy makers are attempting to find the better way to use ICT to advance teaching and learning for the future, it would be hard to pursue the way without the research evidence of the impact of ICT use on teaching and learning (Bober, 2002).

Currently, there is a significant number of initiatives assessing and monitoring the impact of ICT use on education. For example, The Second Information Technology in Educational Study (SITES) investigated the educational use of ICT across 26 countries in the world (Kozma, 2003). European Schoolnet published a technical report to provide comprehensive information on the impact of digital technologies on learning and teaching (Balanskat et al., 2006). Earlier, Livingstone and Bober (2005) investigated the ICT use of the young generation, who was the first generation to grow up with the internet in the UK. This study

provided a substantial understanding of the attitudes and behaviors of young people through in-depth interviews and observations. However, few studies have been conducted to explain a direct and causal relationship between ICT use and learner performance. Recently, OECD has shown the interest in ICT use of new generation, which consists of so-called new millennium learners (NMLs). Since NMLs are the first generation to grow up in a context surrounded by digital media and to have been exposed earlier to ICT based on OECD's conceptualization (Pedró, 2006), the way they use ICT would be a good start in understanding the impact of ICT use on learning.

ICT use in schools focuses intensively on preparing students to acquire academic skills such as formal school works, while ICT use outside schools is dominated by entertainment such as game playing, online shopping, chatting and using social networking sites (Selwyn et al., 2009). The interest toward ICT use for informal learning outside schools has been increasing (Greenhow and Robelia, 2009).

Learners may use ICT individually or socially with peers. A social context refers to a setting where two or more learners involved in collaborative tasks. Wikis, blogs and electronic bulletin boards would be the ones to support learners communicate with others for their collaborative tasks (Minocha, 2009).

There is considerable policy interest in the benefits that ICT can bring to education, which is a particular focus of the Millennium Development Goals. ICT may deliver significant educational benefits by providing tools for the teaching and learning process and by providing the skills needed in a society that is increasingly reliant on ICT. Conversely, students who enter such a world without those skills may be unable to fully participate and

suffer from a digital-divide effect. The digital divide is likely to be a greater problem for developing countries, where access to ICT is generally lower than for OECD countries. Other possible benefits of ICT in education are improved attitudes to learning, development of teachers' technology skills and increased access of the community to adult education and literacy (OECD, 2010; Kozma, 2005).

Empirical experiments that are highly controlled can help establish causal relationships between ICT use and educational outcomes (Kozma, 2005). In Vadodara, India, in 2000, 100 primary schools were each provided with four computers. A controlled experiment commenced in 2002–03 and ran for two years. Half the schools were randomly allocated with training and educational software. Students in those schools played educational computer games for two hours a week and scored significantly higher on mathematics tests than students in the control schools. The bottom group of students benefitted most, with girls and boys benefitting equally (Abhijit et al., 2007). Controlled experiments from the United States, Kenya and Uganda also showed positive impacts on student learning arising from some types of use of computers in specific school subjects, while more general availability and use of computers at school did not affect student learning (Kozma, 2005). An analysis of learning outcomes from the Khanya project in South Africa showed a positive relationship between use of the ICT-based Master Maths programme and mathematics scores on standardized tests (James and Miller, 2005). The analysis was controlled, with comparisons made between a random sample of experimental and control schools. The study found that scores for learners on the ICT-based mathematics programmes were significantly better than for other students.

An OECD study (2010) reviewed empirical experiments and correlation studies. The conclusion was that results of the former indicate that ICT in the class room improves

performance "if certain pedagogical conditions are met" and the latter, that there is no demonstrated consistent relationship between ICT availability and use at school and educational attainment. It is argued that more intensive use of ICT needs to go hand in hand with an increase in the social capital of students as measured by other complementary educational assets.

For most countries, it found a strong positive relationship between performance on the mathematics test and confidence in Internet and routine ICT tasks, such as opening and saving files. This could suggest that the quality rather than the quantity of ICT usage is a more important determinant of the contribution of ICT to student performance (OECD, 2005).

2.4 ICT and Decision Making

Information and communication technology can facilitate democratic processes and increase participation by citizens and employees in decision making. Such impacts may occur as a result of greater communication and information dissemination offered by ICTs, through the use of social networking sites, e-mail and mobile phones. They are also frequently enabled by electronic information and services offered by government (e-government), usually via the Internet or mobile phones. Of particular interest is how e-government can improve democratic processes and encourage citizen participation in decision-making.

According to United Nations Department of Economic and Social Affairs (UN DESA), e-participation can change the dynamics between government and citizens. It undertakes an international survey of e-government every one to three years and collects information on channels offered for online participation of citizens in public affairs. Results from the 2010 survey show that developed countries are leading the way in e-participation, although there are a small number of developing countries in the top 20 countries. Examples of greater

electronic participation are provided for Singapore and China. In the latter case, senior government officials appear to be soliciting, and responding to, online suggestions posted by citizens (UNDESA, 2010).

Positive impacts are potentially numerous and include the ease and immediacy of communicating, finding information and accessing services. For minority groups and those who are socially disadvantaged, such impacts may be particularly beneficial. The World Bank (2009) discussed the potential empowerment of women when they are able to access public services electronically at home or in the community, and of minorities when they are able to gain electronic access to relevant public information on rights and benefits. Using case study evidence, United Nations Economic and Social Commission for Western Asia (UN-ESCWA, 2009) summarized the positive social impacts of ICT in poor communities as improving communication, facilitating knowledge-sharing, networking within and between communities, and improving the delivery of awareness-raising activities.

2.5 ICT and Efficiency of Communication

Information and communications technology has revolutionized the way people live, learn, work and interact (Okinawa Charter, 2000). The world has become a Global village with Internet, mobile phones and satellite networks shrinking time and space, bringing together computers and communications resulting in new ways of communication, processing, storing and distributing enormous amounts of information (UNDP, 2001). It improves efficiency, accuracy, instantaneous transmission of information, increase quantity, enhance quality, and speed up availability of information in a complex world (Ochieng, 2012).

Information technology (IT) is a vital strategic tool for all modern organizations. IT influences the organizational design, the management control systems, and organizational

culture (Pearlson & Saunders, 2010). Information is an essential strategic asset. Information enables organizations to make decisions.

Information and communication technology provides potential means for improving work productivity, for example, through helping knowledge workers perform certain routine tasks faster and through supporting knowledge sharing among professionals (Ahuja and Shankar, 2009). Thus, organizations are eager to purchase various ICT services in order to improve efficiency in their operations (Sigala, 2003).

The development of ICT has changed knowledge work significantly in recent decades. Technology allows many operations to be automated (Flanagan and Marsh, 2000). At best, automation takes care of many routine tasks and thus people have additional time for the more demanding tasks. Technology has also improved access to information (Ahuja and Shankar, 2009) and communication has become easier due to, e.g. mobile phones and video conference calls. Furthermore, the increased use of ICT has improved the quality of information (Suwardy et al., 2003). However, the development of technology has not had only positive consequences. ICT is associated with a lot of dissatisfaction (Karr-Wisniewski and Lu, 2010).

A poorly functioning or difficult to use systems cause frustration and inefficiency for many people (Kinnie and Arthurs, 1996). For this reason, more and more attention is used to improve the usability of the systems. ICT is also a key source of information flood (in the form of emails, social media messages, news items etc.) facing knowledge workers daily. Having information is important but too much information leads to inefficiency (e.g. the need to search for the right information) and may create stress for knowledge workers.

2.6 Measuring the Impacts of ICT Service

There are many reasons for measuring the impacts of ICT on communication efficiency. Analysis of benefits is one part of the overall information technology/information systems (IT/IS) evaluation process (Fitzgerald, 1998). IT/IS investments are usually measured in order to compare between different projects, rank projects in terms of organizational priorities, justify investment requests by management, control expenditure, benefits, risk, development and implementation of projects, provide a framework that facilitates organizational learning, and facilitate mechanisms to decide whether to fund, postpone or reject investment requests (Irani and Love, 2002). A key motivation for measurement is also the fact that none of the potential ICT-based productivity benefits come automatically. For example, the utilization of the ICT service is an essential precondition for the benefits. Even if the direct benefits, such as time saving, are achieved the actual productivity impacts still depend on the way the time-used is spent. Therefore, it is important to be able to analyze whether the expected benefits are realized or not.

The main difficulty in evaluating IT projects has been the identification and measurement of benefits, and particularly intangible and other non-financial benefits and thus, they are often neglected (Seddon et al., 2002; Irani, 2002). For a technology to positively affect performance it must be utilized and it must be appropriate for the task (Goodhue, 2007) and more broadly for the organizational context in which it is used.

Typical measurement challenge of productivity impacts includes the timing of realization as there is often a time lag before the impacts are achieved (Davern and Kauffman, 2000; Love and Irani, 2004): some of the impacts may occur immediately, shortly or only after long period of time, for example, due to learning. The impact may also be negative right after the investment (Jones et al., 2011). In addition, some may not achieve any observable impacts

(Devaraj and Kohli, 2003). Overall, the more detailed the level of analysis, the better chance to detect the impact, if any, of a given technology. For example, Torkzadeh and Doll (1999) argue that the success of IT can be measured through its impact on work at individual user level. As there are several aspects that may influence productivity in addition to a specific ICT service, it may be difficult to determine which factors cause alteration in the productivity level.

In this paper, productivity impacts refer to both tangible and intangible benefits and changes in relation to performance that are achieved after some specific intervention such as deployment of new technology in companies (Vuolle, 2011). "IT business value" is another term which is used in the literature for the same purpose. Melville et al. (2004) define IT business value as "the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts". The business value of ICT is defined as an overarching measure of different types of benefits to the organization, which combines strategic benefits, informational benefits, transactional benefits and enterprise transformation benefits (Basole, 2007). These definitions both point out the fact that various levels need to be taken into account when analyzing the impacts. In their model of IT business value, Melville et al. (2004) divide performance into business process performance and organizational performance. Business process performance refers to operational efficiency of specific business processes, measures of which include customer service, flexibility, information sharing, and inventory management. Organizational performance refers to overall firm performance, including productivity, efficiency, profitability, market value and competitive advantage.

Some authors have presented process-oriented models for measuring the impacts of ICT (or similar change initiatives) for knowledge work. Laihonen et al. (2012) introduced a process for measuring the impacts of change in the context new work practices (including new ICT solutions). The process includes the following steps: defining the measurement task in question, identifying the factors to be measured, planning the actual measurement and choosing metrics to be used, implementation of the measures and, finally, analysing and reporting of measurement results. Vuolle (2011) has developed a three-stage model for measuring the impacts of mobile ICT services. The process starts by analyzing the measurement context. Then, the impact factors to be measured are identified. Finally, suitable measures are designed to capture the impacts. As a process model, the framework by Vuolle seems to suit well the purposes of this paper. However, Vuolle's work is focused on mobile ICT services and thus does not offer a lot concerning the identification of the impacts on knowledge work. In general, business performance can be measured many ways with objective and subjective measures either directly or indirectly and they may focus on tangible and intangible factors (Lönnqvist, 2004).

2.7 Theoretical Framework

The first theoretical framework was the diffusion of innovation theory and information technology. The issues of advantage of adoption, trial ability, compatibility and observability were used. The second framework is the Socio-Technical Systems Theory of Acceptance. This theory perceives an organization as an open system of interdependent units that transform inputs into desired outputs. These two frameworks will be used to evaluate the application of the ICT and its effects on the efficiency of the communication among employees at MOEST. The theories are explained further in the subsequent sub sections.

2.7.1 Diffusion of Innovation Theory and Information Technology

Diffusion theory discusses five characteristics of innovations that affect their diffusion: relative advantage that is the extent to which a technology offers improvements over currently available tools, compatibility which is its consistency with social practices and norms among its users, complexity its ease of use or learning, trial ability that is the opportunity to try an innovation before committing to use it, and lastly observability which is the extent to which the technology's outputs and its gains are clear to see. Each of these characteristics on its own is insufficient to predict either the extent or the rate of diffusion, but diffusion studies have demonstrated that innovations affording advantages, compatibility with existing practices and beliefs, low complexity, potential trial ability, and observable, will be more extensively and rapidly diffused than an innovation with the cluster of opposite characteristics (Rogers, 2003).

An early meta-analysis of the innovation diffusion literature found that three of these characteristics had the greatest influence on adoption: compatibility and relative advantage were positively related to innovation adoption, while complexity was negatively related to adoption at marginally significant levels (Tornatzky, 1990). However, the authors criticized the then current conceptualizations of these constructs. Comparative benefit, in particular, will be cited as particularly vague because the criteria will be used to judge what is beneficial is often not defined that is to say an innovation could be advantageous because it costs less or is less complex.

In investigating and extending these characteristics in a context specific to IT, (Moore, 1991) report a widespread attempt to expand an instrument which can be used to assess user perceptions of IT innovations. This outcome advocate that the most significant perceived characteristics of an IT innovation which influence decisions concerning use are:

voluntariness of use, representation of the measure to which use of an innovation is perceived to enhance one's representation or status in one's social system, relative benefit, compatibility, ease of use, trial capability, result certainty, and visibility. These outcomes lend at least limited support to factors, but add a significant emphasis on variables related to discretion and ease of use. (Rogers, 2003)

Innovation diffusion theory suggests that factors at the level of the individual user are also vital. (Rogers, 2003). The theory divides technology or innovation adopters into five categories depending on their speed of uptake: innovators, early adopters, early majority, late majority, and laggards. Such distinctions could be seen as somewhat fuzzy, not least because any distribution over time could be so divided. Nevertheless, Rogers plots these categories over a normal distribution where each major category (innovators and early adopters are combined into one for this purpose) represents a standard deviation of dispersion. Accordingly, the division between early and late majority is the mean, with laggards and late adopters constituting 50% of the population. On this basis, Rogers estimates that early adopters and innovators jointly make up only 16% of the total population. Early adopters have disproportionate influence over the adoption of any technology, and profiling studies of these categories have revealed a number of personality (e.g., risk-taking, adventure seeking) and socioeconomic (wealth, education) variables that supposedly distinguish their members. The study sought to understand the age of the employees at the MOEST. The younger people tend to adopt technology faster than the older people. Such an explanation can be used to explain the diffusion of technology at the MOEST.

Current research has attempted to extend diffusion theory to more complex adoption scenarios. For example, managerial influence in the organization can support (or deject)

acceptance explicitly through expressed preferences and/or mandates (Moore, 1991) and through reward systems and incentives (Leonard-Barton, 1988). Whereas diffusion theory provides a context in which one can observe the uptake and impact of IT over time, it provides little explicit treatment of user acceptance. Its mainly direct link would emerge to be in the area of innovation characteristics that may drive individual adoption decisions (the perceived complexity, compatibility, etc. of a particular IT) and innovation positioning (the planned marketing of a technology to a specific group or organization), (Rogers, 2003).

The five characteristics of the theory can be applicable to the study at hand. The characteristic of relative advantage is applicable to the situation at the MOEST. Initially, the MOEST was using analogue systems of communication. These included the use of papers, landline telephones and type memos. These systems were slow the tedious and would drag the pace of communication. However, with the adoption of ICT, the tools of communication are supposed to have improved.

The compatibility characteristic is also useful in the study. The government of Kenya adopted the e-governance structure. This means that the government employees have been socialized into accepting the reality of the adoption and the use of ICT. The adoption of ICT at MOEST is thus socially consistent with the employees and is acceptable among them because it is part of the processes needed to improve the service delivery in the government sector. Complexity could be a hindrance to the adoption of the ICT at MOEST. Development of new platforms could be hindered by the complexity of developing the architecture for the ICT. Secondly, the adoption could be a hindrance to the old employees and also to the employees who don't posses the skills and knowledge needed.

With the adoption of ICT at MOEST, the characteristic of relative advantage is at play. Here, the ministry ICT experts are able to test the software first before deploying it. This is bound to help improve the communication at the ministry. It is possible to observe the changes in the outputs at the ministry, occasioned by the adoption of the ICT. The use of key performance indicators is useful in determining the success of the ICT at MOEST. In the study, it was possible to get the required answers because the employees are able to rate the impacts of the ICT in the efficiency of communication.

2.7.2 Socio-Technical Systems Theory of Acceptance

The socio-technical systems point of view has become significant in the analysis of the organizational impact of technology. Originating in work carried out by the Tavistock Institute in London (Trist, 1963) on the introduction of mining technology in Britain, socio-technical systems theory views any organization as an open system of interdependent sub-units, transforming inputs to desired outputs. As the theory has moved on from its original psychodynamic model of human behavior, the term "socio-technical" has become synonymous with almost any analysis of a configuration of technology and users (Miller, 1967) though its use in the present chapter is linked more closely to the researchers and theoreticians who have developed the concept.

A fundamental tenet of socio-technical systems thinking is that a technology on its own (in the form of its technical capability) has little meaning for purposes of organizational analysis, being truly comprehensible only in terms of the context in which it is embedded and, by extension, the organizational goals or transformations that it serves or enables (Pasmore Sherwood, 2004). Moving beyond a concern with one user and an interface, socio-technical systems theory argues that a network of social relationships surround all working practices

(e.g., cooperation among workers over the course of a task, supervisory relationships, and general social interaction) (Argyle, 1993). The gainful employment of any technology hinges on the ability and willingness of users to employ it for worthwhile tasks (i.e., those deemed central to the organization's goals). Accordingly, any technology cannot be analyzed or understood in isolation of the goal-oriented organization it is intended to support.

The theory was useful in the study because ICT cannot be studied and understood in isolation. For the study to come up with correct answers about the effects of the ICT on communication efficiency, a multivariate approach was adopted. This implies that all the employees in the ministry will be targeted for the study. As well, the study population will cut across all the management levels.

2.8 Conclusion

The literature reviewed has established that ICT improve efficiency and effectiveness of operation in an organization by presenting benefits such as improving production, coordination activities and data processing (Uhlenbruck et al., 2003), reshaping business practices in ways of gathering and analyzing information, developing strategic visions, finding the best approach for process redesign, and allowing collaborative teamwork (Akhavan et al., 2006), improve learning sharing of information (Al-Qirim, 2007), improve competitive advantages and grasp market opportunities (Bock et al., 2005). Knowledge sharing through ICT within a firm enhances problem-solving capacity, performance, and profitability (Bhatt and Grover, 2005). By sharing useful information and experience, company members can successfully accomplish their tasks and sustain competitive advantages (Teece et al., 1997, Cepeda and Vera, 2007).

The literature has also established that education sector has been embracing the use of ICT. Heo and Kang (2009) and Smaldino et al., (2008) argue that ICT contribute to the performance improvement in school settings by improve teaching and learning as teachers use ICT for presenting, assessing and monitoring and students for acquiring, sharing and constructing knowledge and skills and ICT is used to enhance the administrative work such as grading and keeping records in schools. Valentine et al., (2005) argue that many efforts have been made to adopt ICT to promote learning excellence in various educational settings. The literature has also indicated that there is a significant number of initiatives assessing and monitoring the impact of ICT use on education (Kozma, 2003). However, education systems vary from one country to another. Therefore, assessment of the impact of ICT on education sector should be contextualized to political, socio-economic and governance structure in a country.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter highlights the methodology that was adopted by the researcher in order to carry out the study and realize its objectives. It includes research design, data collection and data analysis.

3.2 Research Design

The study was interested in finding out how the employees feel and think and their behavior towards adoption of ICT. Therefore, survey research design which involves the collection of information from a sample of individuals through their responses to questions was adopted. Surveys are efficient in that many variables can be measured without increasing the time or cost. (Lynda 2007)

3.3 Target population

The study targeted the employees from all the departments at the MOEST. The employees were studied to provide answers to the research questions. They provided answers about the effect of ICT application on communication efficiency at the MOEST. Mugenda and Mugenda, (2003) explain that the target population should have some observable characteristics, to which the researcher intends to generalize the results of the study.

3.4 Sampling Method and Sample Size

The study adopted stratified random sampling to get the sample for the study. In this technique, a population is stratified first and then random sampling is done. Stratification is done when members of a target population are divided into homogeneous groups before sampling. After the members have been categorized into homogenous groups, they are randomly picked using the simple random sampling. This process is preferred because no

element of the population is left out. The strata are collectively exhaustive. Sampling error is reduced if the procedure is used (Srivastava et al. 1993).

In the sampling procedure, the employees were stratified in three levels. They included the senior management level, the middle management level and the junior staff. In the population, the senior management level had 18 employees; the middle management level had 35 employees while the subordinate staff was made up 105 employees. A list of the population was drawn from each sector. Simple random sampling was then carried out in each stratum. According to Kothari (2008), a researcher should come up with a sample size that is representative of the population. As such, sampling a small size of the population may misrepresent the reality. For proper representativeness of the population, 20 % of the members from each stratum were selected. The 20 % each stratum was picked in order to reduce the sampling error. The information is shown in Table 3.1.

Table 3.1: The Population and Sample Size

Stratum	**Population**	**Sample Size**
Upper Level Management	18	4
Middle Level Management	35	7
Junior Staff	105	21
Total	**158**	**32**

Source: Field Survey 2014

3.5 Data Collection Methods

The study used questionnaires as the data collection method. A questionnaire is a data collection instrument that has a series of questions and other prompts whose purpose is to gather information from respondents. Questionnaires are preferred to other data collection instruments because they are cheap; they do not require efforts on the side of the questioner

and always have standardized answers. Its disadvantage is that it gives the user limited chance of expressing anything. Again, given that they are in writing form, they necessitate the user to read before giving answers (Kothari, 2008).

Primary data was collected using the questionnaires. According to Mugenda and Mugenda (2008), primary data refers to data that the researcher collects from respondents while secondary data refers to data from other sources like records and documents, thus primary data is considered more reliable and up to date. The main instrument of data collection in this study was use of questionnaires.

3.6 Data Analysis and Presentation

Data analysis is the whole process, which starts immediately after data collection and ends at the point of interpretation (Kothari, 2004). Data was analyzed using descriptive statistics. It included frequencies and percentages. This was enhanced by an explanation and interpretation of the data. The study findings were presented using graphs and tables. The use of descriptive statistics is desired because it helps break down the information into understandable bits. With such a managed data, it is easy for the audience to understand the effect of the ICT at MOEST.

CHAPTER FOUR

FINDINGS, ANALYSIS AND DISCUSSION

4.1 Introduction

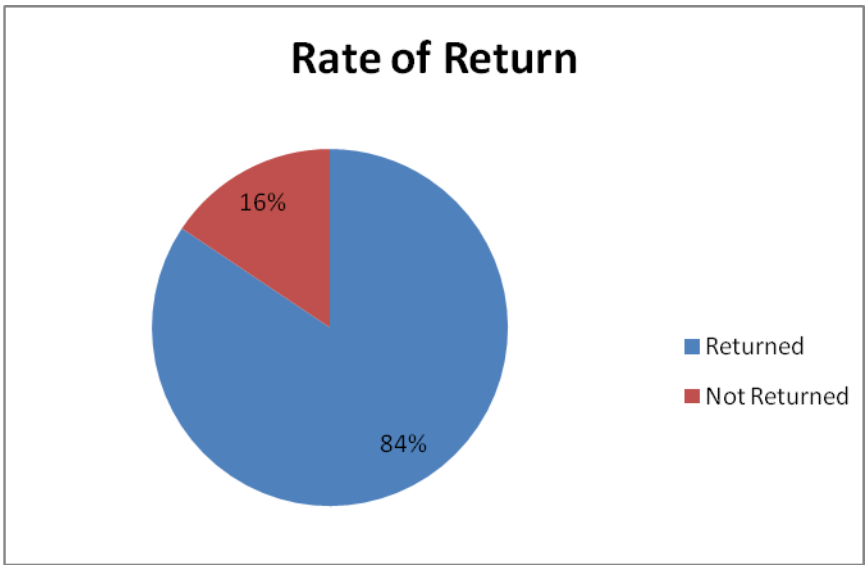
This chapter covers analysis, findings and discussions of the data collected during the study. The researcher managed to receive a response from 27 out of the 32 questionnaires that were distributed to the employees. This represented approximately 85 % overall response rate. The response rates for each stratum have been illustrated in table 4.1 and Figure 4.1. This rate was considered satisfactory for analysis. The questionnaire responses were broken down into manageable categories, coded and thereafter quantitatively analyzed to get insights and make inferences. These were subsequently presented in tables, graphs and in equation forms.

Table 4.1: The rate of response

Stratum	**Targeted**	**Returned**	**%**
Upper Level Management	4	4	100
Middle Level Management	7	6	85.7
Subordinate	21	17	81
Total	**33**	**27**	**N/A**

Source: Field Survey 2014

Figure 4.1: The rate of Return



Source: Field Survey 2014

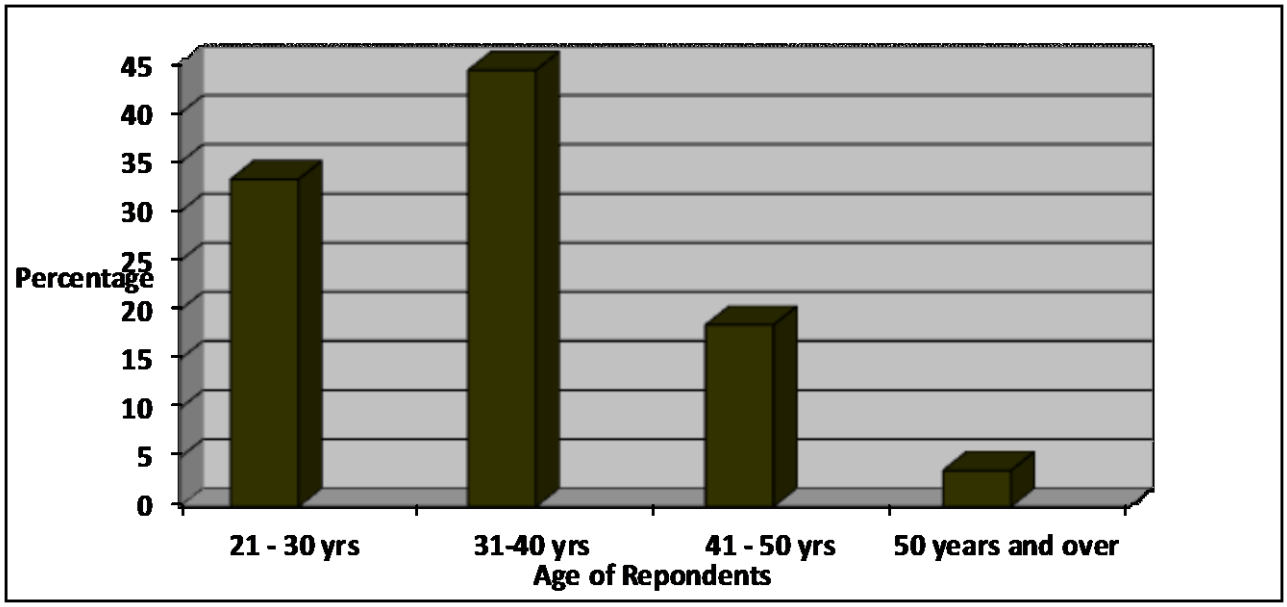
4.2 General Information

4.2.1 Age of the Respondents

The researcher sought to establish the age of the respondents. The age of the respondents is related to the use of the information technology. Given that ICT is a relatively new phenomenon, the young employees are most likely to have an easier understanding of the technology than the older employees. From the research findings, it was established that 33.3 % were between 21 to 30 years, 44.4 % were between 31 to 40 years and 18.5 % were between 41-50 years while 3.7 % were over 50 years. Figure 4.2 shows the age distribution among the employees at MOEST. This distribution shows that most employees at MOEST are of middle age. The lowest age bracket is that which has employees with more than 50 years. The middle aged team can deal well with the advances in ICT because there is a likelihood that they went to school during the new age of information where the ICT was central to learning.

The youngest people in the MOEST are small in number compared to the middle aged ones. This may be a reflection in the slow rate of employing of the fresh graduates in the market. As well, it may signify that the young people do not choose to take up government jobs and opt to work for the private organizations.

Figure 4.2: The Age of the Respondents



Source Field Survey 2014

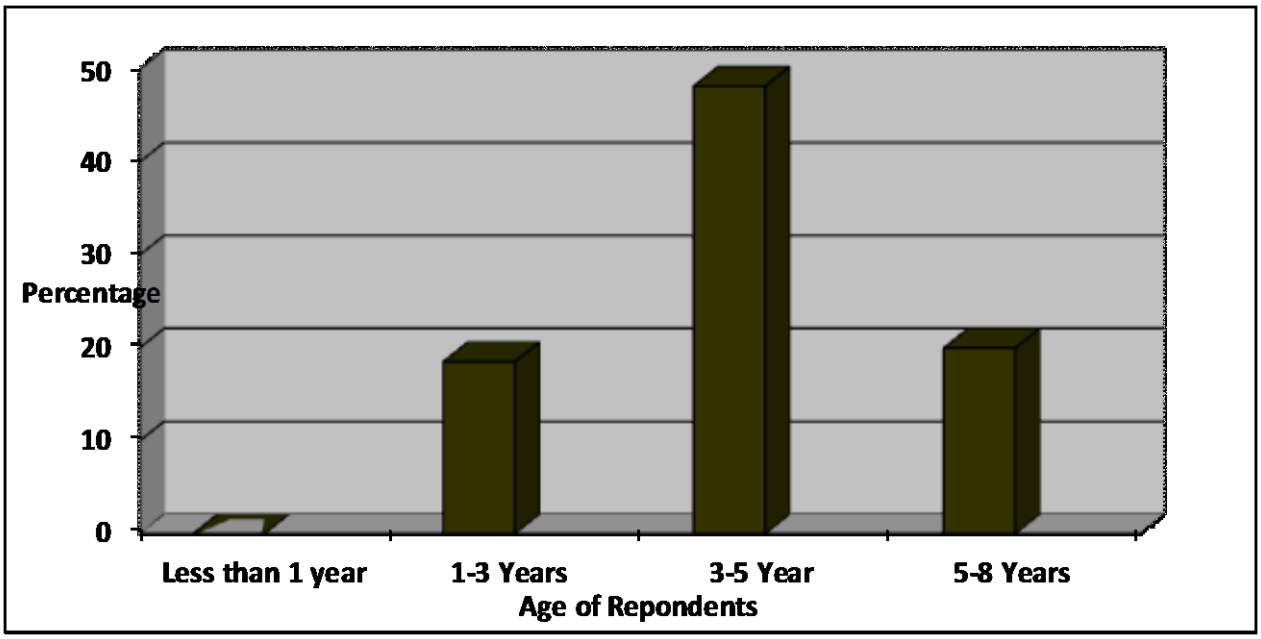
4.2.2 Years of Experience

In the research, the respondents were requested to indicate the years of work experience at MOEST. This parameter was essential because it was used as the control measure of the study. The employees that had worked for less than one year at MOEST could not provide well informed answers to the changes that the ICT had effected at the ministry. This was important because one year may not be enough for an employee to come up with an objective analysis of the efficiency of communication at the ministry. In the responses, none of the

employees admitted to having worked at MOEST for less than a year. This indicates that probably the ministry had not employed within the year that the study had taken place.

In the findings, it was ascertained that 18.5 % of the respondents had worked at MOEST for a period of between 1 and 3 years. 48.2 % of the employees had worked for a period of between 3 and 5 years. 20 % of the respondents indicated that they had worked at MOEST for a period of between 5 and 8 years. 13.3 % had worked at the ministry for more than 8 years. Figure 4.3 gives a graphical illustration of the number of years that the respondents had worked at the ministry.

Figure 4.3: The Years of Experience



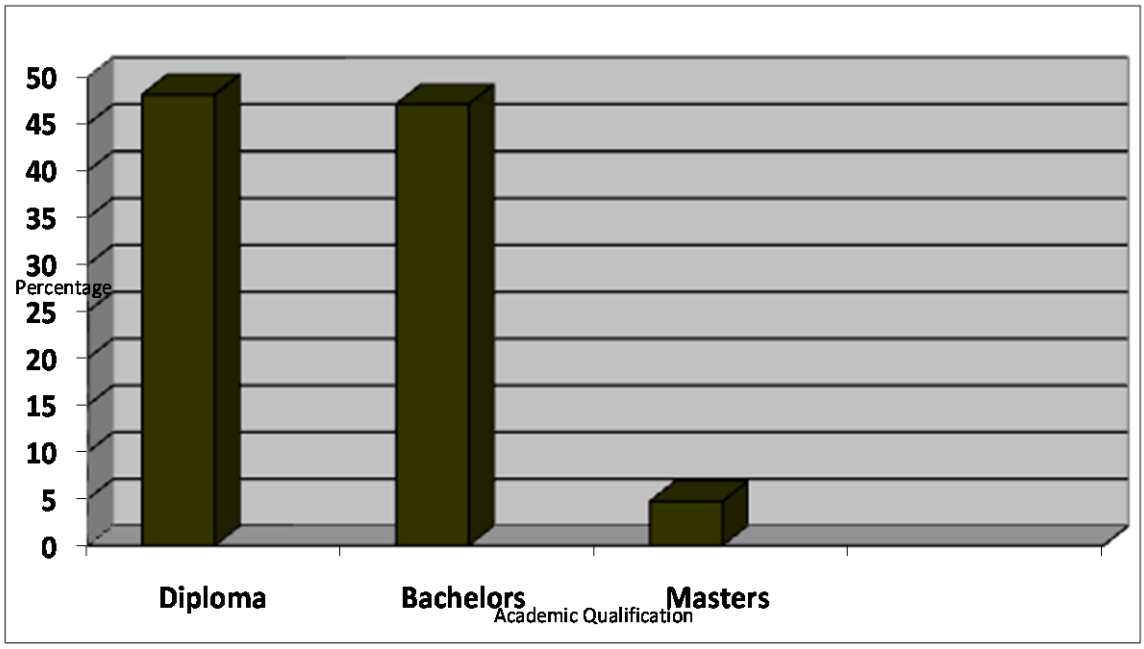
Source: Field Survey 2014

4.2.3 Education Level

The research sought to understand the education level of the respondents. This data was important because the use of ICT can be linked to the education level of the employees. Sophisticated use of the ICT may require a given level of education. 48.2 % of the respondents were ascertained to have obtained a diploma certificate as the highest academic

achievement. 47.1 % had achieved a bachelors degree as the highest academic qualification 4.7 % had obtained a masters degree certificate. Figure 4.4 shows the education level of the employees that were studied at the ministry. The largest part of the employees had a diploma certificate as the highest academic qualification. This could be an indicator of lack of capacity among the staff to execute duties that require higher levels of education.

Figure 4.4: Level of Academic Qualification



Source: Field Survey 2014

4.3 Effects of Adoption of ICT on the Communication Efficiency at MOEST

In the questionnaires, four benefits of ICT application at the MOEST were tested. The agility and ease of information sharing, efficiency of decision making, the knowledge sharing and management among the staff of MOEST, and the reduction of the cost of communication were tested in the questionnaire. In each category of the response, several factors associated with the efficiency of running the strategic and the day to day business of the MOEST was tested.

4.3.1 The Effects of ICT on information sharing at the MOEST

The respondents were tested with an aim of finding out the effects of the ICT on the information sharing at the MOEST. Questions were asked in order for the researcher to understand the degree to which the ICT had influenced the sharing of information at the MOEST. The three strata were asked to state whether the application of ICT had improved the way that the employees shared information about the daily and tactical activities related to work. The three categories of employees' responses were recorded. 75 % of the senior management employees agreed that the use of the ICT in the MOEST had improved the sharing of information about the daily activities of the employees at the organization. This sharing had helped employees execute their daily tactical activities with efficiency. 83.3 % of the middle level employees thought that the use of ICT had improved the way that employees shared information about their daily and tactical activities at the organization. 88.2 % of the junior staff stated that the adoption of ICT at the ministry had improved the way in which employees shared information about their duties on a daily basis.

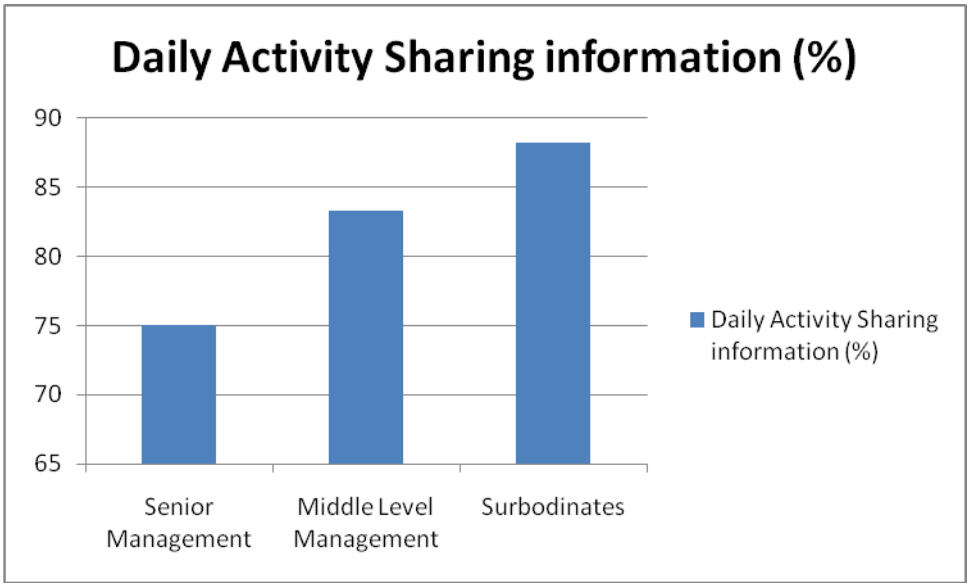
On further explanation, most of the respondents were of the view that the ICT had helped team members share information about various ways of executing their daily duties. This sharing of information had helped improve their performance and their understanding of new approaches to working as a team. As well, some of the respondents stated that the use of ICT had made it easier to share information about any changes in daily procedures at work. This has helped improve consistency of purpose among the employees. From the responses, it is clear that the junior staff have benefitted from the adoption of ICT at MOEST when it comes to the sharing of information about the daily and tactical activities. This reflects the nature of the work of the tactical team in the ministry. Table 4.2 and Figure 4.5 show the results of the responses from the respondents.

Table 4.2: Use of ICT to share information about daily and tactical activities

Employee level	Daily Activity Sharing information (%)	Daily Activity not sharing information (%)
Senior Management	75	25
Middle level management	83.3	16.7
Junior staff	88.2	11.8

Source: Field Study 2014

Figure 4.5: Use of ICT to share information about daily and tactical activities



Source: Field Study 2014

The questionnaires also sought to investigate the effect of ICT on the flexibility of and speed of flow of information about the day to day running of business in the ministry. In the questionnaire, they were requested to select on a scale of 1-5 the speed with which the information spread among employees using the ICT. The scales were coded for purposes of analysis. Scale 1 meant very slow and scale 5 meant very fast. 1 was assigned 20 %, 2 was assigned 40 %, 3 was given 60 %, 4 was 80 % and 5 was 100 %.

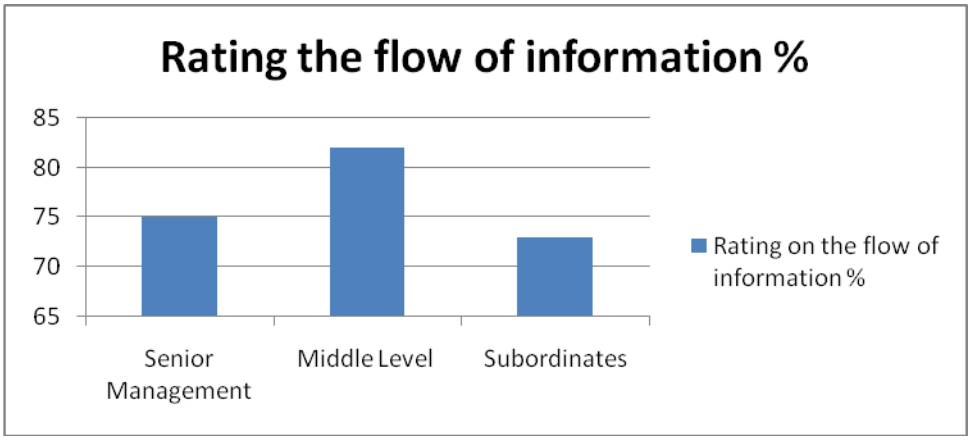
The results from the respondents were averaged and recorded. In the top level management, it was ascertained that the speed of the spread of information about the day to day running of affairs at the ministry was 75 %. The response from the middle level management showed that the speed of sharing of information at the ministry was 82 %. The speed of flow of information using the ICT showed was rated at 73 % by the junior staff that responded to the questionnaires. Table 4.3 and Figure 4.6 illustrate the results that were obtained from the responses.

Table 4.3: Rating of the Speed of Flow of shared Information

Employee level	**Rating on of the flow of information**	**Daily Activity not sharing information (%)**
Senior Management	75	25
Middle level management	82	18
Junior staff	73	27

Source: Field Study 2014

Figure 4.6: Rating of the Speed of Flow of shared Information



Source: Field Study 2014

In the research, the development of platform for information sharing was an important aspect that needed investigation. The researcher sought to understand if the ICT application had helped improve the development of platforms used to share information among the employees. The respondents were requested to respond with a Yes or No answer as to whether the ICT had improved the development of platforms for sharing of information. The answers from the respondents were computed. 50 % of the senior management respondents agreed that there was a development of more platforms that could be used for the sharing of information among the employees. 66.7 % of the respondents from the middle level management agreed that the ICT application had improved the development of the platforms through which employees share information. 82.3 % of the junior staff agreed that the ICT application had improved the development of platforms through which the employees share information about the day to day running of business at the ministry. Table 4.4 and Figure 4.7 show the results of this question.

When the respondents were asked to give examples of platforms that have been developed due to the application of ICT, they cited the chat room developed specifically for the sharing of information. The chat platform has been developed on the intranet of the ministry. Others cited the Microsoft outlook as another example of the platform that had been developed specifically to improve the information sharing among the employees at the MOEST. A group short message service feature was also mentioned by some of the respondents. Here, the office employees were able to send a single message to many people. Such platforms were recognized as useful in enhancing the flow of information among employees. Some employees averred that the chat room created the chance for the employees to create informal networks of communication. This improved the way through which they communicated about various issues that affected their lives both at work and at home. Such an ICT enabled

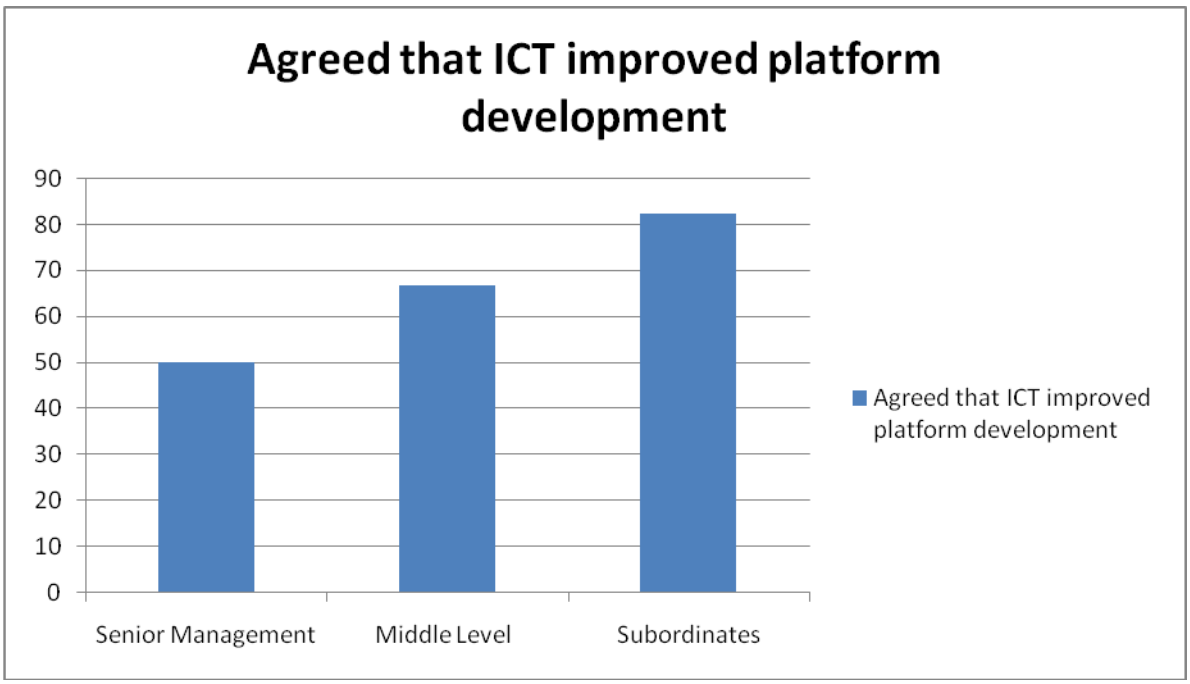
platform is essential for enhancement of the bonding among the employees. As such, this can be said to be a major improvement that has been occasioned by the adoption of the ICT in the ministry.

Table 4.4: Improvement of the development of information sharing platform

Employee level	Agreed the ICT improved platform development	Did not agreed on ICT platform development
Senior Management	50	50
Middle level management	66.7	33.3
Junior staff	82.3	17.7

Source: Field Study 2014

Figure 4.7: Improvement of the development of information sharing platform



Source: Field Study 2014

The junior staff is more positive about the creation of information sharing platform as compared to the senior and middle level management. This may be attributed to the different roles played by the employees at the ministry. Whereas the junior level employees may be

upbeat about the chat rooms and group short message services, the senior and the middle level management may be interested in different platforms that can be used to share information. They could be interested in platforms like the management information systems. Still, this different could be out of the small numbers of the respondents in the senior and middle level management strata.

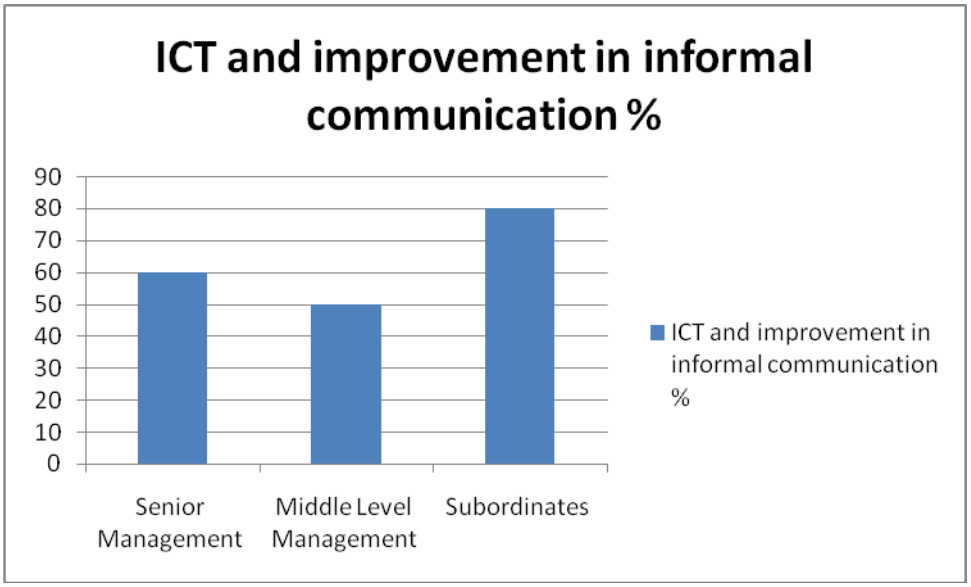
The informal structure of communication is also an essential tool of dealing with employees in an organization. The researcher set out to determine the importance of ICT in the creation of the informal structure of communication in the ministry. The questionnaire requested the study subjects to rate, from 1 to 5, the usefulness of the ICT in creation of the informal communication structure. This question took into account the fact that sometimes information can be shared among employees using informal means. If the tools of communication favor the informal sharing of information, then efficiency can be improved. For the purposes of analysis, the scores were allocated percentages. Score 1 meant least useful. It carried a weighing of 20 %. Score 2 had a weighing of 40 %. Score 3 had 60 %, score 4 was allocated 80 % and score 5 had 100 %. The scores from each stratum were recorded and averaged. Senior level management ranked this variable at 60 %. The middle level management gave the variable a score of 50 % while the junior employees gave a score of 80 %. The scores were tabulated and illustrated as shown in Table 4.5 and Figure 4.8 respectively.

Table 4.5: The improvement of informal communication using ICT

Employee level	ICT and improvement in informal communication	Did not agree on improvement in informal communication
Senior Management	60	40
Middle level management	50	50
Junior staff	80	20

Source: Field Survey 2014

Figure 4.8: The improvement of informal communication using ICT



Source: Field Survey 2014

4.3.2 Effect of ICT on Efficiency of Decision Making

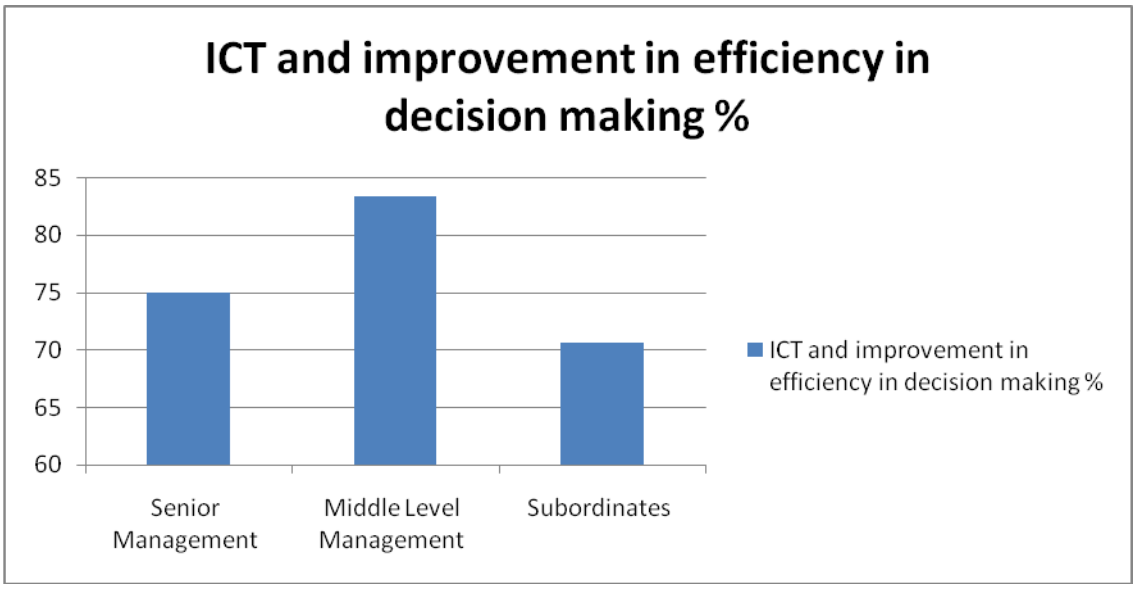
Communication is an essential element of decision making in an organization. The researcher intended to understand if the use of ICT helped improve the efficiency of decision making in the MOEST. The respondents were asked for indicate if they thought that the adoption of ICT helped improve the efficiency of decision making in the ministry. In the response, 75 % of the senior level management agreed that the ICT adoption had helped improve the efficiency of making decisions in the ministry. 83.3 % of the middle level management agreed that the ICT had helped in improvement of the efficiency of decision making at the ministry. 70.6 % of the junior staff agreed that the efficiency of the decision making processes at MOEST had improved because of the use of ICT. The results of this question are indicated in Table 4.6 and Figure 4.9.

Table 4.6: The improvement of the efficiency of making decisions

Employee level	**ICT and improvement in efficiency in decision making %**	**Did not agree on improvement in efficiency in decision making**
Senior Management	75	25
Middle level management	83.3	16.7
Junior staff	70.6	29.4

Source: Field Survey

Figure 4.9: The improvement of the efficiency of making decisions



Source: Field Survey 2014

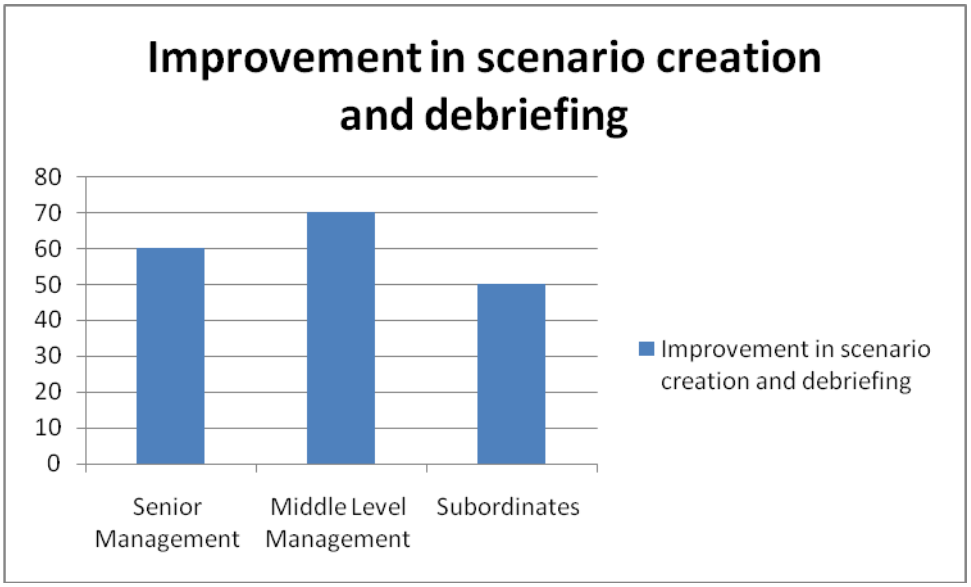
In the same measure, the researcher was out to investigate the effect of ICT on the scenario building and debriefing at MOEST. Scenario building and debriefing are essential parts of communication and they are central to the efficiency of making decisions in any organization. The respondents were asked as to whether the ICT had enhanced in scenario building and debriefing or not. They were given a scale of 1 to 5. 1 meant not at all, 2 stood for very little, 3 represented little, 4 stood for a lot while 5 meant quite a lot. The researcher allocated percentages to the scores. A score of 1 meant 20 %. 2 showed 40 %, 3 indicated 60 %, 4 showed 80 % while 5 meant 100 %. The results were computed and recorded. The senior management rated this variable at 60 %. The middle level management rated the variable at 70 % while the junior staff response rated scenario creation and debriefing at a 50 % success rate. The results are shown in Table 4.7 and Figure 4.10.

Table 4.7: The improvement of scenario creation and debriefing

Employee level	Improvement in scenario creation and debriefing	Did not agree on improvement in scenario creation and debriefing
Senior Management	60	40
Middle level management	70	30
Junior staff	50	50

Source: Field Survey, 2014

Figure 4.10: The improvement of scenario creation and debriefing



Source: Field Survey, 2014

From the results, it is clear that the use of ICT has improved the scenario creation and debriefing activities at MOEST. Here, it has been possible for the management and the junior employees to use ICT to create scenarios and debrief one another during, before and after decision making sessions. This has in turn helped improve the efficiency of decision making in MOEST. It can therefore be ascertained that the adoption of ICT at MOEST has improved

the efficiency of decision making. This has been realized because of the improved efficiency of communication before, during and after the communication.

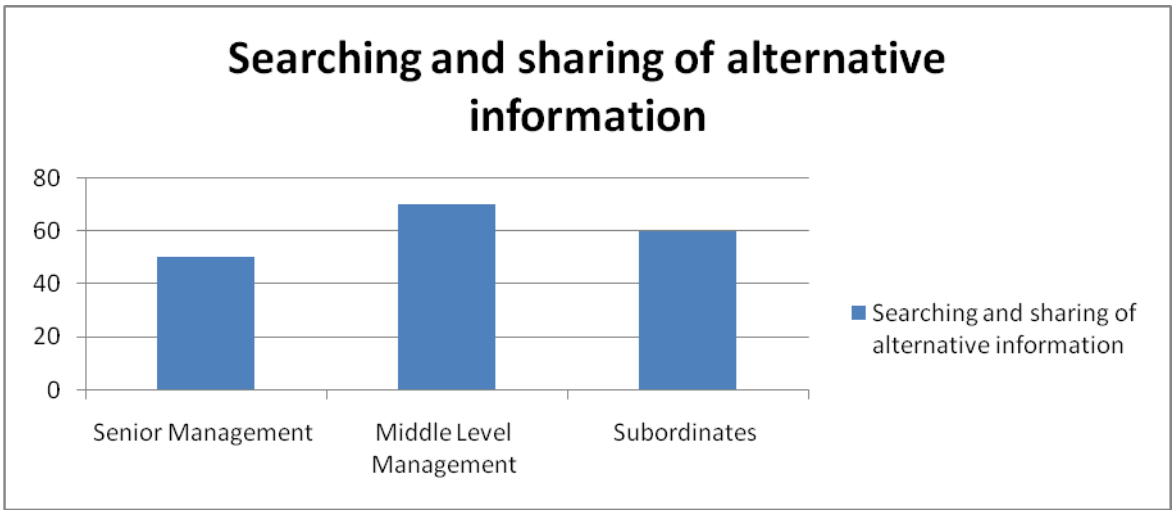
During the decision making process, it is important for the participants to identify and share information about alternatives. The success of such an activity depends on how well the information can be communicated across all the participants. The questionnaire tested the relationship between ICT and the identification and sharing of information by participants before taking any decision on the subject at hand. The question sought to understand if the participants in decision making processes used ICT to identify and share information about alternatives before taking any decision. The results from each level of employees were computed and tabulated as shown in Table 4.8 and Figure 4.11. The scores recorded were 50 %, 70 % and 60 % for the senior and the middle level and the subordinate staff.

Table 4.8: Searching and sharing of alternative information

Employee level	**Searching and sharing of alternative information**	**Did not agree on searching and sharing of alternative information**
Senior management	50	50
Middle level management	70	30
Subordinate	60	40

Source: Field Survey, 2014

Figure 4.11: Searching and sharing of alternative information



Source: Field Survey, 2014

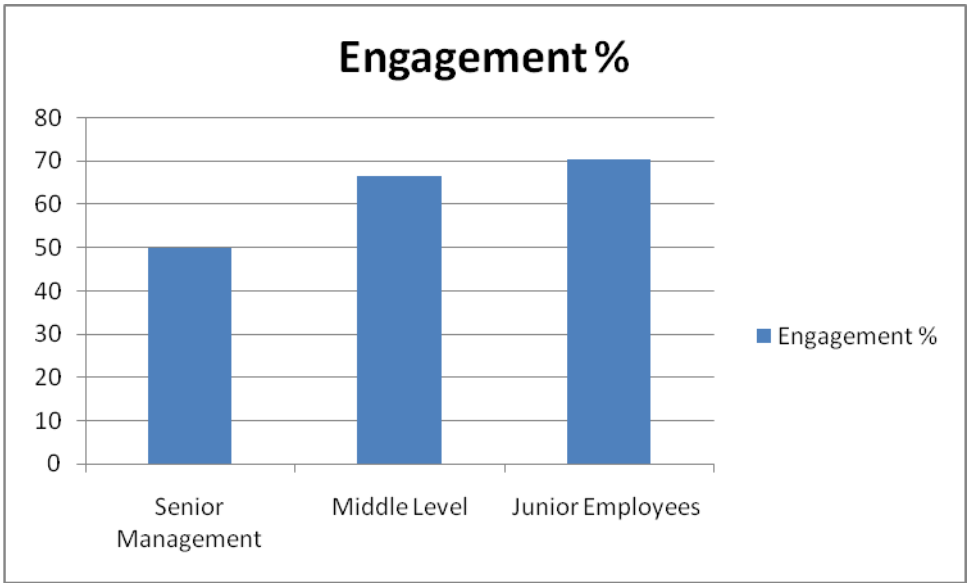
The level of engagement among employees during decision making affects the efficiency of the process. This study investigated the degree to which ICT had improved the level of engagement among employees during decision making. The respondents were asked to whether the ICT had helped improve the engagement level among employees during decision making process. 50 % of the senior level management agreed that the employees engaged a lot during decision making because of the adoption of the ICT. 66.7 % of the middle level management respondents agreed that the ICT had improved the way employees engaged during decision making. 70.6 % of the junior staff agreed that the ICT had improved employee engagement. This means that the ICT, through improvement of communication channels amongst employees during decision making, has improved the efficiency of the process. The results of this variable were tabulated and graphically illustrated as shown in Table 4.9 and Figure 4.12.

Table 4.9: The effect of ICT on employee engagement

Employee level	Engagement %	Did not engage %
Senior management	50	50
Middle level	66.6	33.4
Junior employees	70.6	29.4

Source: Field Survey, 2014

Figure 4.12: The effect of ICT on employee engagement



Source: Field Survey, 2012

4.3.3 Effect of ICT on Knowledge Sharing and Management

Communication efficiency can also be gauged using the sharing and management of knowledge in an organization. This study sought to understand the effect that the ICT adoption at MOEST had on the sharing and management of knowledge. Two factors were tested and awarded the scores from 1 to 4. In the testing, some statements about the use of ICT at MOEST were posed. The respondents were asked to award score to the statements, rating from 1 to 4. 1 meant not true. 2 mean somehow true. 3 meant true and 4 meant very

true. The scores were coded. 1 was given 25 %. 2 represented a 50 % score. 3 meant 75 % while 4 meant 100 %.

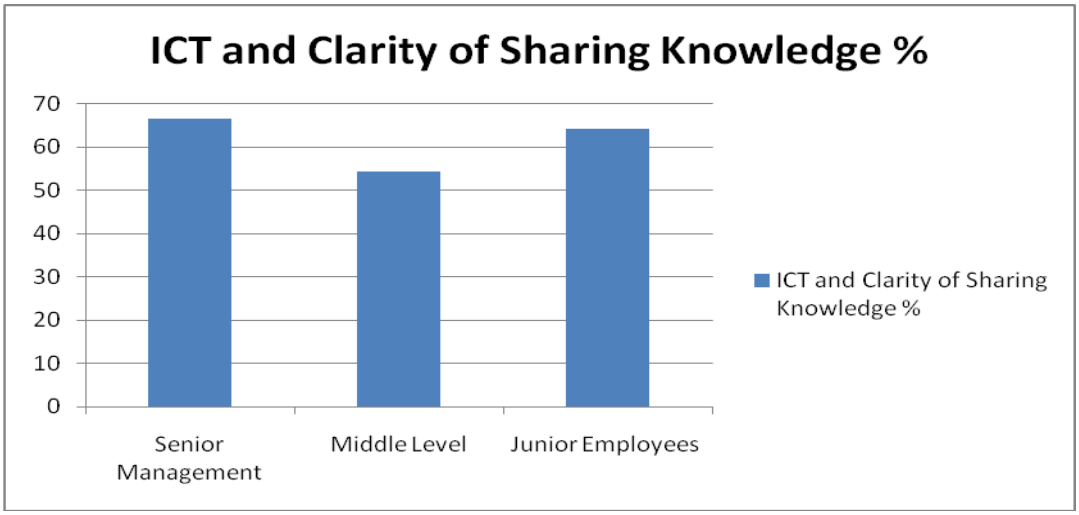
The first factor tested the truth in the fact that the use of ICT in MOEST has enabled the knowledge originators in the ministry to describe information to readers in a clear way. The senior level management rated this statement at 66.7 %. The middle level management awarded this statement 54.3 %. The junior level employees rate the statement at 64.3 %. These results are shown in Table 4.10 and Figure 4.13.

Table 4.10: The use of ICT and Clarity of Knowledge Shared

Employee level	**ICT and clarity of sharing knowledge %**	**Did not agree on clarity and sharing knowledge%**
Senior management	66.7	33.3
Middle level	54.3	45.7
Junior employees	64.3	35.7

Source: Field Survey, 2014

Figure 4.13: The use of ICT and Clarity of Knowledge Shared



Source: Field Survey, 2014

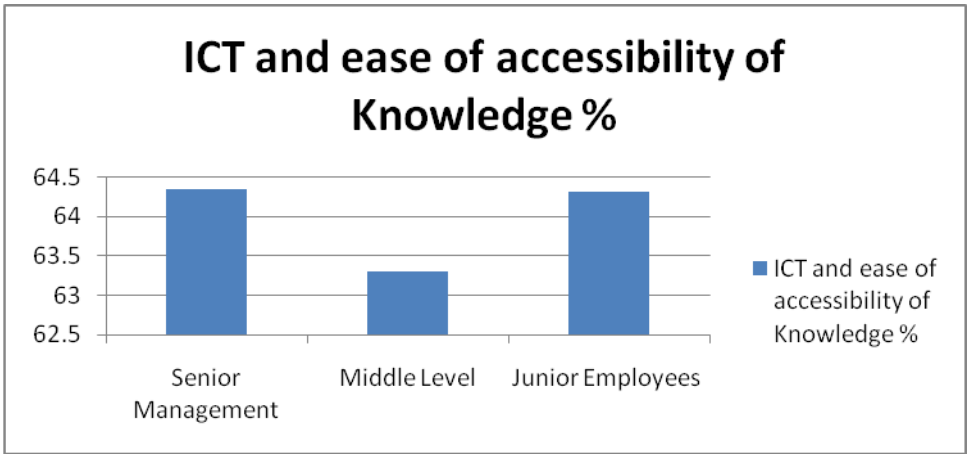
The availability of knowledge and the access of the same are essential for the purposes of knowledge sharing and management. As such, communication efficiency can be greatly improved if the employees know where to obtain knowledge. This study tested this variable by posing a question to the extent that the adoption of ICT at MOEST has helped employees at MOEST to have easy access to the knowledge that can be used to improve their performance. The results from the four strata were recorded and presented in Table 4.11 and Figure 4.14. The senior level management rated the statement 64.3 %. The middle level management rated the statement 63.3 %. The junior level employees rate the statement at 64.3 %.

Table 4.11: ICT and the ease of accessibility to Knowledge

Employee level	**ICT and ease of accessibility of knowledge %**	**Did not agree on ease of accessibility of knowledge%**
Senior management	64.3	35.7
Middle level	63.3	36.7
Junior employee	64.3	35.7

Source: Field Survey, 2014

Figure 4.14: ICT and the ease of accessibility to Knowledge



Source: Field Survey, 2014

4.3.4 Effect of ICT on Cost Effectiveness of Communication at MOEST

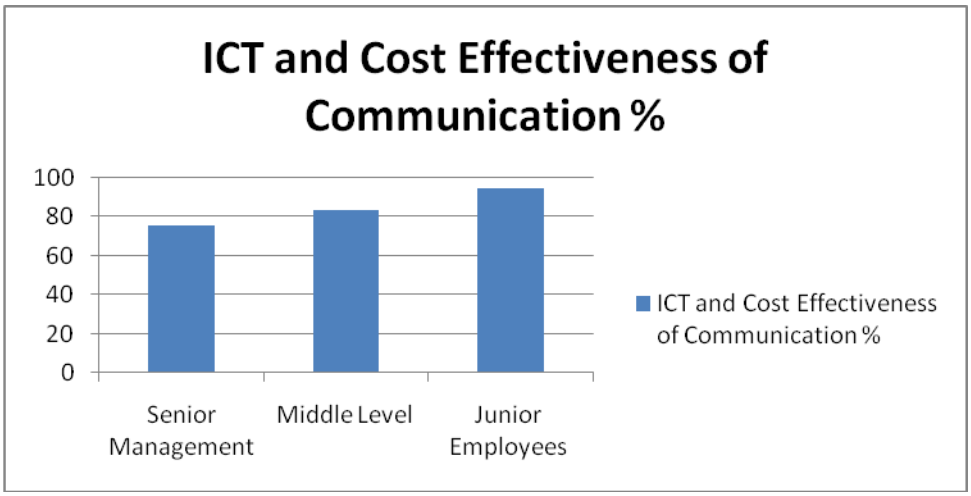
The efficiency of communication in any establishment can be discussed in terms of the costs. In the study, the employees were asked to state if the adoption of ICT at the MOEST had improved the cost effectiveness of communication. 75 % of the senior level employees stated that the ICT adoption had improved the cost effectiveness of the communication process at the ministry. Among the junior level employee respondents, 94.1 % agreed that the ICT use had made the process of communication to be cheaper. In the middle level management, 83.3 % of the employees that responded to the questionnaire agreed that the ICT adoption had improved the cost effectiveness of the communication process. These results were tabulated in Table 4.12 and Figure 4.16.

Table 4.12: ICT and Cost Effectiveness of Communication

Employee level	**ICT and cost effectiveness of communication %**	**Did not agree on cost of effectiveness of communication %**
Senior management	75	25
Middle level	83.3	16.7
Junior employees	94.1	5.9

Source: Field Survey, 2014

Figure 4.15: ICT and Cost Effectiveness of Communication



Source: Field Survey, 2014.

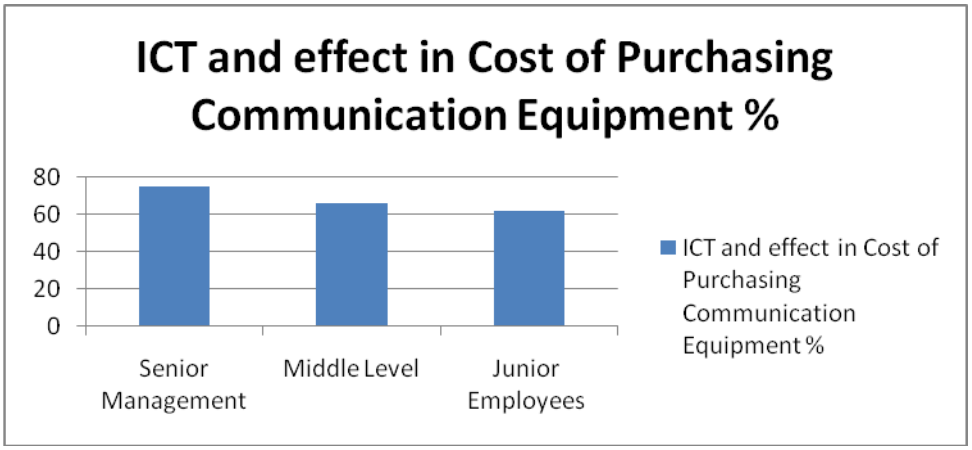
The purchase of communication equipment was also evaluated as a factor that determined the effect of ICT on the efficiency of communication. The respondents were requested to rate the effect of ICT on the cost of purchase of communication equipment. They rated the effect from very poor, poor, good and very good. These ratings were coded for the purpose of analysis. Very poor was given a score of 25 %. Poor was given a score of 50 %. Good was allocated a score of 75 % while very good was allocated 100 %. The results were averaged for every group of respondents and recorded. . The senior level management respondents rated this variable at 74.2 %. The middle level management rated the performance at 65.3 %. The junior level employees rate the statement at 61.3 %. These results were tabulated in Table 4.13 and Figure 4.17.

Table 4.13: ICT and effect in Cost of Purchasing Communication Equipment

Employee level	ICT and effect in cost of purchasing communication equipment%	Did not agree on cost of purchasing communication equipment %
Senior management	74.2	25.8
Middle level	65.3	34.7
Junior employees	61.3	38.7

Source: Field Survey, 2014.

Figure 4.16: ICT and effect in Cost of Purchasing Communication Equipment



Source: Field Survey, 2014.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, the conclusion and the recommendations for further studies. The summary gives an overview of the entire work. It summarizes the results and the inferences. The conclusion section answers the question that prompted the study. The recommendations point out some of the weak points that might have been in the study and suggests areas that should be considered for further studies.

5.2 Summary

The study intended to find out the effect of the adoption of ICT at MOEST on the efficiency of communication within the employees of the ministry. In the study, four variables were tested. These variables were associated with the efficiency of communication. They were tested using a questionnaire as a data collection tool. The tool tested the cost effectiveness of communication, the efficiency of making decisions at the ministry, the knowledge sharing and management and the sharing of information amongst the employees were tested.

In the results, it was ascertained that the adoption of the ICT at MOEST had improved the efficiency of communication. However, some aspects of the efficiency had been negatively affected. It was determined that the cost of purchasing communication equipment had increased with the adoption of the ICT. Other aspects of the cost of communication had been positively affected by the introduction of the ICT at the ministry. It was also determined that the adoption of ICT had helped improve the creation of informal platforms and networks used for the communication amongst the employees.

Knowledge sharing and management has been improved by the adoption of ICT at the MOEST. Most of the respondents agreed that the ICT use had improved the accessibility to

knowledge. Employees were able to access knowledge easily. As well, the source of any knowledge was able to clearly explain the contents. This improved the communication among the employees. The management of knowledge is an essential aspect of communication in an organization. It is one of the ways communicating to the employees about the running of business.

5.3 Conclusions

From the study, it has been observed that the adoption of ICT at MOEST has improved the efficiency of communication amongst the employees. From the studies, it has been ascertained that the ICT adoption at the MOEST office has positively impacted on the knowledge sharing and management. This study thus shows that the adoption of the ICT at MOEST has helped improve the sharing and the management of knowledge. This has in effect improved the efficiency of communication at the office. As stated by De Man (2008), an efficient knowledge sharing system improves the communication in an organization by building trust and creating a network identity.

The adoption of ICT at MOEST affects the cost of communication. From the analysis, all the strata of employees agreed that the ICT had increased the cost of purchasing communication equipment. This indicates that the adoption of ICT in the government offices is likely to lead to the increase of the costs of communication. Given that the efficiency of communication is directly related to the costs incurred, it is possible that ICT impacts negatively on the cost component of communication efficiency. Anderson's (2009) work supports these findings by stating that the cost of ICT hardware and infrastructure maintenance is high in the developing countries, mostly in the African countries.

The sharing of information in MOEST has been enhanced by the adoption of the ICT. The study has indicated that it is easy for the employees to share information about the day to day affairs of the organization. The speed of flow of information, informal communication and creation of information sharing platform has improved since the ICT was adopted at the MOEST. The sharing of information at MOEST has improved because of the adoption of the ICT. Akhtar & Arinto (2009) support these findings by stating that the ICT helps in sharing of information between communities. This indicates that even employees benefit from ICT through the sharing of information.

The effectiveness of decision making is also affected positively by the adoption of the ICT at the MOEST. Decision making is influenced by multiple factors including the scenario creation and debriefing, searching of alternative information and employee engagement. The study found out that the adoption of ICT has improved the three factors. These factors in effect lead to the improvement of the efficiency in decision making. Morcol (2006) observes that ICT helps in facilitation of decision making in organizations. These findings can be useful in providing important information about the use of ICT among the professionals and the scholarly stakeholders. The success of the use of ICTs is pegged on the documented effects of its adoption among the users. It is thus prudent that such studies be inferred by the stakeholders during implementation of the ICT projects in the career and the academic world.

5.4 Recommendations

This study has provided answers to the research questions. It has thus met the objectives of the research. However, more can be done to come up with incisive information about the effect of ICT in the government ministries.

First, on the users the ministry should continuously train employees on ICT based skills and knowledge needed. On policy implication the ministry should ensure that it puts in place policies that support adoption and usage of new technologies.

5.4.1 Recommendations for further studies

(i) This study only focused on the effect of ICT on the employees. It did not focus on the customers served by the ministry. Future studies should seek to understand the effect of ICT on the customers as well as the employees.

(ii) It is recommended that future studies choose a wide pool of respondents. Given that the employees of the MOEST are few in number, future studies should focus on the total population rather than picking a sample. Taking of a census will help come up with more representative results.

(iii) Future studies should focus on the impact of the adoption of ICT on the knowledge sharing and management between the MOEST and the clients that it serves. The studies should sample some of the frequently served customers of the MOEST and carry out a study with an aim of understanding how the ICT adoption has helped improve knowledge sharing and management. Areas of focus should include the ease with which the clients get information about the services offered by the MOEST. Still, the future research should discuss the easiness with which the clients access new knowledge through the MOEST ICT infrastructure.

This study focused on the efficiency of decision making in the ICT. However, this did not narrow down to the specific decisions at MOEST. It is essential to understand the influence of ICT on the strategic decision making processes at MOEST. Studies should be carried out in future to understand if the adoption of ICT has helped improve the strategic decision

making processes at MOEST. Here, the studies should focus on how knowledge management using ICT has impacted on the efficiency of strategic decision making.

Knowledge sharing and management has been found to be enhanced by the adoption of the ICT at MOEST. It is important that future studies find out to what extend the ICT adoption has helped improve the knowledge of the employees. Even though knowledge sharing is an integral part of communication, it is also vital to understand how this aspect improves the productivity of employees (Akhtar & Arinto, 2009). Improvement of the knowledge of employees can be studied and linked to the introduction of ICT at MOEST.

The sharing of information among employees is one of the positive outcomes of the adoption of the ICT at MOEST. This, still, comes with some disadvantages that should be studied in future. One such a demerit is the risk of exposure of sensitive information to unintended parties. Research has to be carried out to investigate the risks that ICT presents to the sensitive information held by the public offices. With ICT, it is possible that payrolls, government secrets and other documents can be leaked. Research has to be carried out to find out the extent of the risks that the ICT presents to public offices during the information sharing.

REFERENCES

Abhijit VB, Cole S, Duflo E and Linden L (2007). Remedying education: evidence from two randomized experiments in India. The Quarterly Journal of Economics. 122(3). Available from http://www.povertyactionlab.org/sites/default/files/publications/4_Duflo_Remedying_Education.pdf.

Ahuja, V., Shankar, J. (2009), "Benefits of collaborative ICT adoption for building project management", *Construction Innovation: Information, Process, Management*, Vol. 9 No.3, pp.323-340.

Akhavan, P., Jafari, M., Ali-Ahmadi, A.R. (2006), "Exploring the interdependency between reengineering and information technology by developing a conceptual model",*Business Process Management Journal*, Vol. 12 No.4, pp.517-34.

Akhtar, S., & Arinto, P. B. (Eds.). (2009). *Digital Review of Asia Pacific 2009-2010*. IDRC.

Anderson, N. (2009). *Equity and information communication technology (ICT) in education* (Vol. 6). Peter Lang.

Arvanitis, S., & Loukis, E. N. (2009). Information and communication technologies, human capital, workplace organization and labour productivity: A comparative study based on firm-level data for Greece and Switzerland.*Information Economics and Policy*, *21*(1), 43-61.

Avgerou, C., (2000). IT and organizational change: an institutionalist perspective. Information Technology & People, 13, 4 [electronic], Available from Emerald Fulltext, Article DOI: 10.1108/09593840010359464 (8 July 2005)

Baily, M.N. (1996), "Great expectations: PCs and productivity", in Kling, R. (Eds),*Computerization and Controversy: Value Conflicts and Social Choices*, 2nd ed., Academic Press, San Diego, CA, .

Balanskat, A., Blamire, R., Kefala, S. (2006), "The ICT impact report: a review of studies of ICT impact on schools in Europe", available at: http://insight.eun.org/shared/data/pdf/impact_study.pdf (accessed 20 April 2010), .

Basole, R.C. (2007), "Strategic planning for enterprise mobility: a readiness-centric approach", *Proceedings of the 2007 Americas Conference in Information Systems*, Vol. 2007.

Bettiol, M., Di Maria, E., Grandinetti, R. (2012), "Codification and creativity: knowledge management strategies in KIBS", *Journal of Knowledge Management*, Vol. 16 No.4, pp.550-562.

Bhatnagar, C. (2004). E-government: from vision to implementation : a practical guide with case studies, Business & Economics, Sage Publications.

Bhatt, G.D., Grover, V. (2005), "Types of information technology capabilities and their role in competitive advantage: an empirical study", *Journal of Management Information Systems*, Vol. 22 No.2, pp.253-77.

Bloomfield, B.P., R. Coombs, D. Knights and D. Littler (1997) (eds), Information Technology and Organizations: Strategies, Networks, and Integration, Oxford: Oxford University Press.

Bober, M.J. (2002), "Technology integration: the difficulties inherent in measuring pedagogical change", *TechTrends*, Vol. 46 No.1, pp.21-3.

Bock, G.W., Zmud, R.W., Kim, Y.G., Lee, J.N. (2005), "Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate", *MIS Quarterly*, Vol. 29 No.1, pp.87-111.

Bosch-Sijtsema, P.M., Ruohomäki, V., Vartiainen, M. (2009), "Knowledge work productivity in distributed teams", *Journal of Knowledge Management*, Vol. 13 No.6, pp.533-546.

Cepeda, G., Vera, D. (2007), "Dynamic capabilities: a knowledge management perspective", *Journal of Business Research*, Vol. 60 No.5, pp.426-37.

Creswell, J. (2003). Research design. Qualitative, quantitative and mixed methods approaches, 2nd edn. Sage, Thousand Oaks, CA.

Davern, M.J., Kauffman, R.J. (2000), "Discovering potential and realizing value from information technology investments", *Journal of Management Information Systems*, Vol. 16 No.4, pp.121-143.

De Man, A. P. (2008). *Knowledge management and innovation in networks*. Edward Elgar Publishing.

Devaraj, S., Kohli, R. (2003), "Performance impacts of information technology: is actual usage the missing link?", *Management Science*, Vol. 49 No.3, pp.273-289.

Drucker, P.F. (1999), "Knowledge-worker productivity: the biggest challenge", *California Management Review*, Vol. 41 No.2, pp.79-94.

Economic and Social Commission for Western Asia (ESCWA, 2009). Impact of ICT on Community Development in ESCWA Member Countries. Available from http://www.escwa.un.org/information/publications/edit/upload/ictd-09-15.pdf.

El Sawy, O.A. (1982), "Implementation by cultural infusion: an approach for managing the introduction of information technologies", *MIS Quarterly*, Vol. 9 No.2, pp.131-40.

Estevez, J., Rhoda, J., Joseph, C.,(2008). A Comprehensive framework for the assessment of E-government Projects. Government Information Quarterly, 25, 118-132.

Flanagan, R., Marsh, L. (2000), "Measuring the costs and benefits of information technology in construction", *Engineering, Construction and Architectural Management*, Vol. 7 No.4, pp.423-435.

Garcia-Morales, V.J., Llorens-Montes, F.J., Verdu-Jover, A.J. (2007), "Influence of personal mastery on organizational performance through organizational learning and innovation in large firms and SMEs", *Technovation*, Vol. 27 No.9, pp.547-68.

GOK-EGS, (2004). E-Government Strategy: The Strategic Framework, Administrative Structure, Training Requirements and Standardization Framework. Government of Kenya Publications, Available Online at: www.e-government.go.ke

GOK-FIP, (2007). Freedom of Information Policy. Government of Kenya Publications, Available Online at: www.information.go.ke

GOK-NICT, (2006). National ICT Policy. Government of Kenya Publications, Available Online at: www.information.go.ke

Goodhue, D.L. (2007), "Comment on Benbasat and Barki's 'Quo Vadis TAM' article", *Journal of the Association for Information Systems*, Vol. 8 No.4, pp.219-222.

Greenhow, C., Robelia, B. (2009), "Informal learning and identity formation in online social networks", *Learning, Media and Technology*, Vol. 34 No.2, pp.119-40.

Haas, M.R., Hansen, M.T. (2007), "Different knowledge, different benefits: towards a productivity perspective on knowledge sharing organizations", *Strategic Management Journal*, Vol. 28 No.1, pp.1133-1153.

Heo, H., Kang, M. (2009), *Impacts of ICT Use on School Learning Outcome*, European Union and OECD, Paris,

Hjelmervik, O.R., Wang, K. (2007), "ICT-supported knowledge representation for development of routines in industry", *Journal of Intelligent Manufacturing*, Vol. 1 No.18, pp.479-85.

Hoogeweegen, M. R., Teunissen, W. J., Vervest, P. H., & Wagenaar, R. W. (1999). Modular Network Design: Using Information and Communication Technology to Allocate Production Tasks in a Virtual Organization*. *Decision Sciences*, *30*(4), 1073-1103.

Huber, G.R. (1991), "Organizational learning: the contributing processes and literatures", *Organization Science*, Vol. 2 No.1, pp.88-115.

Irani, Z. (2002), "Information systems evaluation: navigating through the problem domain", *Information and Management*, Vol. 40 No.1, pp.11-24.

James T and Miller J (2005). Developing a Monitoring and Evaluation Plan for ICT in Education. In: Wagner DA et al., eds. Monitoring and Evaluation of ICT in Education Projects: A Handbook for Developing Countries. infoDev. Available from http://www.unescobkk.org/education/ict/online-resources/e-library/elibrary-themes/monitoring-and-measuring-change/monitoring-and-evaluation-of-ict-in-education-projects/.

Jones, D.C., Kalmi, P., Kauhanen, A. (2011), "Firm and employee effects of an enterprise information system: micro-econometric evidence", *International Journal of Production Economics*, Vol. 130 No.2, pp.159-168.

Karr-Wisniewski, P., Lu, Y. (2010), "When more is too much: operationalizing technology overload and exploring its impact on knowledge worker productivity", *Computers in Human Behavior*, Vol. 26 No.5, pp.1061-1072.

Kinnie, N., Arthurs, A. (1996), "Personnel specialists' advanced use of information technology Evidence and explanations", *Personnel Review*, Vol. 25 No.3, pp.3-19.

Kirlidog, M. (1996). Information technology transfer to a developing country: executive information systems in Turkey. Information Technology & People, Vol. 9 No. 3, 1996, pp. 55-84

Ko, C.E., Lee, S.H., Tsai, Y.C. (2005), "Knowledge intensity within industrial value chain and firm performance: the case of the integrated circuit industry in Taiwan", paper presented at 2005 American Accounting Association Western Region 40th Annual Meeting, San Francisco, CA.

Kothari. C. R.(2004). Research Methodology Methods and Techniques. New Age International Publishers, New Delhi. p1-10

Kozma RB (2005). Monitoring and Evaluation of ICT for Education Impact: A Review. In: Wagner DA et al., eds. Monitoring and Evaluation of ICT in Education Projects: A Handbook for Developing Countries. infoDev. Available from http://www.unescobkk.org/education/ict/online-resources/e-library/elibrary-themes/monitoring-and-measuring-change/monitoring-and-evaluation-of-ict-in-education-projects/.

Kozma, R.B. (2003), *Technology, Innovation, and Educational Change: A Global Change*, International Society for Technology in Education, Eugene, OR,

Ladner, R., Petry, F., McGreedy, F., (2008), " e-Government Capabilities for the 21st Century", International Journal of Electronic Government Research, Volume 4 (1).

Laihonen, H., Jääskeläinen, A., Lönnqvist, A., Ruostela, J. (2012), "Measuring the impacts of new ways of working", *Journal of Facilities Management*, Vol. 10 No.2, pp.102-113.

Lönnqvist, A. (2004), *Measurement of Intangible Success Factors: Case Studies on the Design, Implementation and Use of Measures,* Tampere University of Technology, Tampere, .

Lumpkin, G.T. (2005), "The role of organizational learning in the opportunity-recognition process", *Entrepreneurship Theory & Practice*, Vol. 29 No.4, pp.451-72.

Melville, N., Kraemer, K., Gurbaxani, V. (2004), "Review: information technology and organizational performance: an integrative model of IT business value", *MIS Quarterly*, Vol. 28 No.2, pp.283-322.

Ministry of Education (MoE, 2006). National information and communication technology (ICT) strategy for education and national planning. Available at: nepadkenya.org/documents/MOE-ICT%20in%20Education.pdf. (Accessed on 12 May 14, 2014).

Minocha, S. (2009), "An empirically-grounded study on the effective use of social software in education", *Education & Training*, Vol. 51 No.5, pp.381-94.

Morcol, G. (2006). *Handbook of decision making*. CRC Press.

Mugenda, O. M. and Mugenda, A. G. (2003). *Research Methods: Quantitative & Qualitative Approaches*. Nairobi: Acts Press.

Ochieng J, (2012). The impact of information system security policies and controls on firm operation enhancement for Kenyan SMEs.

OECD (2005b). Are Students Ready for a Technology-Rich World? What PISA Studies Tell Us. Available from http://www.oecd.org/dataoecd/28/4/35995145.pdf.

OECD (2010b). Are the New Millennium Learners Making the Grade? Technology Use and Educational Performance in PISA. Available fromhttp://browse.oecdbookshop.org/oecd/pdfs/browseit/9609101E.PDF

Okinawa Charter 2000. Global Information Society by the Office of International Information Programs. Ministry of foreign affairs of Japan.

Okkonen, J. (2004), *The Use of Performance Measurement in Knowledge Work Context*, Tampere University of Technology, Tampere, .

Omwenga E. I. (2003) Ph.D. Thesis. 'Modelling and analysing a Computer-mediated learning infrastructure'. School of Computing and Informatics, University of Nairobi.

Pearlson, K., & Saunders, C. S. (2010). *Managing and using information systems: a strategic approach* (4th ed.). Hoboken, N.J.: Wiley.

Pedró, F. (2006), *The New Millennium Learners: Challenging Our Views on ICT and Learning*, OECD, Paris, .

Robbins, D. K. and Pearce, J. A., 1992. Turnaround: Retrenchment and Recovery. *Strategic Management Journal*, 13, 287-309.

Seddon, P.B., Graeser, V., Willcocks, L.P. (2002), "Measuring organizational IS effectiveness: an overview and update of senior management perspectives", *The DATA BASE for Advances in Information Systems*, Vol. 33 No.2, pp.11-28.

Selwyn, N., Potter, J., Cranmer, S. (2009), "Primary pupils' use of information and communication technologies at school and home", *British Journal of Educational Technology*, Vol. 40 No.5, pp.919-32.

Smaldino, S.E., Lowther, D.L., Russell, J.D. (2008), *Instructional Technology and Media for Learning*, 9th ed., Pearson Prentice-Hall, Upper saddle river, NJ, .

Suwardy, T., Ratnatunga, J., Sohal, A., Speight, G. (2003), "IT projects: evaluation, outcomes and impediments", *Benchmarking: An International Journal*, Vol. 10 No.4, pp.325-342.

Teece, D.J., Pisano, G., Shuen, A. (1997), "Dynamic capabilities and strategic management", *Strategic Management Journal*, Vol. 18 No.7, pp.509-33.

Thioune, R.M.C. (2003). Information and communication technologies for development in Africa: Opportunities and challenges for community development. Volume 1. Ottawa: IDRC. Available:http://www.idrc.ca

Torkzadeh, G., Doll, W.J. (1999), "The development of a tool for measuring the perceived impact of information technology on work", *Omega, The International Journal of Management Science*, Vol. 27 No.7, pp.327-339.

Uhlenbruck, K., Meyer, K.E., Hitt, M.A. (2003), "Organizational transformation in transition economies: resource-based and organizational learning perspectives", *Journal of Management Studies*, Vol. 40 No.2, pp.257-82.

UNDESA (2010). E-Government Survey 2010: Leveraging e-government at a time of financial and economic crisis. Available fromhttp://unpan1.un.org/intradoc/groups/public/documents/un/unpan038851.pdf.

UNDP 2001. GEO-3: Global environment outlook; Chapter 2; Socio-economic background; Global overview.

UNESCO(2014). Internet Governance. Available at: http://portal.unesco.org/ci/en/ev.php-URL_ID=4404&URL_DO=DO_TOPIc&URL_SEcTION=201.html) (Accessed on 10 May 13, 2014)

Valentine, G., Marsh, J., Charles, P., BMRB (2005), "Children and young people's home use of ICT for educational purposes: the impact on attainment at key stage 1-4", DFES Issue Brief No. RR672, .

Vuolle, M. (2011), *Measuring Performance Impacts of Mobile Business Services from the Customer Perspective*, Tampere University of Technology, Tampere, Publication 1013, .

Waema, T., Mitullah, W. (2007), E-Governance and Governance: A Case Study of the Assessment of the Effects of Integrated Financial Management System on Good Governance in Two Municipal Councils in Kenya. ICEGOV2007, December 10-13, 2007, Macao.

World bank (2008). e-Government. Available at: http://go.worldbank.org/M1JHE0Z280 (Accessed on 10 May 13, 2014)

World Bank (2009). Information and Communication Technologies for Development: Extending Reach and Increasing Impact. Available from http://go.worldbank.org/NATLOH7HV0.

Yildiz, M.,(2008). E-government: initiatives, developments, and issues. Government Information Quarterly, 24, 646−665.

Yin, R. K. (1994). Case study research: design and methods. 1994. *Thousand Oaks, CA*.

Zahra, S.A., Sapienza, H.J., Davidsson, P. (2006), "Entrepreneurship and dynamic capabilities: a review, model and research agenda", *Journal of Management Studies*, Vol. 43 No.4, pp.917-55.

Appendix One: Questionnaire

Section A-General information

Please fill in or tick the appropriate response.

1. What is your age? 21-30 years ( ) 31-40 years ( ) 41-50 ( ) 51 and above ( )

2. How many years have you worked in MOEST?

1. Less than 1 year ( ) 2. 1-3 years ( ) 2. 3-5 years ( ) 3.6-8 years ( ) 4. More than 8 years ( )

3. What is your highest academic qualification?

Certificate ( ) 2.Diploma ( ) 3.Degree ( ) 4.Masters ( ) 5. Other ( )

Specify _____

Section B-Effects of ICT on Communication Efficiency

Effect of ICT on Information Sharing

4. Has the adoption of ICT at the MOEST improved the way that the employees share the information about how to run daily activities?

Yes [ ] No [ ]

Explain……

5. On the scale of 1 to 5, select the speed which with information about running the organization is shared among the employees using the ICT. 1 means very slow and 5 means very fast.

1 [ ], 2 [ ], 3 [ ], 4 [ ], 5 [ ].

6. Has the ICT use at MOEST improved the development of information sharing platform among the employees?

Yes [ ] No [ ]

Explain……

…….

7. On the rating of 1 to 5, with 1 meaning least useful and 5 meaning most useful, kindly tick the appropriate one which describes the usefulness of ICT on the formation of informal structures of information sharing among the employees.

1 [ ], 2 [ ], 3 [ ], 4 [ ], 5 [ ].

Effect of ICT on Efficiency of Decision Making

8. In your opinion, do you think the adoption of ICT has improved the rate of decision making at MOEST?

Yes [ ] No [ ]

Explain……

…….

9. How has ICT helped in scenario planning and debriefing at MOEST?

1 Not at all [ ], 2 Very Little [ ], 3 Little [ ], 4 A lot [ ], 5 Quite a lot [ ].

10. Does the organization use the ICT to identify and share alternatives before coming up with a decision at MOEST?

Yes [ ] No [ ]

Explain……

……

11. Has ICT improved the level of engagement among employees during decision making time?

Yes [ ] No [ ]

Explain……

……

Effect of ICT on Knowledge Sharing and Management

12. To what extent do you agree with statement given about the ICT use at MOEST? 1. Not True 2. Somehow True 3.True 4. Very True

Statement	**1 2 3 4**
The use of ICT in MOEST has enabled the knowledge provider s to describe information to readers in a clear way The adoption of ICT at MOEST has helped employees at MOEST to have easy access to the knowledge that can be used to improve their performance	

Effect of ICT on Cost Effectiveness of Communication at MOEST

13. Do you think the adoption of ICT at MOEST has improved the cost effectiveness of communication?

    Yes [ ] No [ ]

Explain……

……

14. The ICT adoption might have effects on the cost of the purchase of communication equipment. What effect has the adoption of ICT had on the cost of purchase of equipment for communication at MOEST?

    Very poor [ ] Poor [ ] Good [ ] Very Good

Thank you for taking time to respond to the questionnaire.