FACTORS AFFECTING THE POST-IMPLEMENTATION EVALUATION OF INFORMATION SYSTEMS USED IN SMALL AND MEDIUM SIZED ENTERPRISES (SMEs) IN MERU COUNTY KENYA

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DECLARATION

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

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DEDICATION

I dedicate this research to my husband Jackson Mutembei who offered me financial and moral support. I dedicate it also to my children Olive and Ezra.

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ABSTRACT

The purpose of carrying out this research was to propose a Framework on The Factors Affecting the Post-Implementation Evaluation of Information Systems Used in Small and Medium Sized Enterprises of Meru County. The study was guided by four main objectives which were to; determine the implementation status of the information systems implemented in the small and medium sized enterprises of Meru County, identify the evaluation parameters of IS, establish the challenges of IS at the post-implementation level and to propose a Framework for the SMEs in Meru County. An information system brings about automation, information and transformation**.** The organizations adopt information systems that are flexible and organize continuous upgrading of MIS staff. The reviewing of the information systems on post-implementation level is an important step that ensures the IS works appropriately. The benefits that are realized from information systems are realized until four or five years after the adoption of the systems. The criteria for evaluating information systems are cited as user satisfaction, functionality, adaptability, the popularity of suppliers and maintenance. Some SMEs in developing countries are discontented with their IS investments and are inadequate in meeting their needs. This result from the information system installed is inefficient, ineffective and obsolete. More so, the SMEs do not have qualified personnel to develop in-house soft wares; hence opting for the off-shelf soft wares. The research that has been done in other counties shows that the human threatening factors in the post-implementation of information systems are the main reasons for the malfunctioning of the information technologies. These human factors include the users who may lack adequate training to handle the systems; and lack of sufficient communication from the executives on the systems. The study has used the Information Systems Continuous Theory, Technology Fit Model and the TOE Framework. The research used descriptive survey research design which was employed to enable the researcher to obtain the required information. The population of the study was 800 SMEs in Meru County. The sample size was 240 which was 30% of the total population of SMEs using the information systems. The research data was collected using questionnaires which had both open ended and closed questions. The data collected was analyzed using SPSS (version 20). The data was edited and coded in SPSS for analysis. In addition to descriptive analysis; factor analysis and analysis of variance (ANOVA) were also made to gain more insight about the factors that affect post-implementation. The study concluded that implementation of information systems led to efficiency in report generation, enhanced data sharing between departments and improved access to information in the SMEs operating in Meru County. Subsequently, there was swiftness in access to information, improved customer service and enhanced the level of output. In addition, the criteria for evaluating an information system include user friendliness, functionality, user performance and acceptance. Hence an information system implemented in SMEs should be user friendly, perform the functions for which it was meant to and enhance user performance. Also; the high costs involved in upgrading were the major obstacles of information systems at the post implementation level. Some of the recommendations put forth were that the users should be engaged in continuous training and upgrading in order to handle the information systems effectively.

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ABBREVIATIONS AND ACRONYMS

AIS -	Accounting Information System
ERP -	Enterprise Resource Planning
CRMIS –	Customer Relationship Management Information System
HRMIS -	Human Resource Management Information System
IS –	Information Systems
IT –	Information Technology
MIS –	Management Information Systems
SaaS –	Software-as-a-Service
SMEs –	Small and Medium Sized Enterprises
SCIS –	Supply Chain Management Information Systems

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Information Systems is defined as a grouping of physical devices, applications, facilities and knowledgeable employees who have been coordinated to set up, have power over, organization and decision making in an organization. It is also defined as the usage of computer related applications like smart phones, mobile phones, web based systems, social networks and cloud computing (Molano, 2018). It is a combination of Information Technology and the personnel that use the systems to perform activities to support business processes (Setyowati, 2021). An information system therefore brings about automation, information and transformation (Hofmann, 2020). The organizations adopt information systems that are flexible and organize continuous upgrading of MIS staff (Jaafreh, 2017).

The information systems are used for provision of the core processing of transactions, as well as allow consumers, middlemen and vendors inter-relate with the enterprises via diverse computer information systems (Moll, 2019). The computer information system is capable of sustaining the design of a new venture, new commodities and services.

The ERP (Enterprise Resource Planning) which is a form of an information system as software that enables firms to manage their activities for instance, accounting, sales, and client relationships via a central module. It also enhances exchange of information by the Electronic Data Interchange which is administrative software that does away with the idea of an intermediary (Turner, 2020).

In developed countries, the Small and Medium Sized Enterprises (SMEs) are defined as the firms with workforce below 500 whereas in developing countries any firm with less than 100 workers constitutes an SME (Dar, 2017). The small and medium sized enterprise is a firm that is able to recruit up to 500 workers. Therefore; in Kenya; and particularly in Meru County; majority of the small and big firms have workers who do not exceed 200. The Information Systems used in the SMEs include the Bar Code Readers, Radio Frequency Identification, Enterprise Resource Planning, Economic Order Quantity, Vendor Managed Inventory, and Electronic Data Interchange among others, (Beheshti, 2020). In SMEs, IS implementation is directly determined by executives and the fact that SMEs are moving towards embracing of information systems so as to remain competitive.

According to Julianti (2021), the evaluation of information systems refers to systematic procedures that are followed to estimate the performance of an information system in a firm. The assessment enables a firm to evaluate the contribution of a system to its enterprise. Haywood (2021), in addition contend that the measurements of the information technology in the previous years reveal quite a number of setbacks; hence the evaluation of systems should be done in all stages of

systems life cycle i.e. from the implementation up to post-implementation. The aspects that should be put into consideration apart from money factor are the user, business and technology. The reviewing of the information systems on post-implementation level is an important step that ensures the IS works appropriately and is efficient. The benefits that are realized from information systems are realized until four or five years after the adoption of the systems (Lin et al., 2018).

Post-implementation evaluation encompasses review of steps that are critical for the success of the systems, which comprises of analysis, support and maintenance, (Domagała, 2021). Post- implementation of business information systems evaluation is a review that is supposed to analyze the system in terms of general fulfillment of the application, present current cost-benefits, required changes, rationalization, usefulness, training, information security, catastrophe hazard safety, controls, audit trails and system maintenance. Turner (2020), asserts that the post-implementation entails recognizing present working needed for carrying out the day-to-day routines and also every module that may have been implemented but presently not used. Hence; experts look at the present module needed and recognize absent or incomplete functionality. As a result, modifications are suggested and customizations made to align the system with the current requirements. Siagian (2021) argue that there is a direct link between the information systems used by the firm and the overall firm's productivity. The usage of information systems improves the productivity and returns on the investment. Hence the post-implementation

evaluation is meant to look at the profitability of the enterprises as a result of the information system in place.

Shahzad (2021) assert that the results assessment of information systems adoption in organizations are explained using the terms like the functionality, effectiveness of information system module, responsiveness of IS, timeliness of information, accuracy of information and the overall general competitive edge. More so, they claim that appropriate supervision of information systems and its effectiveness assessment are vital for every business organization which intends to gain a competitive edge in a worldwide economy. A proper IS evaluation system improves the functions of engineering, design applications, production, quality and improvement. The evaluation of information systems implemented in SMEs will enhance quality and improvement which will eventually make the business enterprises gain a competitive advantage (Horváth, 2019).

1.2 Statement of the Problem

According to Turner (2020), the post-implementation evaluation of an information system entails recognizing present working needed for carrying out the day-to-day routines and also every module that may have been implemented but presently not used. Hence; experts look at the present module needed and recognize absent or incomplete functionality. As a result, modifications are suggested and customizations to align the system with the current requirements. The criteria for evaluating

information systems are cited as user satisfaction, functionality, adaptability, the popularity of suppliers and maintenance (Shahid Iqbal, 2018).

According to Marima (2018), some SMEs in developing countries are discontented with their IS investments and are inadequate in meeting their needs. This result from the information system installed being ineffective and obsolete. More so, the SMEs do not have qualified personnel to develop in-house soft wares; hence opting for the off-shelf soft wares. From the research that has been done from other countries (Chadhar, 2018) argue that the human threatening factors in the post-implementation of information systems are the main reason for the malfunction of the information systems. These human threatening factors include the users who may lack adequate training to handle the systems; and lack of sufficient communication from the executives on the systems. Ngetich (2018) assert that many studies have been done in other counties in Kenya which show that 40% to 60% of information systems were not a success in a Kenyan based industry. Therefore; this study was meant to address these challenges by analyzing the status of information systems used by SMEs and the parameters for evaluating their success. It also established the challenges faced by SMEs that have adopted the information systems and then proposed a framework at the post-implementation level preferable for the SMEs of Meru County.

1.3 Purpose of the Study

The purpose of this research was to propose a framework of the post-implementation evaluation of information systems used by the SMEs of Meru County Kenya.

1.4 General Objective

To propose a framework on the Factors affecting the post-implementation evaluation of information systems used in the Small and Medium Sized Enterprises of Meru County.

1.5 Specific Objectives

The Research sought to achieve the following objectives:-

i. To determine the implementation status of the Information Systems in use by SMEs of Meru County Kenya.

ii. To identify the evaluation parameters of success for the Information Systems at the post-Implementation stage in SMEs of Meru County Kenya.

iii. To establish the challenges of Information Systems at the post-implementation level used in SMEs of Meru County Kenya.

iv. To propose a framework of post-implementation evaluation of information system for the SMEs of Meru County Kenya.

1.6 Research Questions

i. What is the implementation status of the Information Systems used at the post-implementation level in SMEs of Meru County Kenya?

ii. What parameters would one consider to evaluate the successfulness of information systems used in SMEs of Meru County Kenya?

iii. What are the challenges encountered by SMEs at the post-implementation level?

v. What framework would one propose for the Information Systems used in SMEs at the post-implementation level?

1.7 Justification of the Study

The study would guide business proprietors and managers on the proper choice of information systems after understanding the quality, suitability and performance of information systems. The results of the research would give them an insight of what they would consider as the notable parameters to consider at post-implementation level. Therefore, they would be careful to select the most popular vendors who will offer the best quality and suitable information systems to solve their business problems.

The I.T. assistants and other personnel would keep themselves abreast with the upcoming trends of Technological Advancement. They would undergo frequent

training so that they can upgrade their competence and skills, which is a recommendation of this study, in order to be of use to their organizations.

The vendors and the software developers would also be in a position to re-examine their competence and up-grade their skills where necessary. As a result of the emerging trends in technology, they will keep themselves up-dated so that they can remain competitive and useful to the enterprises that need their products. The study will also add information to the existing body of knowledge. Those academicians and researchers who are focused on information systems will benefit from the insights of this study by using it reference resource.

1.8 Limitation of the Research

This study was conducted in Meru County of Kenya and targets the small and medium sized enterprises only which implies that it may not be generalized to the larger commercial organizations or government institutions. The reason as to why the focus was on SMEs and not other types of organizations like the banking institutions was the fear that they would not divulge their information due to sensitivity of confidential information they handle. Hence; due to the larger number SMEs; the researcher felt that they would offer a large number of respondents for the study.

The study took place in Meru County and not in all 47 counties; because the neighbouring counties of Isiolo and Tharaka-Nithi most of these enterprises are similar to those found in Meru County, hence similar information systems are in use. The findings of the study would, therefore, be generalized to these other counties.

1.9 The Scope of the Study

The study was meant to look into the factors that affect the post-implementation evaluation of information systems used in the Small and Medium Sized Enterprises of Meru County, Kenya. The study used both the qualitative and the quantitative study designs. The study used the Purposive Sampling to get the SMEs that use the information systems as the population under study. This is because this sampling technique makes it easy for the researcher to draw generalizations from the data and the margin of error is also low. The research engaged 80 managers, 80 I.T. personnel and 80 users of information systems that are in use in these business firms.

1.10 The Assumption of the Study

The study assumed that there would be consistency in terms of responses given by different categories of respondents. There was also an assumption that the response rate would be above 60% from the sampled SMEs.

1.11 Operational Definition of Terms

Information Systems is a combination of Information Technology and the personnel that use the systems to perform activities to support business processes.

The **Small and Medium Sized Enterprise (SME)** as a firm that is able to recruit up to 500.

Evaluation refers to systematic procedures followed to estimate the performance of information technology in a firm.

Post-Implementation is defined as recognizing present working needed for carrying out the day-to-day routines and also every module that may have been implemented but presently not used.

ERP (Enterprise Resource Planning) is software that enables firms to manage their activities for instance, accounting, sales, and client relationships via a central module.

CHAPTER TWO

LITERATURE REVIEW

2.0 The Introduction

This chapter focuses on the Implementation Status of information systems that are used in small and medium sized enterprises that are found in Meru County. The types of IS implemented include the social media platforms; especially the Facebook provides ways for clients to collaborate, share, come up with information about enterprises' products and services (Evans, 2021). The information systems in most organizations have enabled SMEs reports be generated efficiently, the CEOs have a readily access to information concerning the firm's performance which makes the managers to take remedial action when the indicators are not moving in the rightful direction (Qalati, 2020).

More so, this chapter focuses on the evaluation factors for the success of information systems. According to Solnørdal (2018), the measurement of information technology refers to systematic procedures followed to estimate the performance of a system in firm. The assessment enables a firm to evaluate the contribution of a system to its enterprise. The chapter also summarizes the theoretical framework of evaluation which is the TOE (Technology-Organization-Environment) Framework which was adopted by Ghaleb (2021), the Information Systems Continuance Model, the TTF model (Rahi et al., 2020) a Conceptual Framework at post-implementation stage in public sectors and the conceptual framework formulated from Independent and the Dependent Variables.

2.1 The Implementation Status of Information Systems in Small and Medium Sized Enterprises

One of the Information Systems currently used in the SMEs include the Bar Code Readers, Radio Frequency Identification, Enterprise Resource Planning, Economic Order Quantity, Vendor Managed Inventory, and Electronic Data Interchange among others (Rafiquea, 2022). Another type of information system is the B2B EC which is implemented by the SMEs to integrate different processes along the supply chain (Lahkani, 2020). The IEBT technologies which include the internet, e-mail, secured online transactions and web-page ownership which can be used by a firm to enhance business value (Fernandez, 2021).

Others include the Social Media: i.e. Face Book, Twitter, You Tube, LinkedIn and Blogs. The social media is used to enhance activities and business profile through improved exchange of information, establishing relationships with existing customers, inviting new customers, advertising firm's products, increasing levels of sales, improving brand awareness, improved collaboration and establishing on-line communities (Ahmad, 2018).

The usage of information systems improves the productivity and returns of the investment (Davarpanah, 2020). The social media platforms; especially the Facebook provide ways for clients to collaborate, share, come up with information about enterprise's products and services (Evans, 2021). Hence, those in charge of advertising must realize that social media is an important element of internet which

provides firms a chance to communicate with clients resulting to customer relationships (Davarpanah, 2020).

The business information systems in most organizations have enabled SMEs reports be generated efficiently, the CEOs have a readily access to information concerning the firm's performance which makes the managers to take remedial action when the indicators are not moving in the rightful direction (Mikalef, 2021). Most of the software suppliers are popular in the country but their support and training services are recommendable; although the users are not contented about the cost and the yearly review (Stair, 2020). Therefore both the SMEs and software vendors should be involved in an agreement which involves the employee being trained as part of the services provided after installation of systems. The employees who possess I.T. knowledge embrace the adoption of IS easily and perform internet transactions than those with less knowledge. Smaller firms use the aspect of outsourcing to overcome the lack of I.T. expertise. Hiring highly educated workers or increasing their qualifications is meant to ensure that information systems are easily implemented (Stair, 2020). To ensure that workers individual performance has been improved, business enterprises have to develop information systems that have proper client segmentation, client information, integration and system flexibility (Appelbaum, 2017).

According to Picchione (2018), a mobile agent-based e-market place is termed as an appropriate business model and a place for those who purchase as well as sell

commodities through the internet or mobile network. In little and big organizations, the human risk factors in the information systems implementation stage are the major reasons leading to systems unsuccessfulness. For the system to be successful, the end users play a great role. Poor exchange of information between the executives and the staff causes them to fear losing their jobs which impacts their usage of the technology. Hence; the staff requires continuous training even after the system is implemented at the post-implementation level to enhance the productivity of the system.

Xie et al. (2015) asserts that in modern days, consumers purchase products through the web based systems, book accommodations or have documents that are sent online instantly. Financial banking information systems, for instance, is a software that is already offered by many firms in the developing countries. National governments have realized that internet is appropriate to communicate to the people especially during elections and results being released immediately through the internet.

As soon as some of the hindrances of limited accessibility to internet are over, there will be rise in demand by local clients for the E-marketing and other internet facilities from general firms. In fact, those enterprises that become pro-active will be the ones that the general clients will go for commodities.

Plessis (2020) assert that the Computer mediated communication (CMC) encompasses all manner of information enhanced by making use of desktops. In the organizations; the system enhances both upward and downward communication. In

addition, it establishes wider accessibility to enterprise power, decision making and innovations. Likewise, it does enhancing efficiency in roles, planning, timely and concrete feedback, and time management, organizing flexible duty time tables, doing away with manual workers, compiling and making correspondence.

The CMC has the ability to filter particular individual, societal and characteristics, for instance the sound and signs that individuals use in dialogue .One of the merits of this system is that it enables the individual to interact more, offers adjustability; the members of a group are able to gather information before feedback and ability to store records called threading. Plessis (2020) state that information systems are used to enhance client service, timesaving and cost reduction. In order to realize good results, enterprises need a proficient system that integrates all the functions in an enterprise.

The same authors more so, claim that in order to gain a competitive edge; the computer technologies should align with business functions tailor-made for good quality commodities and timely service delivery to consumers. Worldwide, human resources are taken as the most crucial resource for any business enterprise. More so, use of Human Resource Information Systems assists in strategizing, management, making decisions and control. The software improves modules for instance; manpower planning, selection and employment, payroll administration, training, career development and assessment of results. These technologies enhance management effectiveness and come up with reports that enhance decision making.

Jackson et al. (2017) assert that the Human Resource Information System does not comprise of hardware and software packages only; it also includes the manpower, rules, processes and information needed to administer the Human Resource activities. Therefore; this is a standardized procedure for gathering, keeping, sustaining and storing the information that is needed by the enterprise about the duties of individual employee. Also it is useful in the coordination of man power and computer information systems. The system is applicable in sustaining data, sorting the data and retrieve data pertaining the enterprises' manpower. Hence, the human resource management information system is an all-inclusive practice meant for the issues of workers in the organization in charge of manpower activities, requirements and advancements for favourable working atmosphere.

Marín (2021) argue that HRMIS are used by organizations to gain a competitive edge in the industry which is attained by improvements, design a large number and variety of human resource activities, shifting attention on human resource from analyzing of documents to tactical human resource management, to include the workers to be part of human resource information system and to redesign the whole function of human resource. An automated human resource information system activity makes decision making faster, organizing and management of human resource because the information is simple to keep, upgrade, categorize and process. Above reduction of expenses and increasing of results, the software has an impact on return on investment.

Chofreh (2020) defines the ERP (Enterprise Resource Planning) as software that enables firms to manage their activities for instance, accounting, sales, and client relationships via a central module. It also enhances exchange of information by the Electronic Data Interchange which is administrative software that does away with the idea of an intermediary. High technologies assist and help in enhancing better enterprise work globally. The web based systems speed up the processes in regard to balancing the authority of vendors and clients. This has led to a paradigm shift from the former ways by granting new opportunities to reach new markets, new raw materials that are affordable, also accessibility to social media and internet. The same author claims that client contentment in regard to buying through the internet; the modules have transformed because of innovations, particularly when the firms discover that there is need for using electronic mails. Najib (2020) claims that some technologies that make use of digital currency, known as e-payment systems, are found which are largely being used in developing countries.

They are used because they are affordable and have inventive answers to economic sector, health sector, farming sector and their transactions can be done conveniently using a mobile phone.

Langenwalter (2020) agrees with the above opinions by claiming that the Enterprise Resource Planning is very helpful in assisting the executives and employees in decision making. The improvement of the functionality of the technology improves the employees' effectiveness and grants them favourable work place for individual

growth. The ERP systems are very crucial to firms in incorporating, making opportunities for enterprise and helping a variety of tasks. According to Lindman et al. (2017), information systems are utilized by business firms for carrying out many activities. They are used for provision of the core processing of transactions, as well as allow consumers, middlemen and vendors inter-relate with the enterprises via diverse information like the web based systems.

Lee (2018) claims that the computer information system is capable of sustaining the design of a new venture, new commodities and services. The technologies are mostly linked to bigger enterprise design. The information system enhances new types of adjustable coordination within the enterprise. The measurement of information technologies should be for making sure that the system venture brings forth software abilities to produce tactical organizational goals. An information system is meant to improve business processes in terms of the present enterprise plan into a technology which brings forth competitiveness and new entrepreneurial windows of opportunity to the enterprise. More so, to enhance in cost reduction, modify products and offering services to a specific clientele.

Pallat (2020) agrees with the above by claiming that technology makes sure that suitable information is gathered at different places, analyzed and relayed later to desired departments. Information technology is required to accomplish the communication desires for individuals, groups and those in charge of managing responsibilities. Therefore, it is generally meant for gathering, analyzing, storage and

dissemination of data to enhance the activities of management in firms. Those in management gather large amounts of information; translate the data into acceptable form, make resolutions based on that data, therefore, coming up with decisions resulting to achieving of organizational goals. Information technologies enable firms to expand their ventures, provide services, redesign work, redefine the procedure of activities and rectify the methods of doing work. Appropriate management and analyzing of data is vital as it enables decision making on the outcome of the enterprise.

Shukla (2019) asserts that the Customer Relationship Management which is used by the business firms to establish and sustain a profit maximizing portfolio of customer relationships.

According to Borg (2021), the employees have been known to make use of e-mails to improve their results. They have been able to communicate to individuals not easily reachable, maintain evidence of content transmitted; accessibility at diverse places, timesaving, minimizing of paper work, and dissemination of information simultaneously to different recipients and global exchange of information.

According to Alanen (2022), Cyber Security is defined as the gathering of equipment, rules, safety concepts, safety measures guidelines, hazard administration methods, events, guidance, reassurance and systems that are able to guard the cyber surroundings, business and client's material goods. It concerns the safeguarding of external devices, the application, information, personnel and the process that the

systems are reached, also the external safety of soft ware's and safeguards of data contained in them. The same authors claim that Block chain is an idea which contains systems and soft wares. It is an automated departmentalized book which offers keeping of data transactions without necessarily engaging a central influence. This idea is similar to the web based systems that contain a variety of systems and soft wares. Wang (2019) further claims that in the organizations, those who are in management positions are aligning their companies by focusing on Block chain with the combined areas of analytics machine learning and artificial intelligence, cloud computing, internet of things, drones and augmented reality. Therefore, the internet that is located within plays the role of enhancing better upload, modify and download information, content and activities.

Akinnuwesi (2020) assert that the Decision Support System is an adjustable as well as an application which allows interaction and is meant to enhance making of decisions. It functions along with artificial intelligence software which assists the user to generate data via the online analytical process which enhances making of decisions. Other computer information technologies enhance workgroups and create an atmosphere where the employees are able to seek information from one another in separate sections with no much direct contacts. The workers are able to utilize electronic mails and interconnected network devices in regard to a particular task. More so, managers and executives make use of the executive information system which they use in connection with the decision support systems and the artificial intelligence to establish as well as solve difficulties. Ritter (2020) more over asserts

that business firms make use of Databank Systems to put into storage all information which is either internal or external.

The internal databank is accessible inside the enterprise and the external one enables information to be available outside the firm by use of an internet protocol address. Therefore, the workers or executives are able to make use of a firm's internet to get the firm's information by use of secret codes. When improving communication in organizations; there are advanced computer technologies like e-mails which enable exchange of information in and outside the firm simplified and fast.

Zhou (2019) asserts that the Web Based Systems have huge selection in terms of advertising features which offer recognition, exchange of information with clients. There is no other innovation like the internet that has seen a fast development. It has become a channel of advertising for organizations and clients because it offers the advantage of individualized attention and advertising transparency. Attempts have been made to avail the web based systems to homes and business enterprises. The only limiting factor has been accessibility to internet facilities, once this is addressed, there is going to be rise in demand by common clients for the electronic trading and other internet services. The business enterprises that will act swiftly are the ones the common clients will seek to look for commodities. When using the computer mediated communication, the receiver of information translate the content considering the following factors which include: mixing electronic mail with other content, employees utilize their personal understanding of the processes and procedures of the company, the relationship between the giver and receiver of

information, the topic of information, the nature of message and the purpose of the receiver in the company.

Munirathinam (2020) defines the Internet of Things as the interconnection of online external devices, motor vehicle, household items and tools that are integrated with electronic devices, computer applications, sensing devices and connections that make them to be linked to gather and transfer information. This includes manpower, methods, technical system and intellectual tool. This technology is interrelated with computerized processing, whose purpose is to design advance tailor made commodities that have good attributes and reduced expenses by incorporating factory internet of things, large content analytics, web based technology and upgraded robotics into factories.

2.2 The Evaluation Parameters of Information Systems

According to D Oliveira-Dias (2022), the measurement of information technology refers to systematic procedures followed to estimate the performance of a system in firm. The assessment enables a firm to evaluate the contribution of a system to its enterprise. When an evaluation of information systems is done, the return on investment shows that the business processes have been a success (Formigo, 2019).

The organizations should adopt information systems that are flexible and organize continuous upgrading of MIS staff (Ikechukwu, 2019). The reviewing of the information systems on post-implementation level is an important step that is meant to ensure the IS works appropriately and is efficient. The gains realized from information systems are realized until four or five years after the adoption of the

systems (Lin et al., 2018) The criteria for evaluating an information system is the total cost of ownership, user friendliness, functionality, adaptability, supplier's popularity and service support (Llopis-Albert, 2021).

A case study analysis that was carried out on four different firms on e-procurement after implementation showed that all departments have an access to information at the same time, for instance, the sales department and the purchases department. Also improvement in customer service, reduced time for decision making hiring of minimal number of employees and elimination of risk of fraud (Stone, 2020). The benefits realized and efficiency is not visible until after four or five years after the systems implementation or not at all in smaller enterprises. One of major limitations for the forthcoming is the requirement for forecasting methods and additional planning tactics.

The criteria for evaluating information systems are cited as user satisfaction, functionality, adaptability, the popularity of suppliers and maintenance, (Shahzad, 2021). The reasons for evaluating systems are to control projects, change management, passing of information, modifications, distribution of resources, staff incentives and prolonged settings of targets (Aguinis, 2019).

The evaluation parameters of an information system include the rejoinder duration, the output, network connections, and dependability and letdown patterns. The systems centered aspects include system performance, passage of information ability, the desired functionality of the software, power usage profiles, storing of information

and the quality of the content. The user centered parameters are user performance and acceptance, the amount of training needed and the user efficiency (Silva, 2021). Most studies have applied diverse evaluation criteria; for instance client satisfaction, decision quality and return on investment to justify why enterprises need to invest in information systems. A post-implementation evaluation is done with quite a number of evaluation measures that are not particular to the type of information technology being reviewed. The value of each parameter varies in regard to the kinds and goals of the information systems. Unlike the bar codes which must be in front of the reader, many software tags can be read at the same time because they do not have to be scanned.

Kim (2017) claims that implementation of an innovation is determined by interactive objective, approaching regard to the character, substance rules, opinions in connection to the character, assessment of character, beliefs of colleagues, inspiration in complying and other hindrances for instance ecological or the firms limitations. The assessment of computer application projects is vital because organizations use a lot of finances and the related hazards. An appropriate technology is a technology that comprises of significance, correctness, completeness, broad coverage, elaborate, adjustable, and trustworthy and time bound communication in order to rationalize its activities by making it a unified component. It should also enable management to make decisions, ease exchange of information, decrease manpower, sustain the objectives and lead to workers' effectiveness.

Generally; the common evaluation parameters are the productivity in the enterprise, firm's efficiency and competitiveness.

Dalenogare (2018) claims that some of the parameters that may be considered to gauge the successfulness of computer applications are: operation of a computer technology; information worth, anticipated benefits of the technology, anticipated usage easiness of the technology, user friendliness, impact of the technology to the users; the contentment it offers and the parameters within the company. Evaluation of worthiness and computer technology valuation is made because of the company's computer applications resources conservation and information integrity.

Licorish (2018) asserts that the, ease of access, features of the coding used, the needs of the consumer factors that determine the consumer's contentment with computer technology is the timeliness of feedback, modification of errors, design and information security, the manual guidelines for the software, processes, software adjustability, correctness and frequency of results. In addition, the brevity of results, the date line of the results, and the arrangement of results, support by executives, and the mode of payments when work is done. There is also the confidence that the consumer has in the technology, the consumer involvement, the anticipation of the consumer from the technology and tangible remunerations. Greer (2021) further claims that the worthiness of computer software is influenced its advantages and expenses incurred in purchasing, designing, orientation of the employees, running and sustaining expenses. The procedure of assessment requires establishing and

managing the crucial aspects of a system plan. It is pertinent to establish every appropriate stakeholder in the system venture before choosing the method of assessment, criterion and make consideration of the people to engage in assessment.

According to Stair (2020), the procedure of evaluating the information system includes the unforeseen gains assessment, the information system venture risk evaluation and physical profits analysis. Therefore, the unforeseen gains and hazards require to be analyzed before assessing the physical gains. The competence of the person conducting the assessment is the one that determines whether the needs of the company have been put into consideration. Hence, those in management position must put into consideration the persons to include in assessment. The outcomes of the assessment should be availed to the interested parties to ensure that the results are used in making decisions.

Burbules (2018) claims that when the information technology is being developed, response that emanates from assessment is supposed to result to modifications when need be. The corrective measures should involve, for instance, an adjustment of the software development or purchasing tactics or alteration of resources used by the venture. Measuring the effectiveness of the information system could also focus on the successfulness of the commodities, possibility of business expansion and increase in the quantity of items sold. Focus could also be on the possibility of older commodities replacing the new ones or impact negatively the quantity of the

commodities of the present items. The time for break-even could also be considered when measuring the outcomes in terms of finances.

Al-Okaily (2022) argues that there are many factors that determine the success of information systems in an organization. These include; employees being concerned with information technology activities, designing and frequent upgrading the data bank which sustains the processes of the organization. In addition, availing improved system to execute the activities in the organization, provision and reach ability of organization repository, access to information at the right time and determination of management to provide individual desktops to all users. More so, encouraging emails amongst the consumers, vendors and workers and utilization of the internet to exchange information amongst stakeholders outside the organization. Other factors include; the way the organization has been structured impacts the giving out of data. Younus (2021) claims that the organizational culture and its structure enhance the utilization of the computer software. The devotion of the business firms to induct the workers that use the software, having the information technology experts and using computer competence are the methods of choosing the employees.

According to Bao (2021) factors like helpfulness, consumer attributes, consumer involvement, attitudes, willingness, competence in information technology, being supported by those in management, induction, outside forces and the accessibility to outside information have played a great role in effective implementation of information systems and its popularity.

2.3 The Challenges of the IS at the Post-Implementation Level

According to Marima (2018), some SMEs in developing countries are discontented with their IS investments and also not adequate in fulfilling the goals of the organization. This is because the information technology installed is inefficient, ineffective and obsolete. More so, CPK Coffie (2022)) asserts that SMEs do not have qualified personnel to develop in-house software; hence opting for the off-shelf software. From the studies that have been carried out from other countries Shirish (2021) argue that the human threatening factors in the post-implementation of computer technologies is the main reason for the malfunction of the information technologies. These human factors include the users who may lack adequate training to handle the systems; and lack of sufficient communication from the executives on the systems. In addition, lack of communication between the top management and the end users.

Singh (2022) likewise supports by asserting that human factors pose a challenge at the post-implementation level like the inadequate support from the system vendors which is caused by the firm when it does not remit the maintenance fees hence causing disagreement with the vendor.

In addition, managers are unable to recover relevant information from the system. Moreover; sales forecast produced by the systems are not proper; therefore; causing unsuitable production strategies and incorrect financial plans. Also administrators do not offer adequate backing to information systems implementation.

According to Esmat (2021), some of the challenges posed by the information systems are the outdated client documents and using the technology in unworthy way as a result of inadequate training and incomplete systems design. Therefore, this brings forth customers who are not loyal and end up getting lost. In addition, managers are unable to recover relevant information from the system. Moreover; sales forecast produced by the systems are not proper; therefore; causing unsuitable production strategies and incorrect financial plans. Also administrators do not offer adequate backing to information systems implementation. In addition, the functioning personnel not agreeing to use the system because they fear being sacked, loss of dependence in the system, inadequate training of personnel, poor user interface and system design. Moreover; the loss of the I.T. technical staff that goes to seek for greener pastures.

The implementation of information systems is not a success all the time in most companies. According to Makwinj (2018), other reasons leading to IS failure are lacking of support from the management, lack of co-operation from the users and lack of careful selection of information systems.

Trikhun (2019) claims that CMC is faced with quite number of difficulties such as rudeness, congested information and employee distress because they are required to offer urgent feedback. The use of e-mails lacks security on confidentiality matters and sending content to the wrong recipients. More so, it affects person to person relationships.

According to Berman (2021), the handicaps that face the adoption of Human Resource Management Information System is the failure to be supported by executives, size of the organization, inside requirements and competitiveness. Nevertheless; one of the recommendations that have been put forward in regard to the above is that regular meetings should be made between the seniors and the head of the Human Resource Department for elaborating the purpose and roles of both stakeholders. In addition; the type of the system established should possess standard functionalities to improve service delivery and enhance the productivity of workers. More so, there should be competent IT experts for maintenance of the system. Likewise, there should be readily available booklets that have elaborate knowledge to offer proper guideline to the users of the system. This greatly assists the effective implementation of the technology.

Kang (2021) argues that there are many acceptable standards like near-field communication for credit cards and soft wares used in industries. More so; there is lack of uniformity where these applications are used. Lack of content accuracy automatically has an impact on the accuracy of an activity and the duration that is taken in providing a solution to a difficulty. Also there are costs implications in fixing the tags on commodities to store the content.

Rodríguez (2020) states that the Enterprise Resource Planning software is faced with the difficulties of training costs. More so, the employees who are not experienced need to take much time and hard work to understand the interfaces of the system.

In addition; the interface of the chosen software is poorly organized which in return has an impact to the employee effectiveness and efficiency.

AboAbdo (2019) likewise is of the same opinion by stating that Enterprise Resource Planning technologies are costly and have an impact on the operations of many activities of an organization. Also, measuring the efficiency is made difficult by the impact caused by adoption is absolutely different from the costs involved, hence impossible to interconnect both of them. More so, the unseen gains, which makes the evaluation to be more complicated. The greatest challenge with identifying the efficiency of information system is showing the physical gains and also often, the much information required for similar transactions has absolutely no records. In developed countries, the employees do not pay much attention about soft wares, they take time to understand these systems, and hence organizations spend in terms of finances meant for training these employees.

The same author claims that establishing this system takes time accompanied by minimal success rate and other challenges of maintenance and transmission of knowledge. In smaller organizations, the information expertise remains an issue compared to large organizations. According to Madakam (2019), the application of the ERP is mostly found among enterprises with big processing ability and workers who are capable of communicating with vendors and clients. Designing new methods of conduction business to the clients and business firms proved to be a difficulty of the online transactions accompanied by the expensive facilities that go with the web

based systems and the external devices, infrastructure, social and economic factors such as low literacy and income levels, and deficient legal provisions or government policies

Le et al. (2019) claim that the e-payment challenges have been overcome to some extent through gaining insight from technology adoption theories, and adopting their proposition as to inform and guide implementation of electronic innovations. The reasons as to why electronic payment soft wares are becoming unpopular is that they are safe, lack of confidence by clients, they are somehow inconvenient, there is no evidence of payments, ignorance, the network providers charge expensively, lack of enough faculties, lack of adequate finances and rules established by the governments. As far as the developing countries are concerned, such difficulties have been countered in attaining understanding of information systems and have clear policies on technological inventions.

According to Kirilchuk (2022), the setbacks of information technology involve redundancy of workers; infringe confidentiality and disappointments to the workers. However, the organization in charge of executing the project likewise encounters the challenge and must conduct evaluation of the hazards related to the consumer. In regard to the consumer's perspective, the financial evaluation at the post-implementation is vital because he uses a lot of finances to purchase the hardware devices, organize the physical facilities, buying the system licensing, seeking outside opinion, induction of employees, the time consumed by employees when

implementing. In addition, inadequate choosing of software, company rejecting change, faults that arise out of incompetence of the new software once it is installed.

Sutton (2020) asserts that one of the threats for providing solutions to safety is that the systems function in an advanced concentrated environment, multiple automated tools being utilized and other computerized devices are inadequate in connection to electricity and automated equipment. Hence, the older proactive measures may not be applicable in internet of things software. The internet based administration should boost understanding, computer skills and evaluate advanced software like block chain and software defined networking.

2.4 The Frameworks and Theories for the Evaluation of IS at Post implementation level

According to Oztemel (2020), the technology needs for infrastructure services, safety measures, technical support and methods for assessment are used to come up with a proposed framework for the system.

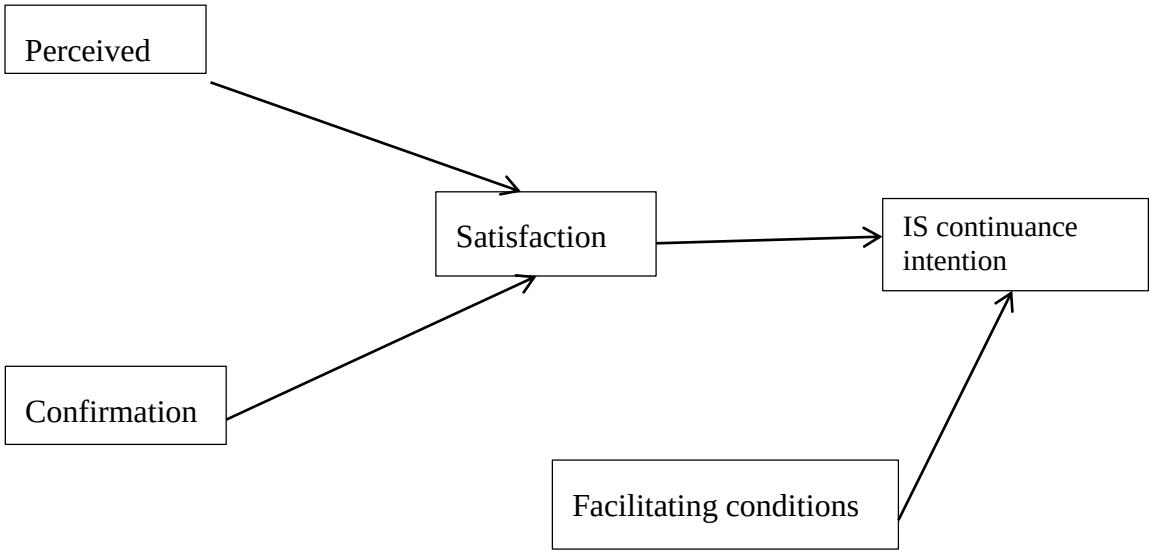
2.4.1 Information Systems Continuance Theory

The model below depicts the IS Continuance Theory Nurdin, (2019) which is an integration of three elements namely: perceived usefulness, confirmation and satisfaction to predict IS continuance intention. IS continuance is determined by consumers satisfaction of prior use and satisfaction is determined by two factors, the perceived usefulness and confirmation. Higher levels of confirmation denote exceeded initial expectation of the user experience while lower levels denote that the actual use did not meet the expectation. Greater levels of confirmation are thought to

have a positive impact on satisfaction of the system. Perceived usefulness fundamentally illustrates expectation perceptions of post consumption usage. Higher levels of perceived usefulness in the system are expected to lead to higher levels of satisfaction. Perceived usefulness is also expected to have a direct effect on IS Issues in Information Systems continuance intention. The last relationship in the model is that higher levels of confirmation are expected to have higher levels of perceived usefulness. The IS Continuance Theory denotes that post-consumption behavior is more critical than pre-consumption behavior and that as users developed additional experience with a software product their satisfaction levels regressed toward the mean and had a less predictive power on overall satisfaction.

Figure 2.1

IS Continuance Theory



2.4.2 Task Technology Fit Model (TTF)

Rahi et al. (2020) argues that this model examines the linkage between individual performance and the Information Systems. It shows that the user of the system accept technology so long as it is beneficial and enhances their task performance. The model includes constructs such as task characteristics, technology characteristics and use. Task characteristics mean "the actions carried out by individuals in turning inputs into outputs". The technology characteristics refer to "the technology used by individuals to perform their tasks" and the task technology-fit is identified "the degree to which a technology assists an individual in carrying out his/her tasks". The importance of this model is due to the fact that, it is embedded in three IS success dimensions which leads to the acceptance of IS.

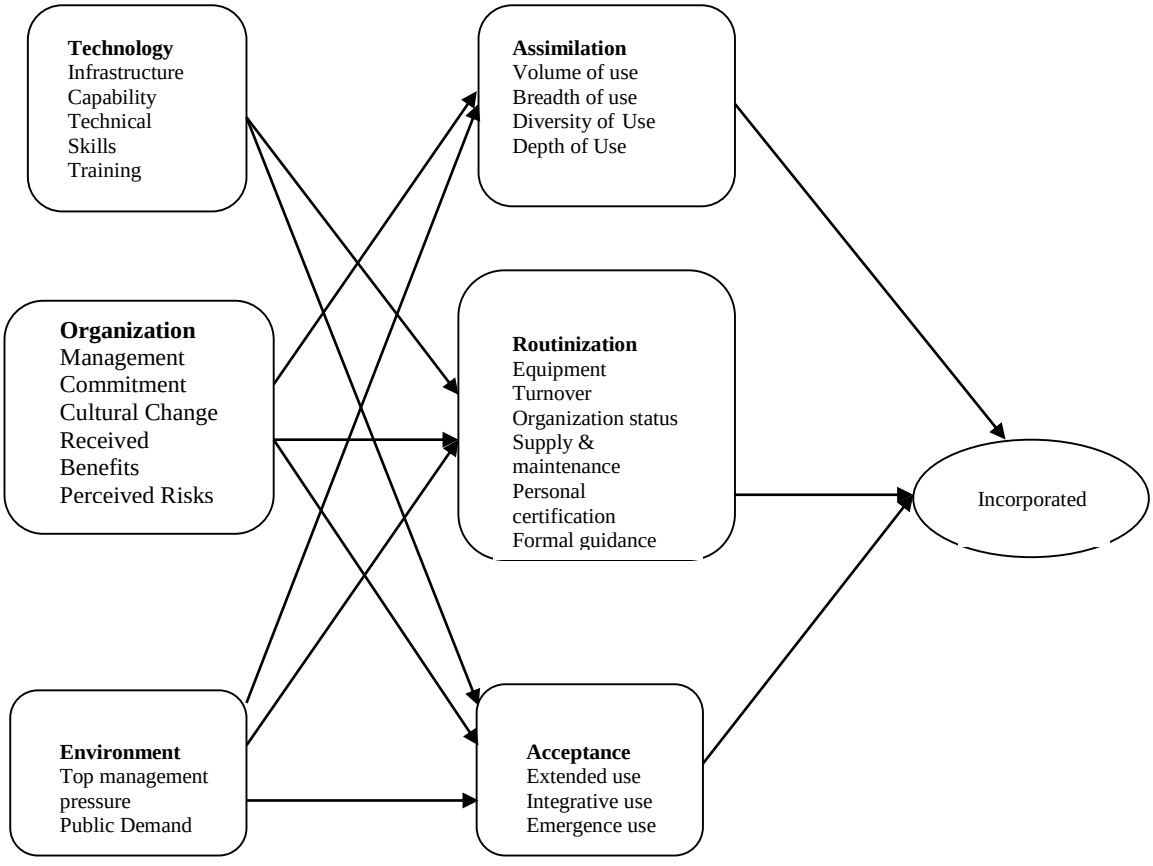
2.4.3 The TOE (Technology-Organization-Environment) Framework

This framework which was adopted by Tornatzky et al. (2021) portrays that there are three constructs that are likely to influence technological innovation adoption and implementation process. These consist of Technological, Organizational and Environment elements (Awa et al., 2017). **Technological Context** means all technologies that are relevant to the business enterprise. It revolves around the factors that influence technological innovation adoption and implementation process. **Organization** refers to all attributes and assets of the firm, including connecting structure between representative and firm size. It refers to descriptive measures related to organizations such as firm scope, firm size and managerial beliefs. **Environment** incorporates the structure of the business, information systems vendor

and administrative environment. It focuses on areas in which a firm conducts its business operations, with the priority given to external factors influencing the industry such as government incentives and regulations. The above constructs are dynamic and indicate that they can be manipulated with other factors that influence the post-adoption of information systems used in business organizations

Figure 2.2

Post-Implementation Framework used in Public Sectors Nasarudin



Definition of terms used in the above framework

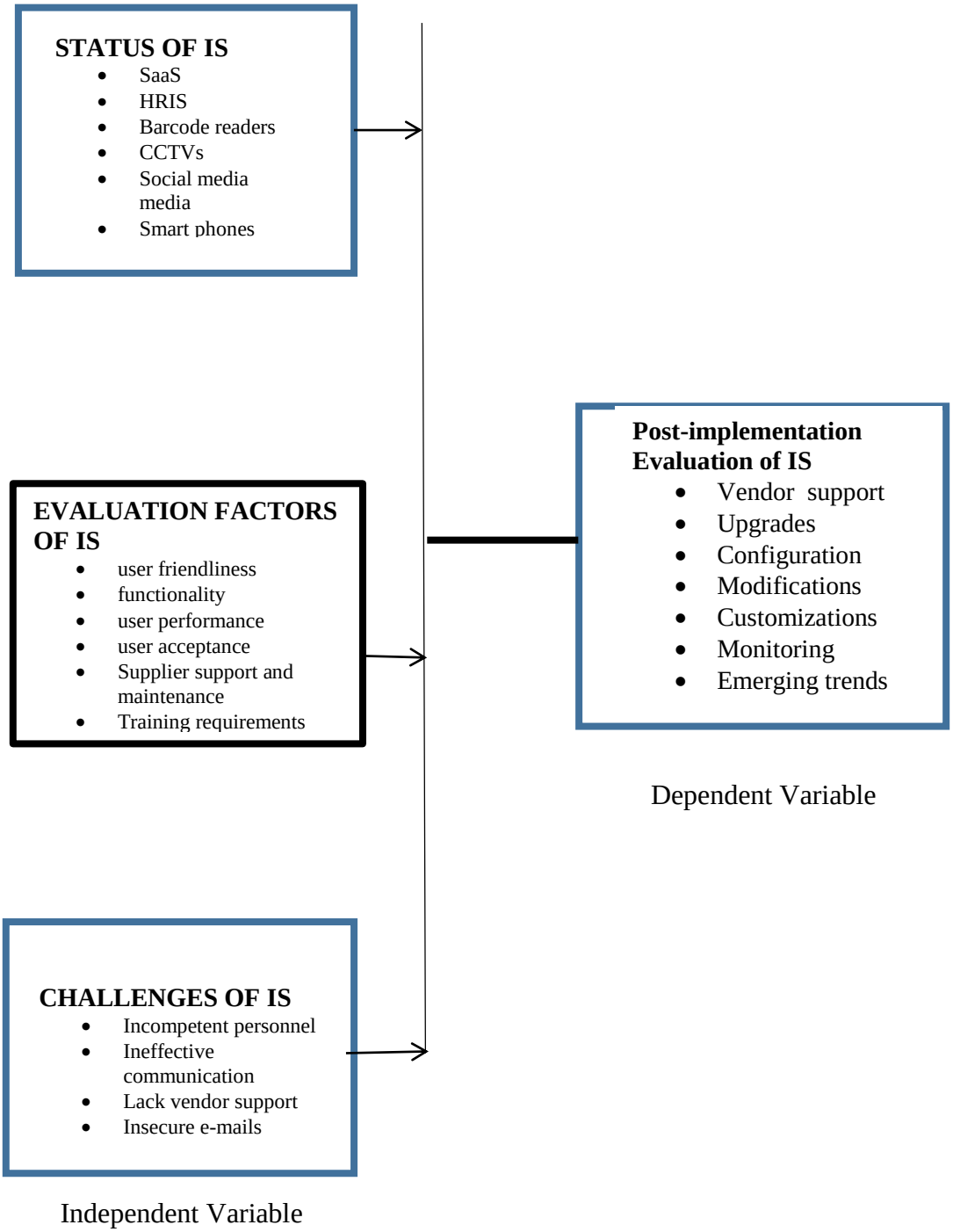
Nasarudin (2017) gives the following elaboration in regard to the above Framework: Technology means all technologies that are relevant to the business enterprise. Organization means characteristics and assets of the firm, including connecting structure between representative and firm size. Environment is an integration of the business structure, supplier of information systems and administrative environment. Assimmilation refers to the extent to which use of the invention is able to spread out throughout the processes of the firm. Routinization means the degree to which an organization's governance systems are adjusted to accommodate the innovation. Acceptance is the degree to which business enterprise constituents receive the innovation. Therefore, Assimilation, Routinization and Acceptance are the key activities involved at the post-implementation level. The above framework was proposed at post-implementation stage by the public sectors. It is a unified framework that has been adopted to test the supply chain innovations at post-implementation level and can therefore also be generalized to other types of information systems. Since it has been used to test information systems in public sectors, this study also used it to establish whether it was relevant to post-implementation evaluation of information systems used in SMEs in Meru County.

2.4.4 Conceptual Framework

This study has used a conceptual framework that is an integration of the Independent variable and the dependent variable. The independent variable under study is factors of post-implementation which consists of the status of information systems; the evaluation parameters of success of information systems at the post-implementation level and the challenges faced by the SMEs that have implemented the information systems. The dependent variable consists of post-implementation evaluation of I.S. found in SMEs of Meru County.

Figure 2.3

Conceptual Framework



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The aim of conducting this study was to propose a framework on the factors affecting post-implementation evaluation of computer systems used in Small and Medium Sized Enterprises of Meru County. Therefore, this chapter deals with the targeted population, research design, sampling design, pilot study, validity and dependability of the instruments and data analysis.

3.2 Research Design

The research used descriptive survey whereby investigation would be carrying out to measure the worth of the information systems being used by the Small and Medium Sized Enterprises of Meru County. A study design guides the researcher in gathering, processing and interpreting the experimental results Mugenda and Mugenda (1999) who argue that descriptive study involves scrutinizing of the state of affairs explaining, processing and reporting conditions that exist or existed. The survey used this design as it was appropriate to collect and analyzed data. In addition, several respondents were used in the study which gave a more accurate sample to draw conclusions.

3.3 Sample Size & Sampling Procedures

The total population of the small and medium sized enterprises in the Meru County is 800 according the information given by the Auditor General, Meru County.

The study used both the qualitative and the quantitative study designs. The study used the Purposive Sampling to get the SMEs that use the information systems as the population under study. Etikan (2017) claims that the researcher decides what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience. This involves identification and selection of individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest. This is because this sampling technique makes it easy for the researcher to draw generalizations from the data and the margin of error is also low. The study used a simple random selection of 80 managers, 80 ICT experts and 80 users of the system from the sampled enterprises.

Barlet et al. (2001) propose a table that can be used to come up with a sample size for continuous and categorical data (see appendix IV). The population of the study was 800 SMEs. Therefore, the sample size in this case was 240 computed at 96% level of significance with a margin error of 0.03. Therefore, the researcher chose the above table because the margin of error is appropriate for this study.

Table 3.1

SMEs and Sampling

CATEGORY OF SMEs	**NO. OF MANAGERS**	**NO. OF ICT PERSONNEL**	**NO. OF ICT USERS**
Service Industry	50	50	50
Manufacturing Industry	5	5	5
TOTAL	55	55	55

3.4 Research Instruments

A questionnaire with open and closed ended questions was used to collect data and was administered by the researcher. Ryan and Bell (2003) argue that closed ended questions are advantageous over open ended questions because of easy to process and compare answers and to show relationship between the variables.

3.5 Validity and Reliability of Measuring Instruments

In regard to study made by (Ryman and Bell, 2013) 1 to 1.5 % of the population sample is adequate for pilot study. Hair (2001) states that the purpose of a pilot study

is not so much to test hypothesis but to test research data gathering instruments in preparation for the larger study. Validity can be described as the extent to which the instrument measures what it is meant to evaluate (Melanie & Erikka, 2013). It concerns the accurateness and meaningfulness of inferences which are based on the research (Alan & Emma, 2015).

To test validity of the research tool, a pilot study was conducted comprising of 1% respondents. This was 8 firms which imply that each firm received a questionnaire each. To guarantee the legitimacy, the researcher closely scrutinized every question in reference to research objectives and the way managers responded to them, ICT personnel and the system users. The questionnaire was consequently revised in regard to the response from the pilot test. The pilot experiment showed that the structured questions were not very clear to the informants.

Therefore, the pilot study was an eye opener to the researcher to do modifications in regard to the framing and structure of the research instruments.

Reliability is the extent to which a research tool gives out similar results. That is, the stability or uniformity of scores over time or across raters (Mohajan, 2017). Reliability of the data collection tool was tested and determined by Cronbach‘s Alpha, since the computed value 0.86 is greater than 0.8 (standard value). This shows that the instrument used for the study was reliable enough.

3.6 Logical and Ethical Consideration

An introduction letter was obtained from the university and also the research permit was granted by the national commission for science and technology (NACOSTI). When carrying out the study, the research approached the respondent by first doing personal introduction and explaining the topic under study. This ensured that the respondent is comfortable enough to reveal any information he/she may be required to offer. This also eased the mind of the research participant, reducing the potential for distress, which is an important fundamental principle of research ethics. In regard to maintaining confidentiality of the respondent(s), the identity of participants was concealed hence participants were not required to indicate their names in the questionnaires and were informed that the exercise is absolutely voluntary in the sense that no one will be forced to participate against their will.

3.7 Data Analysis Procedure

Data analysis of this study involved interpreting the information that would be collected from the respondents after filling and completing the questionnaires. Descriptive analysis involved the use of frequency percentages and cross tabulations. Analyzed data was presented in tables, graphs and charts. In addition to descriptive analysis; factor analysis and analysis of variance (ANOVA) were also made to gain more information about the factors that affect post-implementation. Anderson (2001) assert that Analysis of Variance gives an extremely powerful and useful tool for test of factors.

3.8 Regression Model Analysis

A basic regression analysis was done.

The equation assured a linear relationship in the mode form of;

$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + E$ Where:

Y stands for the proposed framework

βo stands for intercept (constant)

β_1, β_2, β_3, stands for coefficient

X1 stands for Status of Information Systems

X2 stands for Evaluation Parameters

X3 stands for challenges of Information Systems The independent variables include the status of information systems at the post implementation level, the evaluation parameters of success and the challenges of information systems at the post implementation level and E stands for the proposed framework.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results of the data collected from the respondents, the analysis, interpretation, presentation and discussion of findings and the analyzed data analysis from the respondents. The chapter describes the data collection process and analysis, and profile of respondents. Descriptive statistics are presented. The post-implementation assessment of computer information technologies in Small and Medium Enterprises in Meru County has been discussed. The objective of the study was to establish the implementation status of the IS implemented in SMEs, to identify the evaluation parameters of success for IS, to establish the challenges of IS at the post-implementation level and to propose a framework preferable for the SMEs.

4.2 Data Collection Process and Analysis

The data for the study was collected by use of questionnaires. A total of 240 questionnaires were distributed to the targeted respondents; 80 manager's questionnaires, 80 IS users questionnaires and 80 ICT personnel questionnaires. Each category had 55 questionnaires returned which is an equivalence of 68% for every category

4.2.1 Distribution of Respondents by type of Organization

A 95% of the respondents were in the service industry while 5% were in the manufacturing industry. This result indicates that most small and medium sized enterprises in Meru County were in the service industry line with a very small proportion in the manufacturing industry as illustrated in figure 4.1.

Figure 4.1

Distribution of respondents by type of organization

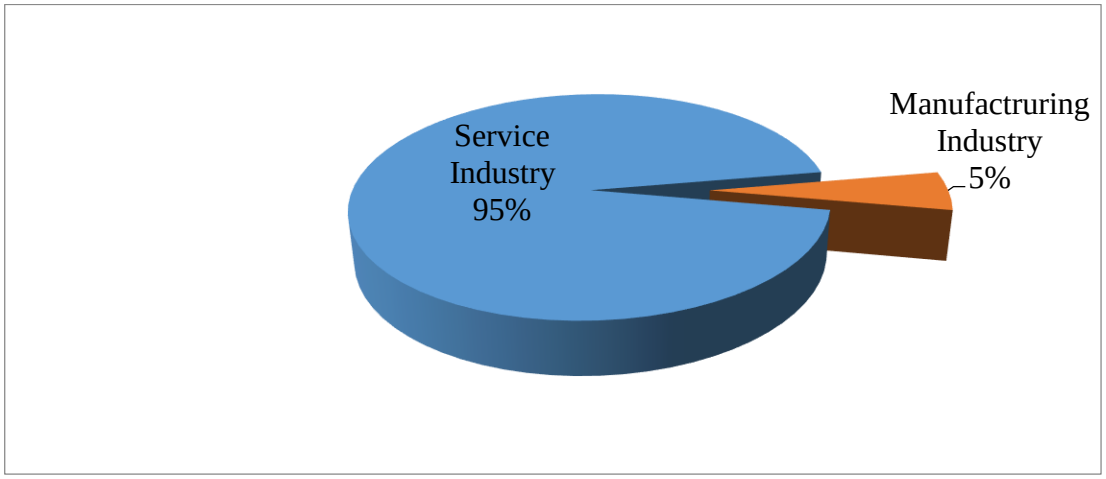
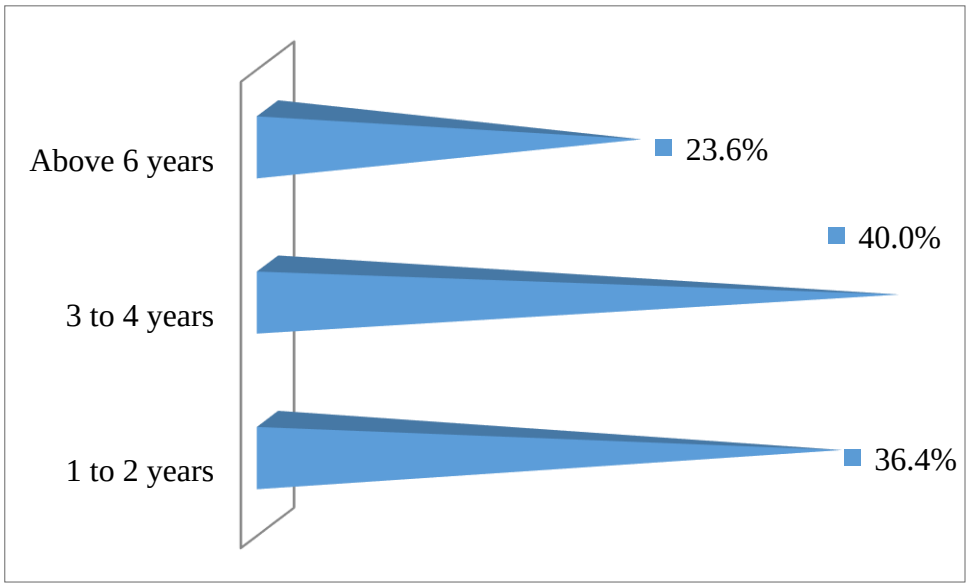


Figure 4.2

Distribution of IS users by length of service



4.2.2 Distribution of IS Users by length of Service

The study established that majority of the IS users (40%) had worked in the firm for a period of 3 to 4 years, 36.4% for 1 to 2 years and 23.6% had worked for more than 6 years. Hence, close to two thirds of the IS users had a working experience of more than 2 years, period long enough to give valid response on post-implementation evaluation of information systems in SMEs in Meru County. This is illustrated in figure 4.2.

4.2.3 Distribution of ICT personnel by length of Service

It was further established that majority of the ICT personnel (40%) had a working experience of 1 to 2 years, same as 3 to 4 years while 20% had a working experience of more than 6 years. This result signifies that more than half of the ICT personnel

had worked in their respective firms for a period of more than two years. Hence, the responses of the ICT personnel on post-implementation evaluation of information systems in SMEs in Meru County was valuable since they had interacted with the information systems in question for a significant period. This result is illustrated in table 4.1.

Table 4.1:

Distribution of ICT personnel by length of service

	Frequency	**Percent**
1 to 2 years	22	40.0
3 to 4 years	22	40.0
Above 6 years	11	20.0
Total	**55**	**100.0**

4.2.4 Distribution of Managers by length of Service

Nearly three quarters of the managers (70.9%) had a working experience of more than 6 years, 18.2% had worked for 3 to 4 years and 10.9% had a working experience of 1 to 2 years. This result suggests that almost all the managers interviewed had a significant working experience as only a tenth indicated a working experience of up to two years.

Hence the input of the managers on post-implementation evaluation of information systems in SMEs in Meru County was credible as they had stayed in the SMEs for a significantly long period.

Table 4.2

Distribution of managers by length of service

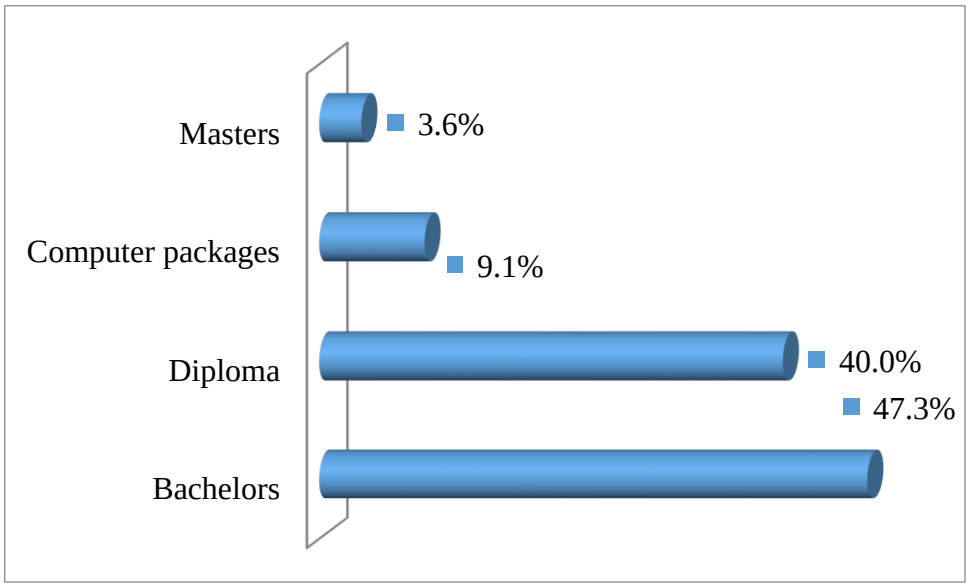
	Frequency	**Percent**
1 to 2 years	6	10.9
3 to 4 years	10	18.2
Above 6 years	39	70.9
Total	**55**	**100.0**

4.2.5 Distribution of IS Users by Level of Education

The study revealed that majority of the IS users (47.3%) had a first degree, 40% had diploma qualification, 9.1% had trained in computer packages while 3.6% had a master's degree qualification. This result implies that to a great extent, the IS users had adequate education qualification since more than half were graduates and only less than a tenth had less than a diploma qualification. This result was good for the study since from the educational credentials of the IS users, it is likely that they had no issues interpreting the constructs captured in the questionnaire. It also means that the proprietors of the SMEs in Meru County had invested in highly trained human resource in respect to IS users, signifying that information system was a critical component in the small and medium sized enterprises in Meru County. This result corresponds well with the finding of Juste et al. (2010) who asserted that highly educated workers or increasing their qualifications is meant to ensure that information systems are easily implemented. Figure 4.3 illustrates this result.

Figure 4.3

Distribution of IS users by education level

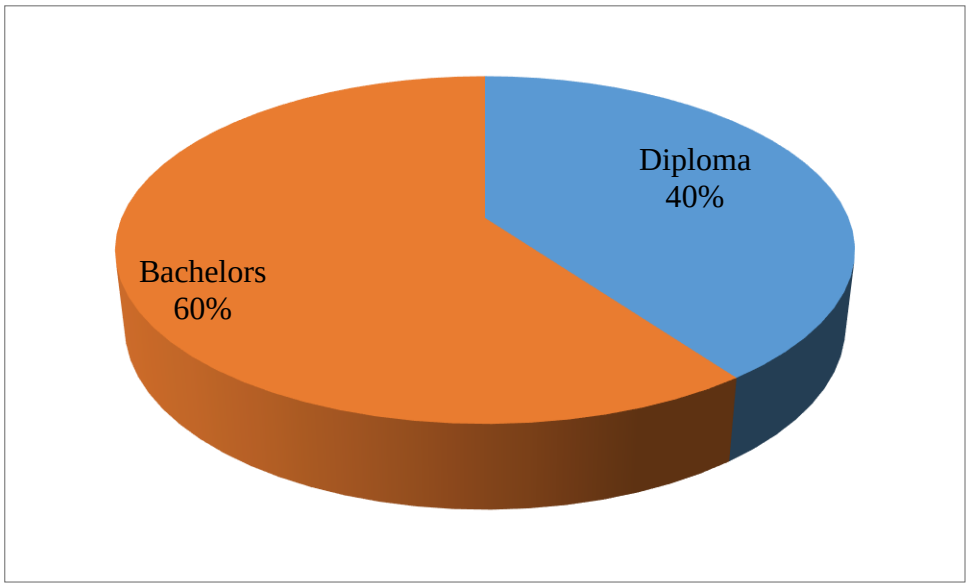


4.2.6 Distribution of ICT Personnel by Level of Education

In regard to the education level of the ICT personnel, majority (60%) had a first degree qualification while 40% had diploma qualification. This result indicates that the ICT personnel engaged by the SMEs in Meru County had sufficient educational credentials since none had less than a diploma qualification. Hence, the small and medium sized enterprises in Meru County had embraced ICT from the caliber of the ICT personnel they had contracted as illustrated in figure 4.4.

Figure 4.4

Distribution of ICT personnel by education level



4.2.7 Distribution of Managers by Level of Education

The study established that four fifths of the managers (80%) had first degree qualification while 20% had diploma qualification. This means that most of the managers were graduates since only a fifth indicated they were not. Hence, in terms of education qualification, the managers of the small and medium sized enterprises in Meru County were competent as illustrated in table 4.3.

Table 4.3

Distribution of managers by education level

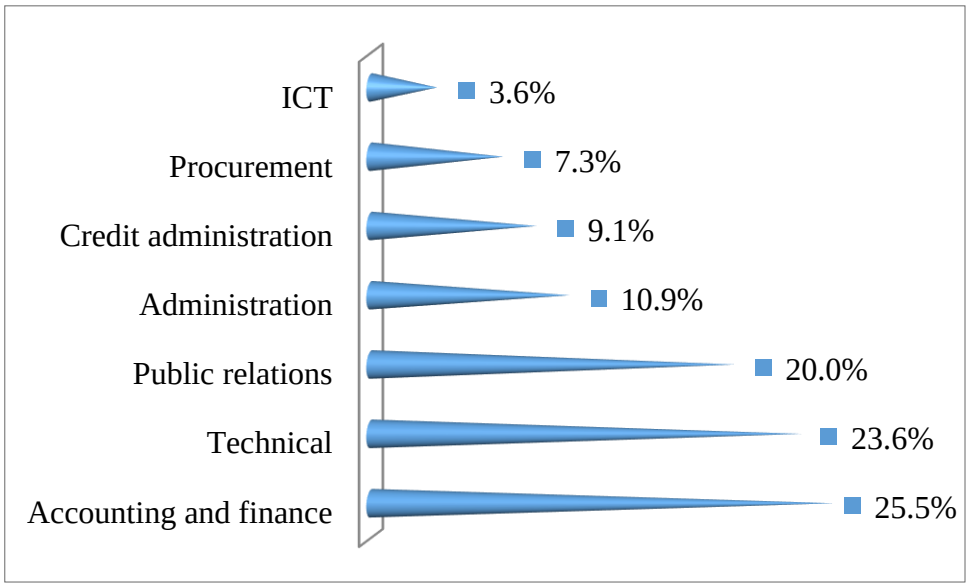
	Frequency	**Percent**
Diploma	11	20.0
Bachelors	44	80.0
Total	**55**	**100.0**

4.2.8 Distribution of IS Users by Area of Specialization

In respect to area of specialization of the IS users, 25.5% indicated they were in accounting and finance, 23.6% stated they were in technical and 20% specified they were in public relations while 10.9% indicated they were in administration. Besides, 9.1% were in credit administration, 7.3% in procurement while 3.6% were in ICT. This result signifies that the IS users in the small and medium sized enterprises in Meru County were mainly in finance, technical and public relations as each specialization enumerated more than a fifth of the respondents as illustrated in figure 4.5.

Figure 4.5

Distribution of IS users by area of specialization

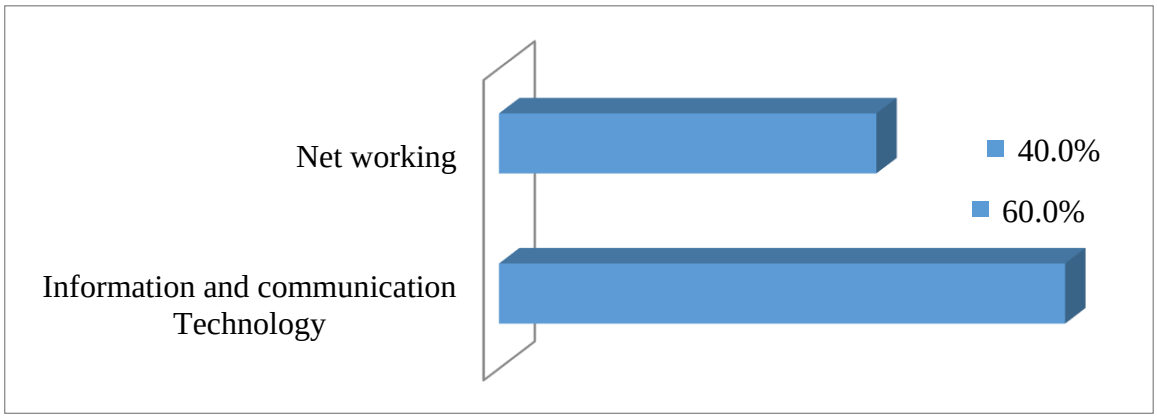


4.2.9 Distribution of ICT Personnel by Area of Specialization

Nearly two thirds of the ICT personnel (60.0%) had specialized in information and communication while 40.0% were specialists in networking. Hence, the ICT personnel working with the small and medium sized enterprises in Meru County were either specialists in information and technology or networking as illustrated in figure 4.6.

Figure 4.6:

Distribution of ICT personnel by area of specialization



4.3 Distribution of Managers by Area of Specialization

It was further established that 40.0% of the managers were in the field of finance, same as business administration, 10.9% were in the line of procurement while 9.1% were had studied the area of entrepreneurship. This result means that the fields of finance and business management were leading among managers of the small and medium sized enterprises in Meru County since the two fields accounted for a total of four fifths of the managers interviewed as illustrated in table 4.4.

Table 4.4

Distribution of managers by area of specialization

	Frequency	**Percent**
Finance	22	40.0
Procurement	6	10.9
Business Management	22	40.0
Entrepreneurship	5	9.1
Total	**55**	**100.0**

4.4 Status of the Information Systems Implemented in SMEs

The research was meant to establish the implementation status of the IS implemented in the small and medium sized enterprises in Meru County. The respondents availed adoption details of six information systems namely; accounting information system, customer relationship information system, human resource information system, enterprise resource planning information system, purchases and procurement information system and bar code readers' information system.

4.4.1 Status of accounting IS Implemented in SMEs

The study established that close to nine tenths of the SMEs (87.3%) had implemented an accounting information system, 9.1% did not have an accounting information system while 3.6% of the SMEs were in the criteria of implementing an accounting information system. This result implies that to a very large extent, the accounting information system of the small and medium sized enterprises in Meru County had been implemented since only around a tenth of the SMEs indicated either

being in the process of implementing the accounting information system or not having an accounting information system at all.

4.4.2 Status of customer relationship management IS Implemented in SMEs

In regard to the status of customer relationship management information system, nearly four fifths (78.2%) of the SMEs indicated the information system was implemented, 12.1% did not have a customer relationship management information system while 9.1% of the SMEs were in the process of implementing a customer relationship management information system. This result signifies that, to a large extent the customer relationship management information system of the small and medium sized enterprises in Meru County had been implemented since only about a fifth of the SMEs indicated either being in the process of implementing the customer relationship management information system or not having a customer relationship management information system at all.

4.4.3 Status of Human Resource IS Implemented in SMEs

Close to three quarters of the SMEs (72.7%) had implemented a human resource information system, 14.5% were in the process of implementing a human resource information system while 12.7% had not implemented a human resource information system. This result means that to a large extent, human resource information system of the small and medium sized enterprises in Meru County had been implemented since only about a quarter of the SMEs indicated either being in the process of implementing or not having implemented.

4.4.4 Status of Enterprise Resource Planning IS Implemented in SMEs

It was further established that slightly above half of the SMEs (54.5%) had implemented an enterprise resource planning information system, 21.8% did not have an enterprise resource planning information system, and 14.5% had not implemented an enterprise resource planning information system while 9.1% were in the process of implementing an enterprise resource planning information system. This result suggests that the enterprise resource planning information system of the small and medium sized enterprises in Meru County had been implemented to a moderate extent since only about half of the small and medium sized enterprises indicated they had implemented the enterprise resource planning information system.

4.4.5 Status of Purchases and Procurement IS Implemented in SMEs

In respect to the status of purchases and procurement information system of the small and medium sized enterprises in Meru County, 54.5% attested they had implemented, 29.1% indicated they did not have a purchases and procurement information system, and 10.9% stated they had not implemented while 5.5% specified they were in the process of implementing a purchases and procurement information system. Hence, purchases and procurement information system of the small and medium sized enterprises in Meru County had been implemented to a moderate extent since only about half of the small and medium sized enterprises indicated they had implemented the purchases and procurement information system.

4.4.6 Status of Bar Code Readers IS Implemented in SMEs

The study established that nearly half of the SMEs (43.6%) did not have a bar code reader information system, 27.5% had implemented a bar code reader information system, and 20.0% had not implemented while 9.1% were in the process of implementing a bar code reader information system. This result signifies that bar code reader information system of the small and medium sized enterprises in Meru County had been implemented to a little extent since only less than a third of the SMEs reported having implemented a bar code reader information system.

4.4.7 Status of the Information Systems Implemented in SMEs: Summary

The study established that accounting information system, customer relationship management information system and human resource information system had been implemented in the small and medium sized enterprises in Meru County to a great extent as they enumerated implementation prevalence of more than two thirds of the SMEs. Enterprise resource planning information system and purchases and procurement information system had been implemented in the small and medium sized enterprises in Meru County to a moderate extent as they documented implementation prevalence within a half range. Contrariwise, bar code readers' information system had been implemented in the small and medium sized enterprises in Meru County to a little extent since it recorded implementation prevalence of around a quarter. This result is illustrated in table 4.5.

Table 4.5

Implementation status of the Information Systems

	Implemented	Being Implemented	Not Implemented	Not Applicable	Total
Status of AIS	87.3	3.6	.0	9.1	100.0
Status of CRMIS	78.2	9.1	0	12.7	100.0
Status of HRMIS	72.7	14.5	0	12.7	100.0
Status of ERP	54.5	9.1	14.5	21.8	100.0
Status PIS	54.5	5.5	10.9	29.1	100.0
Status of Bar Code Readers	27.3	9.1	20.0	43.6	100.0

4.4.8 Existence of an Old System

The study sought to establish whether the SMEs in Meru County had an old system that was in place before embarking on the current information system. Nearly two thirds of the respondents (60.0%) indicated that their firms had an old system while 40.0% specified that their firms did not have an old system. This result means that a high majority of the small and medium sized enterprises in Meru County had an old system that was utilized before engaging the current information system as illustrated in table 4.6.

4.4.9 Period taken to Transit from Old to New System

It was further established that a fifth of the SMEs (20.0%) took up to three months to transit from the old to the new system, same as 4 to 12 months and more than 1 year. This means that the transition period from old to new system of the small and medium sized enterprises in Meru County varied from one firm to another and ranged from as short as up to 3 months to as long as more than 1 year in equal proportions as illustrated in table 4.7.

Table 4.7

Period taken to Transit from Old to New System

	Frequency	**Percent**
Up to 3 months	11	20.0
4 to 12 months	11	20.0
More than 1 year	11	20.0
Not Applicable	22	40.0
Total	**55**	**100.0**

In regard to the period taken to transit from the old to the new system; 20% indicated that it took up to 3 months, 20% showed that it took 4 to 12 months and 20% showed that it took more than one year. This is an indication that majority of enterprises take 3 to 12 months to transit from an old systems to a new system.

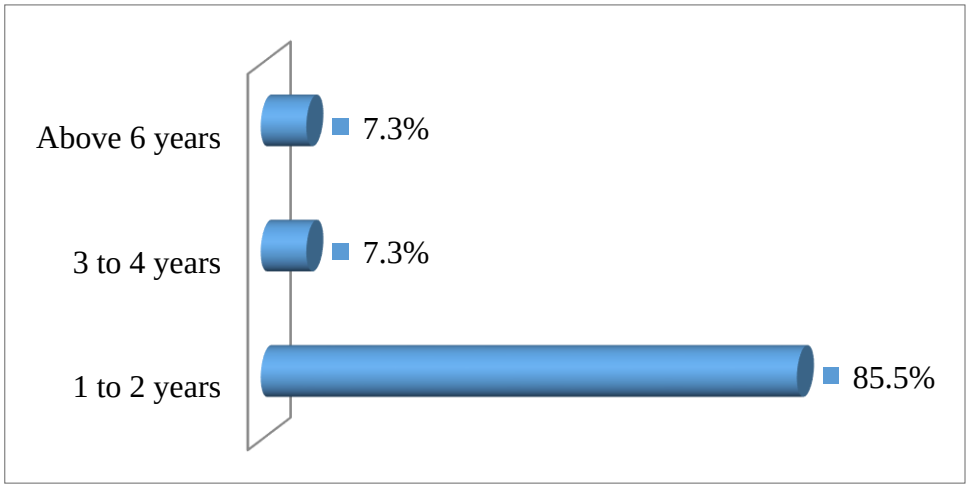
4.5 Frequency of the System Support and Maintenance

In respect to the frequency in which the information system received support and maintenance, a whopping 85.5% indicated 1 to 2 years while 7.0% stated 3 to 4 years

same as above 6 years. This result indicates that most of the small and medium sized enterprises in Meru County had their information system supported and maintained in a span of 1 to 2 years since more than four fifths of the respondents indicated so as illustrated in figure 4.7.

Figure 4.7

Frequency of the system support and maintenance



4.5.1 Personnel engaged in support and maintenance

The respondents were asked to cite the personnel engaged in support and maintenance of the information systems. Close to half of the respondents (49.1%) cited internal employees, 29.1% indicated hired experts while 21.8% stated both internal employees and hired experts. This result indicates that the function of support and maintenance in the Small and Medium Sized Enterprises in Meru County was mainly executed by internal employees with hired experts also playing a substantial role as illustrated in table 4.8. This finding is in agreement with the

finding of Juste et al. (2010) who argued that smaller firms use the aspect of outsourcing to overcome the lack of I.T. expertise.

Table 4.8

Personnel engaged in support and maintenance

	Frequency	**Percent**
Internal Employees	27	49.1
Hired Experts	16	29.1
Internal employees and hired experts	12	21.8
Total	**55**	**100.0**

4.5.2 Functions of the Information System: IS Users' response

In regard to the opinion of the information system users on the functions of the information system, four functions enumerated a rating of more than 90%, three functions scored a rating in the range of two thirds while 2 functions recorded a rating of less than half. Specifically, efficiency in report generation scored 98.2%, enhanced data security enumerated 94.5%, improved access to information scored 92.7% same as data sharing between departments. Hence, in the opinion of the information system users the main functions of the information system was efficiency in generation of reports, enhancement of data security, improved access to information and data sharing between departments since for each item, more than nine tenths of the respondents attached great significance. It is also worth noting that almost all the information system users indicated efficiency in report generation as a

key function. Hence, the most outstanding function cited by the information system users of the small and medium sized enterprises in Meru County was efficiency in report generation.

Nearly two thirds of the information system users (65.5%) specified facilitation of online transactions as a vital information system function, 63.6% cited collaboration with clients while 61.8% indicated increased interaction with customers. Hence, facilitation of online transactions, collaboration with clients and increased interaction with customers were also paramount functions of the information system in the small and medium sized enterprises in Meru County as about two thirds of the information system users believed they were key functions of the information system. In contrast, advertising of firm products enumerated a rating of 47.3% and improved brand awareness scored 45.5% rating. This result suggests that in the opinion of the information system users, advertising of firm products and improved brand awareness were not utmost functions of the information system in the small and medium sized enterprises in Meru County since only less than half of the information system users believed they were vital functions as illustrated in table 4.9.

Table 4.9

Functions of the Information System: IS users' response

	Frequency	Percent
Efficiency in report generation	54	98.2
Enhanced data security	52	94.5
Improved access to information	51	92.7
Data sharing between departments	51	92.7
Facilitates online transactions	36	65.5
Collaboration with clients	35	63.6
Increased interaction with customers	34	61.8
Advertising of firm products	26	47.3
Improved brand awareness	25	45.5

4.5.3 Functions of the Information System: ICT Personnel response

In respect to the opinion of ICT personnel on the functions of information system, five functions recorded a rating of 100%, two functions enumerated a rating of 60% while some other two functions posted a rating of 20%.

Specifically, efficiency in report generation, improved access to information, improved brand awareness, data sharing between departments, and enhanced data

security posted a rating of 100%. This means that, in the opinion of the ICT personnel, efficiency in report generation, improved access to information, improved brand awareness, data sharing between departments and enhanced data security were vital functions performed by the information systems since all the ICT personnel interviewed opined so.

Three fifths of the ICT personnel (60.0%) indicated that information systems were important in facilitating online transactions and increased interaction with customers.

This result suggests that the information systems in the small and medium sized enterprises in Meru County played a fairly important function in facilitation of online services and increased interaction with customers as more than half of the ICT personnel believed they were key functions of the information system.

On the other hand a fifth of the ICT personnel (20.0%) specified that the information systems enhanced collaboration with clients and advertising of firm products.

Hence, in the opinion of the ICT personnel, collaboration with clients and advertising of firm products were not vital function played by the information systems as only a fifth of the ICT personnel perceived the two as important functions as illustrated in table .10.

4.5.4 Functions of the Information System: Managers response

Table 4.10

Functions of the Information System: ICT personnel response

	Frequency	Percent
Efficiency in report generation	55	100.0
Improved access to information	55	100.0
Improved brand awareness	55	100.0
Data sharing between departments	55	100.0
Enhanced data security	55	100.0
Facilitates online transactions	33	60.0
Increased interaction with customers	33	60.0
Collaboration with clients	11	20.0
Advertising of firm products	11	20.0

In respect to the opinion of managers on the functions of information system, one function enumerated 100.0% rating, three functions posted a rating of two thirds to nine tenths, and two functions recorded a rating of two fifths, while another two functions enumerated a rating of less than 10.0%.

All the managers interviewed (100.0%) indicated that efficiency in report generation was a vital function performed by the information systems, nearly nine tenths (89.1%) of the managers attested that data sharing between departments was an important function played by information system same as enhanced data security. Besides, four fifths of the managers (80.0%) indicated that the information systems were paramount in improving access to information and slightly above two thirds

(70.9%) specified that information systems enhanced online transitions. This finding shows that, according to the managers, efficiency in report generation was the most outstanding function of the information systems as none of the managers held a divergent opinion. Also, data sharing between departments and enhanced data security were to a very large extent viewed by managers as vital functions performed by information systems since only around a tenth of the managers held a divergent opinion. Facilitation of online transactions was also viewed by the managers as a significant function of the information system to a large extent since close to three quarters of the managers opined so.

Table 4.11

Functions of the Information System: Managers response

	Frequency	**Percent**
Efficiency in report generation	55	100.0
Data sharing between departments	49	89.1
Enhanced data security	49	89.1
Improved access to information	44	80.0
Facilitates online transactions	39	70.9
Collaboration with clients	22	40.0
Increased interaction with customers	22	40.0
Advertising of firm products	5	9.1
Improved brand awareness	5	9.1

On the other hand, collaboration with clients enumerated a rating of 40.0% from the managers same as increased interaction with customers while advertising of firms products and improved brand awareness posted a rating of 9.1% each. This result implies that collaboration with clients and interaction with customers were viewed by managers as important functions played by information systems to a moderate extent since less than half of the managers believed they were. However, in the opinion of the managers, advertising of firm products and improved brand awareness were not important functions performed by information systems as each attracted a rating of less than a tenth as illustrated in table 4.11.

4.5.5 Functions of the Information System: Summary

The study established that efficiency in report generation, data sharing between departments and improved access to information, were the most important functions performed by the information systems since almost all the managers, ICT personnel and IS users judged them as vital functions executed by the information systems. This result is in harmony with the finding of Wyan et al. (2013) who established that E-Business technologies enabled SMEs reports be generated efficiently hence the CEOs have access to information concerning the firm's performance which makes the managers to take remedial action when the indicators are not moving in the rightful direction. The result also supports the finding of Piotrowicz & Irani (2010) who established that all departments access to information at the same time as a result of adoption of information system.

4.5.6 Benefits of the Information System: ICT Personnel response

The ICT personnel were asked to cite the benefits of information systems adopted by the small and medium sized enterprises in Meru County. Four items enumerated a rating of 100.0%, two items scored 80.0%, 3 items posted 60.0% while one item recorded a rating of 40.0%. All the ICT personnel (100.0%) indicated that improvement in customer service, improved output, quick response time, and enhanced user interface were dominant benefits accruing from the adoption of the information systems.

Hence, in the opinion of the ICT personnel, improvement in customer service, improved output, quick response time, and enhanced user interface were the top benefits of the information system as none of the ICT personnel held a differing opinion.

It was further established that four fifths of the ICT personnel (80.0%) opined that readiness and quick access to information, and reduction of expenses were major benefits derived from the information systems. Hence the information systems lead to swift access to information and reduction of expenses to a large extent since only a fifth of the ICT personnel did not uphold this opinion. Nearly two thirds of the ICT personnel (60.0%) observed that information systems enhanced quick decision making, gave the firms a competitive advantage and resulted in increased interaction with customers. This result signifies that adoption of information system boosted decision making, placed the firms at a competitive edge and lead to increased

interaction with customers to a moderate extent since slightly above half of the ICT personnel upheld this view.

Two fifths of the ICT personnel (40.0%) specified that information systems enhanced value creation. Hence, enhanced value creation was not judged by the ICT personnel as a major benefit derived from adoption of information systems since far less than half of the ICT personnel believed that information system lead to enhanced value creation as illustrated in table 4.12.

Table 4.12

Benefits of the Information System: ICT personnel response

	Frequency	**Percent**
Improvement in customer service	55	100.0
Improved output	55	100.0
Quick response time	55	100.0
Enhanced user interface	55	100.0
Readiness and quick access to information	44	80.0
Reduction of expenses	44	80.0
Quick decision making	33	60.0
Competitive advantage	33	60.0
Increased interaction with customers	33	60.0
Enhanced value creation	22	40.0

4.5.7 Benefits of the Information System: Managers response

In respect to the managers opinion on the benefits of information system, one item posted a rating of 100.0%, two items scored a rating of between 80.0% and 90.0%,

four items enumerated a rating of between 60.0% and 70.0% while three items recorded a rating of between a third and a half.

All the managers (100.0%) indicated that information systems lead to readiness and quick access to information, 89.1% specified that improvement in customer service was a benefit derived from adoption of the information systems while 81.8% opined that information system lead to improved output. This result implies that to a very large extent, the information systems employed by the small and medium sized enterprises in Meru County resulted in swiftness in access to information, lead to improved customer service and enhanced the level of output since more than four fifths of the managers believed so. It is also worth noting that swiftness in access to information was the most outstanding benefit derived from the information systems since none of the managers upheld a divergent opinion.

Slightly above two thirds of the managers (69.1%) had opinions that information system lead to quick decision making, quick response time and enhanced user interface while 61.8% specified that information system resulted in reduction of expenses. This result suggest that to a moderate extent, information systems in the small and medium sized enterprises in Meru County lead to quick decision making, quick response time, enhanced user interface and reduction of expenses since these items posted ratings within the range of two thirds. Half of the managers (50.9%) stated that information systems gave the firms a competitive edge, 41.8% opined that information systems enhanced value creation while 38.2% specified that information

systems lead to increased interaction with customers. This result suggests that information systems gave the firms a competitive edge, enhanced value creation and resulted in increased interaction with customers to a little extent since only up to half of the managers indicated that the aforementioned three items were benefits derived from adoption of the information systems.

Table 4.13

Benefits of the Information System: Managers response

	Frequency	**Percent**
Readiness and quick access to information	55	100.0
Improvement in customer service	49	89.1
Improved output	45	81.8
Quick decision making	38	69.1
Quick response time	38	69.1
Enhanced user interface	38	69.1
Reduction of expenses	34	61.8
Competitive advantage	28	50.9
Enhanced value creation	23	41.8
Increased interaction with customers	21	38.2

4.5.8 Benefits of the Information System: Summary

The study established that the information systems employed by the small and medium sized enterprises in Meru County resulted in swiftness in access to information, lead to improved customer service and enhanced the level of output since almost all the managers and the ICT personnel perceived the aforementioned

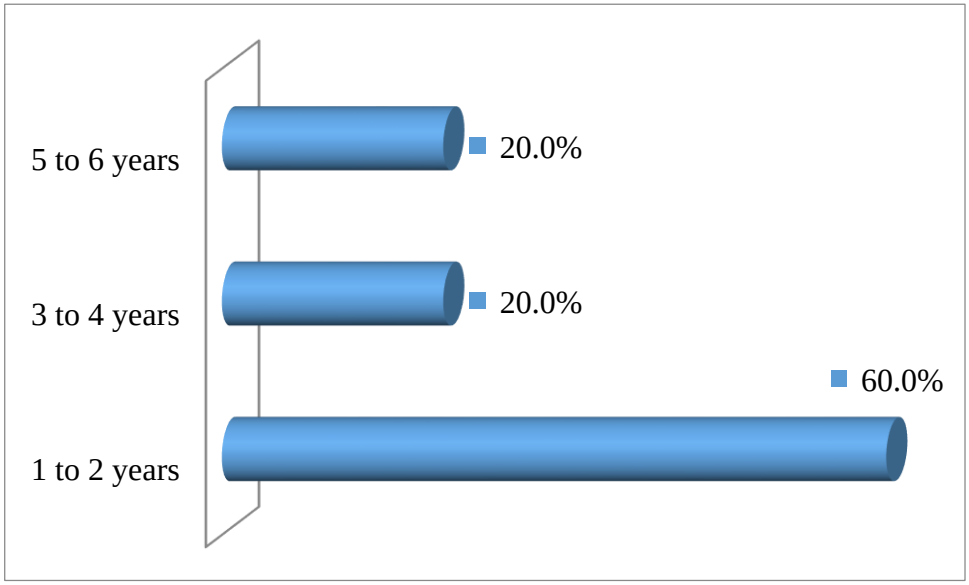
three items at top most benefits derived from adoption of the information systems. This result is in agreement with the finding of Piotrowicz & Irani (2010) who establihed that improvement in customer service and reduced time for decision making were benefits that accrued to a firm that adopted information systems.

4.5.9 Period taken to realize Benefits of the Information System: ICT Personnel response

A high majority of the ICT personnel (60.0%) stated that it took 1 to 2 years to realize the benefits of the information system, 20.0% specified 3 to 4 years, same as those who indicated that it took a firm 5 to 6 years to realize the benefits of information system. This result suggest that in most of the instances, firms took 1 to 2 years to realize the benefits of information system since more than half of the ICT personnel indicated so as illustrated in figure 4.8. This result reflects the finding of Nicolaou et al. (2004) who established that the gains realized from information systems are realized until four or five years after the adoption of the systems.

Figure 4.8

Period taken to realize benefits of the IS: ICT Personnel response



4.6.0 Period taken to realize Benefits of the Information System: Managers response

Close to four fifths of the managers (78.2%) opined that it took 1 to 2 years to realize the benefits of information system while 21.8% indicated that it took 3 to 4 years to realize the benefits of the information system. Hence, in the opinion of the managers, it took 1 to 2 years to realize the benefits of the information system since more than three quarters of the managers supported this view.

Table 4.14

Period taken to realize benefits of the information system: Managers response

	Frequency	Percent
1 to 2 years	43	78.2
3 to 4 years	12	21.8
Total	55	100.0

4.6.1Training on the Information System: IS Users

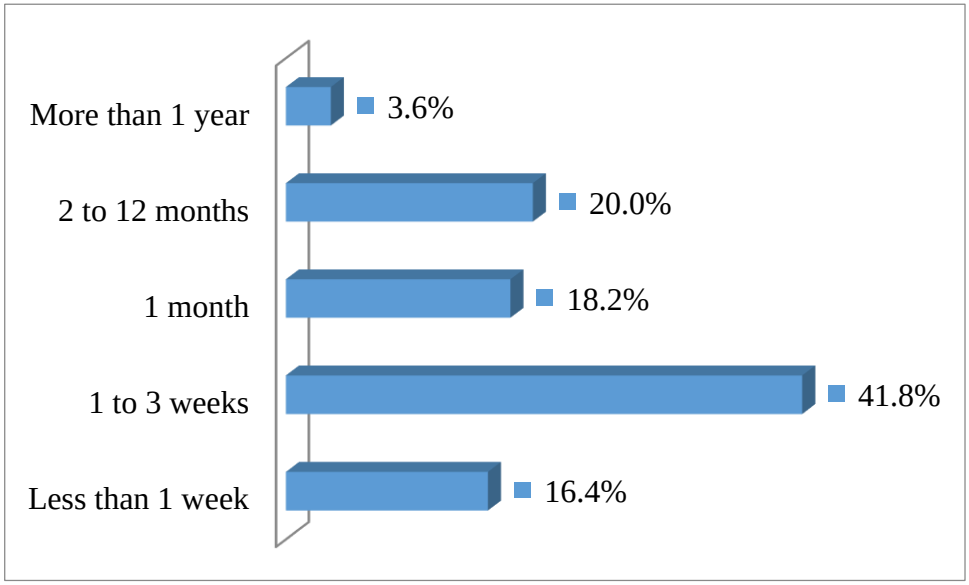
It was revealed that all the information system users (100.0%) were trained on the information system. Hence, the proprietors of the small and medium sized enterprises in Meru County had ensured that all the information system users were trained on the system. This result supports the finding of Patel et al. (2012) who indicated that staff requires continuous training even after the system is implemented at the post-implementation level to enhance the productivity of the system.

4.6.2 Length of the Training on Information System

Majority of the information systems users (41.8%) were trained on the information system for 1 to 3 weeks, 20.0% were trained for 2 to 12 months, 18.2% were trained for a month and 16.4% were trained for less than a week while 3.6% took more than a year in training. This result implies that the information system users were taken through training on the information system that took up to one month since more than three quarters of the information users indicated the training took a month or less as illustrated in figure 4.9.

Figure 4.9

Length of the training on information system for IS users



4.6.3 Evaluation Parameters of Success for IS: ICT Personnel response

The study sought to examine the evaluation parameters of success for the information systems. The ICT personnel gave a rating of 100.0% for three parameters, 80.0% for another three parameters and 60.0% for yet another three parameters.

User friendliness, functionality and quality of output enumerated a score of 100.0% as evaluation parameters on the accomplishment of an information system. Hence, in the opinion of the ICT personnel, an information system is considered successful if it is user friendly, functional and produces quality output since all the ICT personnel unanimously stated so. This is in agreement with (Rimal et al., 2011) who argues

that the criteria for evaluating an information system is the user friendliness and functionality.

Quick decision making, return on investment, and user performance and acceptance posted a rating of 80.0% as evaluation parameters on the accomplishment of an information system. This result signifies that to a large extent, quick decision making, return on investment, and user performance and acceptance were important evaluation parameters for the success of an information system since only a fifth of the ICT personnel upheld a differing opinion. This is very much supported by (MS et al., 2015) who asserts that the user centered parameters are user performance and acceptance.

It was further established that popularity of the vendor, supplier support and maintenance, and training requirements recorded a rating of 60.0% as evaluation parameters on the accomplishment of the computer information technology. This result suggests that, to a moderate extent, popularity of the vendor, supplier support and maintenance, and training requirements were significant assessment parameters on the achievement of the computer technology since three fifths of the ICT personnel viewed the three items as vital parameters in evaluation of an information system. This is illustrated in table 4.16.

Table 4.16

Criteria for evaluating the Information System: ICT personnel response

	Frequency	Percent
User friendliness	55	100.0
Functionality	55	100.0
Quality of output	55	100.0
Quick decision making	44	80.0
Return on investment	44	80.0
User performance and acceptance	44	80.0
Popularity of the vendor	33	60.0
Supplier support and maintenance	33	60.0
Training requirements	33	60.0

4.6.4 Evaluation Parameters of Success for IS: Managers response

In regard to the opinion of the managers on the evaluation parameters of a successful information system, two parameters posted a rating of 100.0%, one item enumerated a rating of 80.0%, and three items scored a rating of between 50.0% and 70.0% while three items recorded a rating of less than a third.

User friendliness and functionality scored a rating of 100.0% as evaluation parameters on success of an information system. This result signifies that user friendliness and functionality were the most important parameters in assessing the success of an information system since all the managers opined that two parameters were significant standards in measuring the achievement of an information system.

Besides, user performance and acceptance posted 80.0% rating as an evaluation parameter of the accomplishment of an information system. Hence, to a large extent, user performance and acceptance was a significant evaluation parameter of the accomplishment of an information system since only a fifth of the managers opined differently.

Quick decision making posted a score of 69.1%, supplier support and maintenance enumerated 60.0% rating while training requirements registered a rating of 52.7%. Hence, to a moderate extent, quick decision making, supplier support and maintenance, and training requirements were important evaluation parameters of the success of an information system since managers in the range of a half to two thirds believed the three parameters were significant criteria in assessing the achievement of an information system. On the other hand, quality of output registered a rating of 30.9%, same as return on investment while popularity of the vendor recorded a rating of 9.1%. This result signifies that quality of output, return on investment and popularity of the vendor were not significant parameters in measuring the achievement of an information system since only less than a third of the managers perceived the three parameters as vital standards in assessing the achievement of an information system. This result is illustrated in table 4.17.

Table 4.17

Criteria for evaluating Information System: Managers response

	Frequency	Percent
User friendliness	55	100.0
Functionality	55	100.0
User performance and acceptance	44	80.0
Quick decision making	38	69.1
Supplier support and maintenance	33	60.0
Training requirements	29	52.7
Quality of output	17	30.9
Return on investment	17	30.9
Popularity of the vendor	5	9.1

4.6.5: Evaluation Parameters of Success for IS: Summary

The study established that user friendliness, functionality and user performance and acceptance were the most important parameters in assessing the success of an information system since these three parameters were judged as significant evaluation parameters in measuring the achievement of an information system by almost all the managers and the ICT personnel interviewed. This result relates to the outcome of Mittermayer and Rodriguez (2013) who established that the criteria for evaluating an information system include user friendliness, functionality, and adaptability. The result also supports the finding of Yang et al. (2010) who indicated that user centered parameters are user performance and acceptance and the user efficiency.

4.7 Challenges of IS at the Post-Implementation Level: ICT Personnel response

The research is meant to determine the challenges of information system at the post implementation level. Four items enumerated a rating of 80.0%; two items recorded a rating of within 40.0% and 60.0% while two items posted a rating of 20.0%.

User resistance, user incompetence, high cost of upgrading and emerging trends in ICT posted a rating of 80.0% as challenges facing information system at the post implementation level.

This result suggests that user resistance, user incompetence, high costs of upgrading and emerging trends in ICT were significant challenges of information system at the post implementation level since four fifths of the ICT personnel viewed the four parameters as challenges of information system at the pot implementation level.

High information technology staff turnover posted a rating of 60.0% while infrequent upgrading registered a rating of 40.0% as challenges of information system at the post implementation level. This result suggests that high information technology staff turnover and infrequent upgrading were moderate challenges of the information system at the post implementation level since ICT personnel in the range of two fifths to three fifths judged the two items as significant challenges of the information system at the post implementation level.

Inadequate vendor support and lack of support from top management enumerated a rating of 20.0% as challenges of information system at the post implementation level.

This result suggests that inadequate vendor support and lack of support from top management were not significant challenges of the information system at the post implementation level since only a fifth of the ICT personnel judged them as major challenges of the information system at the post implementation. This result is illustrated in table 4.18.

Table 4.18

Challenges of IS at the Post-Implementation Level: ICT personnel response

	Frequency	**Percent**
User resistance	44	80.0
User incompetence	44	80.0
High costs of upgrading	44	80.0
Emerging trends in ICT	44	80.0
High IT staff turnover	33	60.0
Infrequent upgrading	22	40.0
Inadequate vendor support	11	20.0
Lack of support from top management	11	20.0

4.7.1 Challenges of IS at the Post-Implementation Level: Managers response

In regard to the opinion of the managers on challenges of the information system at the post implementation level, two items enumerated a rating of 80.0% and above, another two items posted a rating of 40.0% to 50.0% while four items registered a rating of less than a third.

High costs of upgrading posted a rating of 90.9% while emerging trends in ICT recorded a rating of 80.0% as challenges of information system at the post implementation level. This result signifies that high costs of upgrading and emerging trends in ICT were significant challenges of information system at the post implementation level since more than four fifths of the managers perceived the two items as serious challenges of information system at the post implementation level.

High information technology staff turnover enumerated a rating of 49.1% while user resistance posted a rating of 41.8% as challenges of information system at the post implementation level. Hence, high information technology staff turnover and user resistance were moderate challenges of information system at the post implementation level since managers within the range of one half perceived the two items as challenges of information system at the post implementation. This result is illustrated in table 4.19.

Table 4.19

Challenges of IS at the post-implementation level: Managers response

	Frequency	Percent
High costs of upgrading	50	90.9
Emerging trends in ICT	44	80.0
High IT staff turnover	27	49.1
User resistance	23	41.8
Infrequent upgrading	17	30.9
User incompetence	17	30.9
Inadequate vendor support	15	27.3
Poor interface and design	11	20.0

4.7.2 Challenges of IS at the Post-Implementation Level: Summary

The study established that high costs of upgrading and emerging trends in ICT were critical challenges of information system at the post implementation level since almost all the managers and ICT personnel perceived the two items as serious challenges of information system at the post implementation level. This result contradicts the finding of Kale et al. (2010) who argued that some reasons leading to IS failure are lack of support from the management, lack of co-operation from the users and lack of careful selection of information systems.

4.8 Further Analysis

The researcher carried out factor analysis to determine the extent to which the various factors affecting ICT were correlated for the purpose of gaining more information about the factors that affect post-implementation. Variance

maximization (VARIMAX) rotation method was used to obtain the weighting of the variables that affect the post-implementation evaluation of information systems used in SMEs.

Table 4.20

KMO and Bartlett's Test of sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		..540
Bartlett's Test of Sphericity	Approx. Chi-Square	484.123
	Df	105
	Sig.	.000

The KMO obtained indicated that the sample obtained was adequate as indicated by the KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) was moderate (0.546). The Bartlett's Test of Sphericity which measured the correlations among the variables in the correlation matrix was significant (χ^2 (105) = 484.12 $p<0.01$) and therefore the use of factor analysis was appropriate.

Table *4*.21

Total variance of extracted factors on ICT Post-implementation

Component	Initial Eigen values			Extraction Sums of Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.505	16.700	16.700	2.505	16.700	16.700
2	1.848	12.317	29.017	1.848	12.317	29.017
3	1.414	9.426	38.443	1.414	9.426	38.443
4	1.253	8.356	46.799	1.253	8.356	46.799
5	1.167	7.781	54.579	1.167	7.781	54.579
6	1.118	7.451	62.030	1.118	7.451	62.030
7	1.070	7.130	69.160	1.070	7.130	69.160
8	.865	5.770	74.930			
9	.786	5.240	80.170			
10	.702	4.677	84.848			
11	.556	3.705	88.552			
12	.552	3.679	92.231			
13	.452	3.010	95.242			
14	.396	2.640	97.881			
15	.318	2.119	100.000			

The total extracted variables accounted for 69.16% of the variance on ICT post-implementation. The components had various weightings as shown in factor loadings in table 4.22. The highest weighting the total variance was factor one which had 16.7% followed by factor two which had 12.37%. The third and fourth factors had variances of 9.43% and 8.36% respectively. The rest of the factors had variances of 7.78%, 7.45% and 7.13% respectively.

4.8.1 Rotated component matrix

A rotated component matrix was carried out to determine how the factors under the study affected ICT post-implementation evaluation among SMES in Meru County. A total of 7 variables were extracted and the findings were presented as shown in Table 4.22

Table: 4.22

Rotated component matrix

Variable Number	Component						
	1	2	3	4	5	6	7
AIS	-.824	.080	-.001	-.086	.010	.100	.195
CRMIS	.664	-.037	.181	-.109	.132	.258	.079
Accessibility	.628	-.132	.335	-.022	-.349	-.117	.066
Ready access	.491	-.286	-.317	-.318	.410	-.215	.115
Brand Awareness	.292	-.691	.118	.305	-.112	.231	-.011
HRMIS	-.158	.677	-.015	.033	-.099	.012	-.328
Client Collaboration	.325	.608	.018	.090	.164	.328	.384
ERP	.102	.006	.755	-.257	-.047	.055	-.017
Presentation	.199	-.128	.688	.118	.413	-.034	-.120
Online Transactions	.111	.039	-.024	.769	-.048	-.115	.069
Advertising	-.193	-.152	-.154	.689	.138	-.057	.023
Reports Generation	.026	-.056	-.117	-.058	-.813	-.027	.065
PPIS	-.125	-.009	.225	-.286	.195	.701	.143
Data Security	-.127	.028	.252	-.008	.247	-.695	.386
Interaction	.076	.123	.102	-.085	.119	.059	-.855

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 14 iterations.

As captured in Table 4.22, there were four variables in components one, three variables

Component two

Table 4.23

ICT reports generation

Variable	Mean	Std. Deviation	Comment
Reports Generation	2.9394	.89234	Moderate
Client Collaboration	2.8636	.60476	Moderate
Ready access to information	3.6515	.79406	High
Online Transactions	1.2879	.51932	Very low
Advertising	1.3030	.55386	Very low
Brand Awareness	2.9848	.48014	Moderate
Accessibility	4.3030	.92769	Very high
Data Security	4.4545	.70562	Very high
Interaction	4.1667	.77625	High
ERP	3.9242	1.18075	Moderate
Barcode readers	1.4242	.70297	Very low
Mobile Computers	1.6667	.70892	Low
Presentation	2.7879	.95297	Low
AIS	3.5303	.91517	High
PPIS	2.8939	.78699	moderate

The implementation of IS reports generation (m=2.94, SD=0.89) was noted to be moderate.

The table above illustrates that not many respondents cited the Information Systems used in their organizations are used for reports generation and client collaboration.

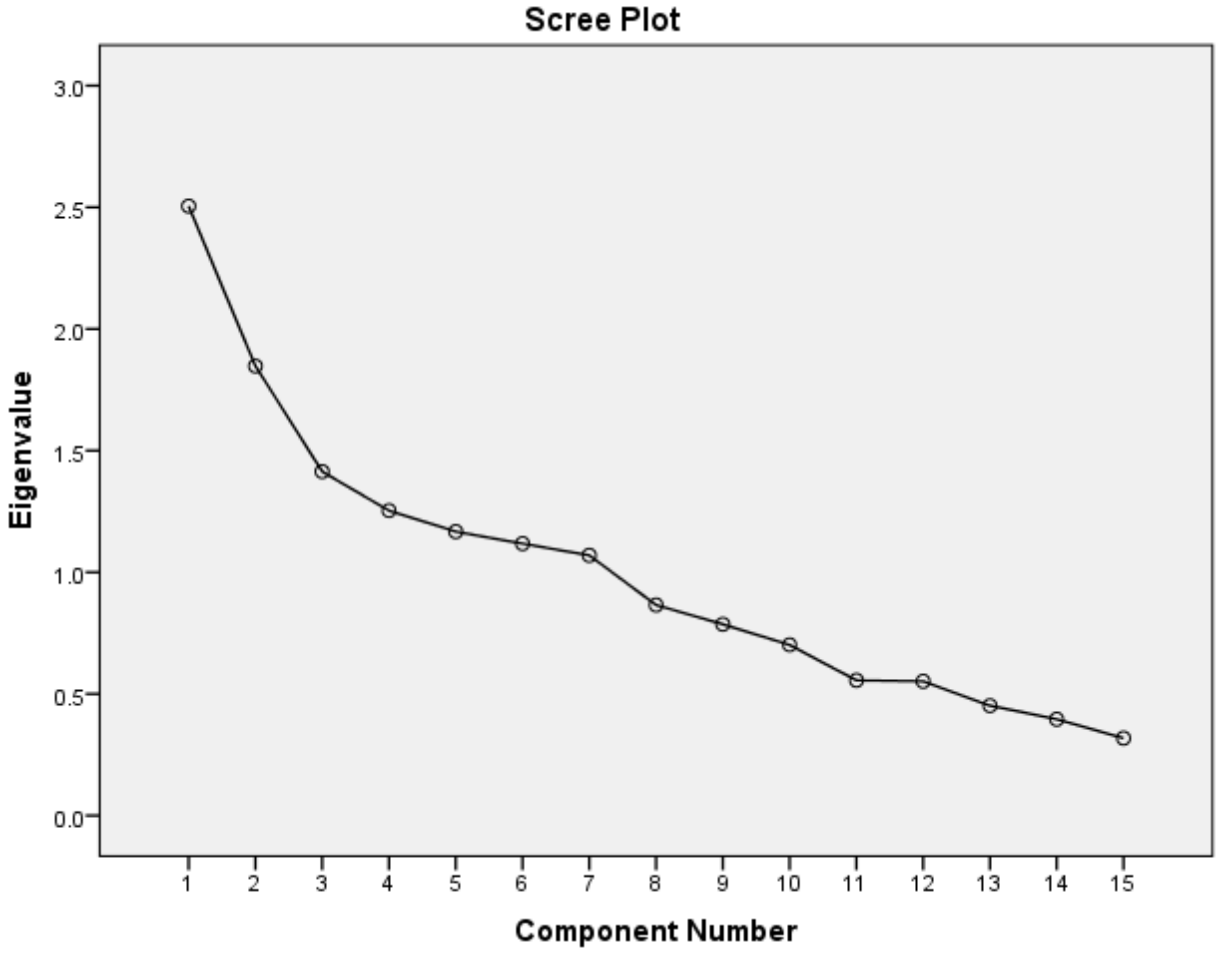
Ready access to information was noted as one of major functions of IS in most organizations. This clearly shows that most SMES have been relying much on their information systems to have to enhance easy availability of data by all the users.

There is also an indication that most organizations do not rely on their information systems for advertising and online transactions. This means that they rely on IS mostly on customer interactions, to enhance data security, and ready access to information.2

In addition; the types of information systems that have been fully implemented by the SMEs are the AIS, PPIS, CRIS, and HRIS. This is an implication that these types of information systems are used in most business enterprises. However; there is an indication that very few SMEs had implemented the barcode readers. This means that not many business enterprises have been using the bar code readers.

Figure 4.10

Post-implementation parameters of IS



4.8.2 Analysis of variance

To be able to compare the variation in successful IS implementation across the main operations of the SMEs, an analysis of variance (ANOVA) was carried out. This was important to enable the researcher have a clear picture on how the IS had been adopted across the accounting departments, the Enterprise resource planning, customer relationship management system, Human resource systems and the purchasing. The findings were captured as shown in Table 4.24

4.24 Table

Analysis of variance

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Accounting	Between Groups	17.661	3	5.887	4.922	.004
	Within Groups	74.157	62	1.196		
	Total	91.818	65			
ERP2	Between Groups	18.861	3	6.287	5.677	.002
	Within Groups	68.669	62	1.108		
	Total	87.530	65			
CRM	Between Groups	2.365	3	.788	.803	.497
	Within Groups	60.907	62	.982		
	Total	63.273	65			
HRIMS	Between Groups	3.325	3	1.108	.996	.401
	Within Groups	68.993	62	1.113		
	Total	72.318	65			
Purchasing	Between Groups	.241	3	.080	.068	.977
	Within Groups	73.213	62	1.181		
	Total	73.455	65			

It was noted from the analysis that the implementation of IS among the SMEs in accounting and ERP was statistically significant. The analysis showed that F (3, 62) = 4.92, $p<0.05$ was significant for accounting. The implementation of ERP F (3, 62) =5.68, $P<0.05$ was also significant. This implied that variance in the implementation of Accounting Information Systems and the Enterprise Resource Planning differed significantly from the variance in the adoption of CRM, HRM, and the Purchasing Information Systems. The evidence suggests that the variances obtained would vary depending on the sample taken. The variations in the implementation of IS in CRM were $F(3,62)=0.80$, $p>0.05$, HIRMS had $F(3,62)=1.00$,$p>0.05$ while purchasing had $F(3,62)=0.07$,$P>0.05$ which were all not significant. Therefore; it means that the level of implementation was high for the Accounting Information Systems and the Enterprise Resource Planning. In addition; the level of implementation was low for the Customer Relationship Management, Human Resource Management and the Purchasing Information Systems. This implies that the implementation and use of IS in Meru county did not differ significantly among the various SMEs in the county.

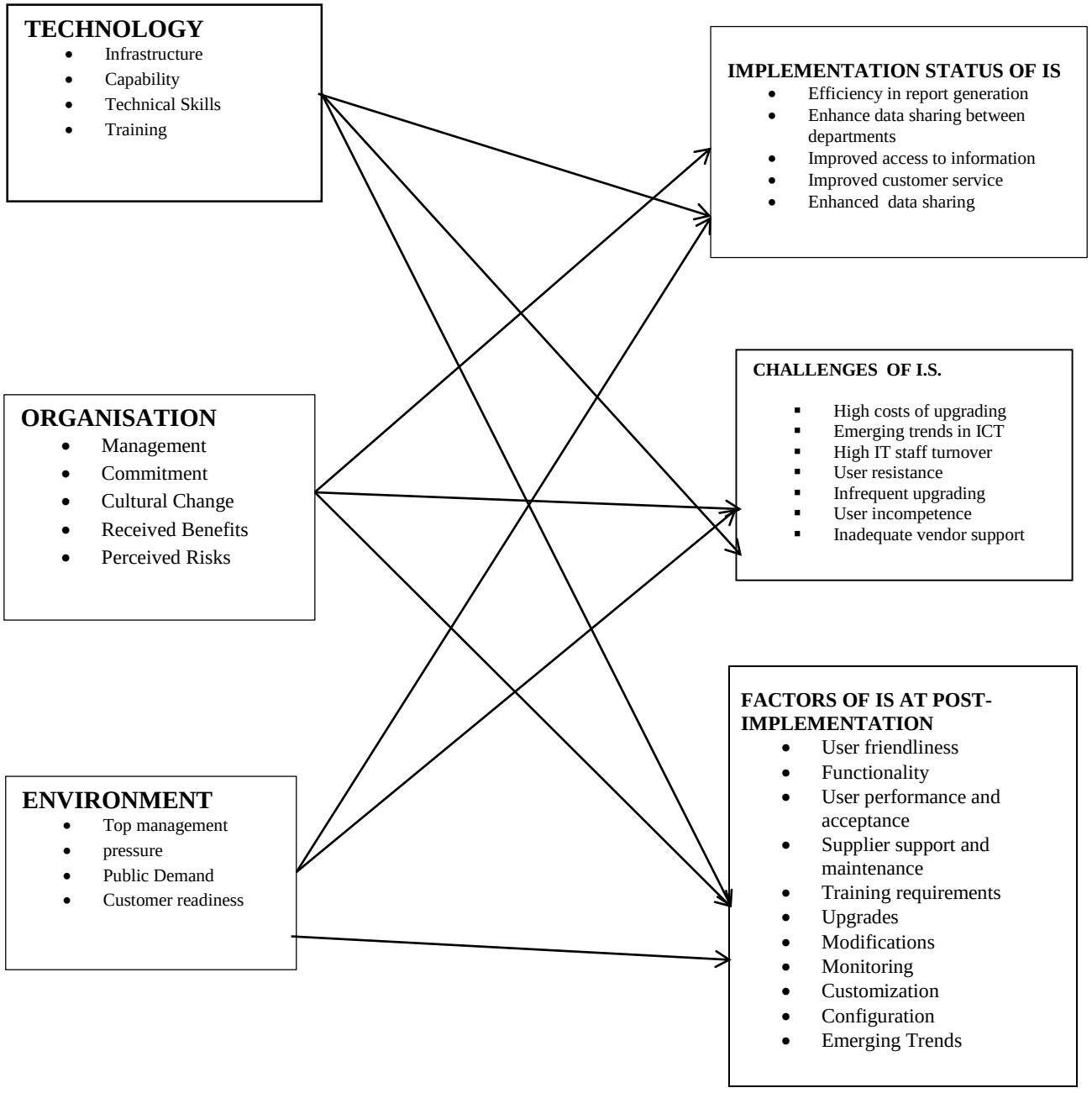
4.9.0 The Proposed Framework for the Post-Implementation Evaluation of Management Information Systems by the SMEs in Meru County

The Proposed Conceptual Framework of OGD Post-adoption in public sectors which was mentioned earlier in chapter 2 had incorporated the TOE (Technology-Organization-Environment) Framework which is applicable in the entire process of information systems implementation, i.e. pre-implementation through the post-

implementation process. Therefore; the proposed framework of this research is an integration of the TOE Framework and the ultimate results of the entire study as shown in **Figure 4.11.**

Figure 4.11

The Proposed Framework



4.9.1 DISCUSSION OF THE FRAMEWORK

The T-O-E Framework means the Technology, Organization and Environment. Technological Context means all technologies that are relevant to the business enterprise. It revolves around the factors that influence technological innovation adoption and implementation process. Organization refers to all attributes and assets of the firm, including connecting structure between representative and firm size. It refers to descriptive measures related to organizations such as firm scope, firm size and managerial beliefs. Environment incorporates the structure of the business, information systems vendor and administrative environment. It focuses on areas in which a firm conducts its business operations, with the priority given to external factors influencing the industry such as government incentives and regulations. The above constructs are dynamic and indicate that they can be manipulated with other factors that influence the post-implementation of information systems used in business organizations. The implementation status of I.S. and the challenges of I.S. at represent the Independent Variable. The factors at the post-implementation level represent the Dependent Variable. The functions of IS as per the findings in the study is that they enhance data sharing amongst departments, efficiency report generation, improved access to information and improved customer service.

The factors to consider at the post-implementation level include the user friendliness, functionality, user performance and acceptance, supplier support and maintenance, training requirements, upgrades, modifications, monitoring and customization.

The challenges as per the study were the high costs in upgrading, emerging trends in information technology, high staff turnover, user resistance, infrequent upgrading, user incompetence and inadequate vendor support.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The objective of the study was to determine the implementation status of the IS implemented in SMEs, to identify the evaluation parameters of success for IS, to establish the challenges of IS at the post-implementation level and to propose a framework preferable for the SMEs. This chapter gives a summary of the findings, makes conclusions of the findings and gives relevant recommendations.

5.2 Summary of the Findings

The data for the study was collected by use of questionnaires. A total of 240 questionnaires were distributed to the targeted respondents; 80 manager's questionnaires, 80 IS users questionnaires and 80 ICT personnel questionnaires. From each category of respondents; 55 questionnaires were returned. A total of 165 questionnaires were recovered, hence a return rate of 68% was realized.

5.2.1 Implementation Status of the IS Implemented in SMEs

The study established that accounting information system, customer relationship management information system and human resource information system had been implemented in the Small and Medium Sized Enterprises in Meru County to a great extent. Besides, Enterprise resource planning information system and purchases and procurement information system had been implemented in the small and medium sized enterprises in Meru County to a moderate extent while bar code readers' information system had been implemented in the small and medium sized enterprises

in Meru County to a little extent. Further analysis revealed that efficiency in report generation, data sharing between departments and improved access to information, were the most important functions performed by the information systems. It was further established that the information systems employed by the Small and Medium Sized Enterprises in Meru County resulted in swiftness in access to information, lead to improved customer service and enhanced the level of output.

5.2.2 Evaluation Factors of Success for IS

The study established that user friendliness, functionality and user performance and acceptance were the most important parameters in assessing the success of an information system since these three parameters were judged as significant evaluation parameters in evaluating the success of an information system by almost all the managers and the ICT personnel interviewed.

5.2.3 Challenges of IS at the Post-Implementation Level

The study established that high costs of upgrading and emerging trends in ICT were critical challenges of information system at the post implementation level since almost all the managers and ICT personnel perceived the two items as serious challenges of information system at the post implementation level.

5.3 Conclusions

From the research results and discussions, the study made conclusions based on the objective of the study; determine the implementation status of the IS implemented in SMEs, to identify the evaluation parameters of success for IS, to establish the

challenges of IS at the post-implementation level and to propose a framework preferable for the SMEs.

5.3.1 Implementation Status of the IS Implemented in SMEs

The study concluded that implementation of information systems led to efficiency in report generation, enhanced data sharing between departments and improved access to information in the SMEs operating in Meru County. Subsequently, there was swiftness in access to information, improved customer service and enhanced the level of output.

5.3.2 Evaluation Factors of Success for IS

It was concluded that the criteria for evaluating an information system include user friendliness, functionality, and user performance and acceptance. Hence an information system implemented in SMEs should be user friendly, perform the functions for which it was meant to and enhance user performance.

5.3.3 Challenges of IS at the Post-Implementation Level

The study concluded that high upgrading costs of the information systems and the emerging trends which necessitated for adjustments in the information systems were major obstacles of information system at the post implementation level.

The proposed framework in chapter 4 is a reflection of the above objectives of the study which include the status of the information systems used in SMEs at the post-implementation level, the evaluation factors of success at the post-implementation level, and the challenges of the information systems the post-implementation level.

5.3.4 Summary on the Proposed Post-Implementation Framework

The TOE constructs used on the framework are dynamic and indicate that they can be manipulated with other factors that influence the post-implementation of information systems used in business organizations. The implementation status of IS and the challenges of IS represent the Independent Variable. The factors at the post-implementation level represent the Dependent Variable. The functions of IS as per the findings of the study is that they enhance data sharing amongst departments, efficiency report generation, improved access to information and improved customer service.

The factors to consider at the post-implementation level include the user friendliness, functionality, user performance and acceptance, supplier support and maintenance, training requirements, upgrades, modifications, monitoring and customization.

The challenges as per the study were the high costs in upgrading, emerging trends in information technology, high staff turnover, user resistance, infrequent upgrading, user incompetence and inadequate vendor support.

5.4 Recommendations

As a result of the conclusion made in respect to the implementation status of the IS implemented in SMEs, to identify the evaluation parameters of success for IS, to establish the challenges of IS at the post-implementation level, the study makes the following recommendations:

The proprietors of the Small and Medium Sized Enterprises should put into consideration the user friendliness, functionality and user performance and acceptance as the key and most important parameters in assessing the success of an information system since these three parameters were judged as significant evaluation parameters in evaluating the success of an information system. In addition; since the high cost of upgrading the systems was cited as one of the key challenges at the post-implementation level; the researcher recommends that the top management should be pro-active in terms of pre-budgeting for the costs involved in the process of upgrading. Moreover; the users should be engaged in continuous training and upgrading in order to handle the information systems effectively. Also; effective communication should be made to the users by the managements in preparation for the up-coming changes in technology to counter the aspect of emerging technologies and user resistance. The proprietors of the SMEs in Meru County should invest highly in manpower that interacts with the systems in terms of on-job training and apprenticeship to ensure effectiveness.

5.5 Recommendations for Further Research

Since the study focused on SMEs in Meru County, it is suggested that the study be extended to other Counties to assess whether different findings may be reached regarding the post-implementation evaluation of information systems in small and medium enterprises.

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APPENDICES

Appendix 1 - Managers' Questionnaire

The owner of this document is a student at the Kenya Methodist University pursuing a degree of Masters of Science in Computer Information Systems and is conducting a research on **Factors Affecting Post-Implementation Evaluation of Information Systems used in Small and Medium Sized Enterprises of Meru County.** You are hereby, requested to assist in filling this questionnaire to the best of your ability and you are promised that the information that you offer will be treated with a lot of confidentiality.

Background Information

(Please tick where appropriate)

1. State the category of your organization**:**

    a. Service Industry.

    b. Manufacturing Industry.

2. How long have you been in this organization?

    a. [ ] 1 – 2 years

    b. [ ] 3 – 4 years

    c. [ ] 5 – 6 years

    d. [ ] above 7

3. Please indicate the highest level of education you have completed.

a. [ ] Computer Packages

b. [ ] Diploma

c. [ ] Bachelors

d. [ ] Masters

Which is your area of specialization?

……

……

The Status of the Information System Implemented

4. Do you have an information system in your organization? yes/no

5. If yes, which of the following types of information system (s) are do you use in your organization?

   (Please circle the appropriate response):

   I = Implemented

   BI = Being implemented

   NI =

   Not implemented

Status of Information Systems

TYPE OF TECHNOLOGY	I	BI	NI
Accounting Information Systems			
Bar Code Readers			
Enterprise Resource Planning			
Customer Relationship Management			
Human Resource Information Systems			
Purchases & Procurement Information Systems			

Others state

……

……

6. Did you have old system in place? YES/NO

7. If yes, how long did it take to transit from the old system to the new one?

   ……..

8. How frequently is the system support and maintenance done?

   a. [ ] 1 – 2 years

   b. [ ] 3 – 4 years

   c. [ ] 4 – 5 years

d. [ ] 6 years and above

9. Support and maintenance is carried out by: (please tick where appropriate)

(a) The personnel employed by the organization.

(b) Hired experts from outside the organization.

10. The functions of information system.

(Please circle the responses that apply)

a. It enables reports to be generated efficiently.

b. Enhances collaboration with clients.

c. Helps to have a readily access to information.

d. Performs online transactions.

e. Advertising of firm products.

f. Improving brand awareness.

g. Data accessibility by all departments/units

h. Enhances data security.

i. Increases interaction with customers.

Evaluation Parameters of Information Systems Success

11. After how long did you realize that the information systems was beneficial?

a. [ ] 1 – 2 years

b. [ ] 3 – 4 years

c. [ ] 5 – 6 years

d. [ ] 7 years and above

12. The benefits of the information systems:

(Please tick all the responses that apply)

a. Readily and quick access to information.

b. Improvement in customer service.

c. Quick decision making

d. Competitive advantage .

f. Reduction of expenses.

g. Improves output.

h. Enhances value creation.

i. Increases interaction with customers.

j. Quick response time.

k. Enhanced user interface

Others state

……

……

13. The criteria for evaluating the information system.

(Please tick responses that apply)

a. User friendliness.

b. Functionality.

c. Quick decision making.

d. Popularity of the vendor.

e. Supplier support and maintenance

f. The output.

g. Return on investment.

h. Training needed.

i. User performance and acceptance.

Challenges of Information Systems Used By The Organization

14. The following challenges may have been encountered with your information system.

(Please tick the responses that apply)

a. Lack of frequent upgrading.

b. User resistance.

c. User incompetence.

d. Poor interface and design.

e. Lack vendor support.

f. IT staff seeks for greener pastures

g. Extra costs because of upgrading.

h. Emerging trends in ICT.

Others, state

……

……

Appendix II ICT Personnel Questionnaire

The owner of this document is a student at the Kenya Methodist University pursuing a degree of Masters of Science in Computer Information Systems and is conducting a research on **Factors Affecting Post-Implementation Evaluation of Information Systems used in Small and Medium Sized Enterprises of Meru County.** You are hereby, requested to assist in filling this questionnaire to the best of your ability and you are promised that the information that you offer will be treated with a lot of confidentiality.

Background Information

(**Please tick where appropriate)**

15. State the category of your organization**:**

c. Service Industry.

d. Manufacturing Industry.

16. How long have you been in this organization?

e. [ ] 1 – 2 years

f. [ ] 3 – 4 years

g. [ ] 5 – 6 years

h. [ ] above 7

17. Please indicate the highest level of education you have completed.

e. [ ] Computer Packages

f. [ ] Diploma

g. [ ] Bachelors

h. [ ] Masters

Which is your area of specialization?

……

……

The Status of the Information System Implemented

18. Do you have an information system in your organization? YES/NO

19. If yes, which of the following types of information system (s) are do you use in your organization?

(Please circle the appropriate response):

I = Implemented

BI = Being implemented

NI = Not implemented

Status of Information Systems

TYPE OF TECHNOLOGY	I	BI	NI
Accounting Information Systems			
Bar Code Readers			
Enterprise Resource Planning			
Customer Relationship Management			
Human Resource Information Systems			
Purchases & Procurement Information Systems			

Others state

……

……

20. Did you have old system in place? YES/NO

21. If yes, how long did it take to transit from the old to the new one?

……

22. How frequently is the system support and maintenance done?

e. [ ] 1 – 2 years

f. [ ] 3 – 4 years

g. [ ] 4 – 5 years

h. [ ] 6 years and above

23. Support and maintenance is carried out by: (please tick where appropriate)

(c) The personnel employed by the organization.

(d) Hired experts from outside the organization.

24. The functions of information system.

(Please circle the responses that apply)

a. It enables reports to be generated efficiently.

b. Enhances collaboration with clients.

c. Helps to have a readily access to information.

d. Performs online transactions.

e. Advertising of firm products.

f. Improving brand awareness.

g. Data accessibility by all departments/units

h. Enhances data security.

i. Increases interaction with customers.

Evaluation Parameters of Information Systems Success

25. After how long did you realize that the information systems was beneficial?

e. [ ] 1 – 2 years

f. [ ] 3 – 4 years

g. [ ] 5 – 6 years

h. [ ] 7 years and above

26. The benefits of the information systems:

(Please tick all the responses that apply)

a. Readily and quick access to information.

b. Improvement in customer service.

c. Quick decision making

d. Competitive advantage .

f. Reduction of expenses.

g. Improves output.

h. Enhances value creation.

i. Increases interaction with customers.

j. Quick response time.

k. Enhanced user interface

Others state

……

……

27. The criteria for evaluating the information system.

(Please tick responses that apply)

a. User friendliness.

b. Functionality.

c. Quick decision making.

d. Popularity of the vendor.

e. Supplier support and maintenance

f. The output.

g. Return on investment.

h. Training needed.

i. User performance and acceptance.

Challenges of Information Systems Used by the Organisation

28. The following challenges may have been encountered with your information system.

    (Please tick the appropriate response).

a. Lack of frequent upgrading.

b. User resistance.

c. User incompetence.

d. Poor interface and design.

e. Lack vendor support.

f. IT staff seeks for greener pastures

g. Extra costs because of upgrading.

h. Emerging trends in ICT.

i. Lack of full management support

Appendix III User of the System Questionnaire

The owner of this document is a student at the Kenya Methodist University pursuing a degree of Masters of Science in Computer Information Systems and is conducting a research on **Factors Affecting Post-Implementation Evaluation of Information Systems used in Small and Medium Sized Enterprises of Meru County.** You are hereby, requested to assist in filling this questionnaire to the best of your ability and you are promised that the information that you offer will be treated with a lot of confidentiality.

Background Information

(Please tick where appropriate)

1. State the category of your organization**:**
    a. Service Industry.
    b. Manufacturing Industry.
2. How long have you been in this organization?
    a. [ ] 1 – 2 years
    b. [ ] 3 – 4 years
    c. [ ] 5 – 6 years
    d. [ ] above 7
3. Please indicate the highest level of education you have completed.
    a. [ ] Computer Packages
    b. [ ] Diploma

c. [ ] Bachelors

d. [ ] Masters

Which is your area of specialization?

……

……

The Status of the Information System Implemented

4. Do you have an information system in your organization? YES/NO
5. If yes, which of the following types of information system (s) are used in your organization?

   (Please circle the appropriate response):

   I = Implemented

   BI = Being implemented

   NI = Not implemented

Status of Information Systems

TYPE OF TECHNOLOGY	I	BI	NI
Accounting Information Systems			
Bar Code Readers			

Enterprise Resource Planning			
Customer Relationship Management			
Human Resource Information Systems			
Purchases & Procurement Information Systems			

Others state

.....

.....

Did you undergo any training before handling the system? Yes/no

If yes, how long did the training take……..

6. How frequently is the system support and maintenance done?

   i. [ ] 1 – 2 years

   j. [ ] 3 – 4 years

   k. [ ] 4 – 5 years

   l. [ ] 6 years and above

7. Support and maintenance is carried out by: **(**please tick where appropriate)

   (e) The personnel employed by the organization

   (f) Hired experts from outside the organization

8. **T**he functions of information system.

   (Please circle all those that apply)

a. It enables reports to be generated efficiently.

b. Enhances collaboration with clients.

c. Helps to have a readily access to information.

d. Performs online transactions.

e. Advertising of firm products.

f. Improving brand awareness.

g. Data accessibility by all departments/units

h. Enhances data security.

i. Increases interaction with customers.

J. Others (state)

.....

.....

Appendix V (Bartlet, Kotrlik & Higgins Table)

	Sample size					
	Continuous data Margin of error = .03			Categorical data Margin of error = .05		
Population Size	Alpha=10 !=1.65	Alpha=.05 !=1.96	Alpha=.01 !=2.58	P=50 !=1.65	P=50 !=1.96	P=50 !=2.58

100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	382
1,000	77	106	173	213	278	399
1,500	79	110	183	230	306	461
2.000	83	112	189	239	323	499

4,000	83	119	198	254	351	570
6,000	83	119	209	259	362	598
8,000	83	119	209	262	367	613
10,000	83	119	209	264	370	623

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Ref. No.

NACOSTI/P/16/15196/14725

Date

6th December, 2016

Salome Kagendi Francis
Kenya Methodist University
P.O. Box 267- 60200
MERU.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Post-implementation evaluation of information systems in SMEs in Meru County,"*** I am pleased to inform you that you have been authorized to undertake research in **Meru County** for the period ending **5th December, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Meru County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Meru County.

The County Director of Education
Meru County.

THIS IS TO CERTIFY THAT:
MISS. SALOME KAGENDI FRANCIS
of KENYA METHODIST UNIVERSITY,
0-60200 meru, has been permitted to
conduct research in *Meru County*

on the topic: *POST-IMPLEMENTATION EVALUATION OF INFORMATION SYSTEMS IN SMES IN MERU COUNTY*

for the period ending:
5th December,2017

.....
Applicant's
Signature

Permit No : NACOSTI/P/16/15196/14725
Date Of Issue : 6th December,2016
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science,
Technology & Innovation

KeMU
Kenya Methodist University

Certificate of Participation

This is to Certify that

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THE ROLE OF FOG COMPUTING IN COMPLIMENTING INTERNET OF THINGS IN TRANSPORTATION INDUSTRY

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ABSTRACT

Fog Computing is a technology introduced by CISCO to extend cloud computing and services to the edge of the network. It provides data storage and application services to the users like cloud. The Internet of Things (IoT) is generating an unprecedented volume and variety of data. But by the time the data makes its way to the cloud for analysis, the opportunity to act on it might be gone. Fog computing analyzes the most time sensitive data at the network edge, close to where it is generated instead of sending vast amounts of IoT data to the cloud. Fog computing also acts on Internet of things data in milliseconds, based on policy and sends selected data to the cloud for historical analysis and longer-term storage.

Globally, transportation systems are reeling under several challenges brought on by the sharp growth in the number of vehicles and these challenges can be addressed by IoT with help of fog computing. This paper will employ an exploratory methodology to create contextual awareness of fog computing and to explore the role of fog computing and how it intends to compliment the implementation of internet of things to help the growth of transportation industry. This will be followed by identification of the challenges and security issues faced by internet of things in transportation industry and how they can be solved by fog computing. The results of this paper will be used to advice the transportation sector stakeholders on techniques to use for successful integration of fog computing to compliment internet of things.

Keywords

- **Fog Computing, Cloud, Internet of things, Analytics, CISCO**