UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

A MODEL FOR EVALUATING THE SUCCESS OF AGRICULTURAL MANAGEMENT INFORMATION SYSTEM IN PROVIDING EXTENSION SERVICES TO SUGARCANE FARMERS IN RURAL AREAS OF KENYA:

CASE OF MUMIAS SUGAR COMPANY

BY

JOHNSON MATETE

P56/62001/2011

SUPERVISOR: DR. ROBERT OBOKO

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF MSC INFORMATION SYSTEM

2014

DECLARATION

I declare that this is my original work and it has not been presented for examination in any other University or institution for academic credit.

Sign: …… Date: ……..

Johnson Matete
P56/62001/2011

The research project has been submitted with my approval as the University Supervisor

Sign:……. Date: ……..

Dr. Robert Oboko

School of Computing and Informatics

University of Nairobi

DEDICATION

My daughter Joy Blessings Matete, just like your name goes, you have been a source of massive joy and blessings in the entire work of this document. May God give you good character and long life to witness the success of your desires. Nothing is more honorable than a grateful heart." Life holds so many simple blessings, each day bringing its own individual wonder."

ACKNOWLEDGEMENTS

The completion of this research project and subsequent M.sc information system has been a long journey. It's true that "Life is what happens" when you are completing your research project. Life doesn't stand still, nor wait until you are finished and have time to manage it. Much as happened and changed in the time I've been involved with this project, or as some of my dear friends have so affectionately referred to it "The Paper." Many have questioned whether I would finish my research project, as have doubted my commitment to it. I, on the other hand, barring losing confidence so many times I've lost count, getting writer's block just as many times, ending one relationship, moving, beginning another relationship, computers crashing, needing to work as much as possible, and pure frustration in general, knew I'd complete my research project. I just had to do it in my own time and on my own terms. This research project has always been a priority, but as most know, there are several priorities in a person's life at any one time. Unfortunately due to life's challenges and the changes that followed, my research project could not always be the number one priority. At any rate, I have finished, but not alone, and am elated.

I could not have succeeded without the invaluable support of several. Without these supporters, especially the select few I'm about to mention, I may not have gotten to where I am today, at least not sanely.

First and foremost, I give special thanks to the almighty God from whom everything comes from. God thank you so much for the grace you gave me throughout the entire research project period, for the gift of life and good health. Next, I'd like to give special thanks, beginning with my dearest supervisor , advisor and panel chairman Dr. Robert Oboko.Sir,you have been a tremendous mentor for me .I would like to thank you for encouraging my research and allowing me to grow as a research scientist. Your advice on both research as well on my career have been priceless**.**

Also, I would like to thank my panel members starting with Professor Okello Odongo, Professor Waema and Mr.Ayienga for serving as my committee members even at hardship. I whole heartedly thank you for letting my defense be an enjoyable moment, and for your brilliant comments and suggestions. You have made me appreciate academic research as a rewarding

experience. Panelist, for all you did, for who you are, I will be forever grateful you are in my life. Someday I will give back what you have given me. Thank You.

To the entire fraternity of Mumias Sugar lead by Mr. Joseph Nyagah, The Agricultural Engineering Operations Manager. Sir, Thank you so much for giving me time off my tight schedule at Mumias Sugar Company. This gave me an opportunity to collect data and make numerous trips to Nairobi to meet my research supervisor and panelists.

I also acknowledge Mr. Steven obaga who assisted me in printing of the documents without tiring and Mrs. Sherry Wanangwe Wasike of Mumias Sugar for formatting the entire document God bless you.

Last but not least, my wife Jackline, daughter Joy Blessings and son Lewis that have been on my side during the entire period and sacrificed a lot to give me moral support.

ABSTRACT

Mumias Sugar Company has an elaborate Agricultural Management Information system that is used to run the agricultural docket of the company. The system has been in place for a long period of time and it has been performing its function to the satisfaction of people and to the dissatisfaction of others. Since its inception, the AMS system has never been evaluated to ascertain its level of success based on its initial objectives. A study was conducted to evaluate the success of AMS in providing extension services to sugarcane farmers in the rural areas of Kenya. The case was based in Mumias sugar company cane growing areas. A sample of 742 respondents comprising of 680 Farmers and 62 employees was sampled and administered the questionnaires. The questionnaire were dropped and picked later to employees group while to the farmers the questionnaire was personally administered.

A total of 509 respondents were received and data analyzed. Management has to support the improvement of the system. In additional training and user involvement has to be utilized to realize the full success of AMS in providing extension services to farmers. The research also ascertained Information quality, system quality and service quality are the key independent variables used to measure the success of AMS, and the intervening variables are management support, training and user involvement.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AMS	Agricultural Management Information System
DOI	Diffusion of Innovation
GDP	Gross domestic Product
ICT	Information and Communication Technology
IS	Information System
ISM	Integrated Success Model
MSC	Mumias Sugar Company
TAM	Technology Acceptance Model
U.S	United States
UN	United Nations
UTAUT	Unified Theory of Acceptance and use of Technology

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Wikipedia defines a rural area as a geographical area located outside urban centres and towns. The Health Resources and Services Administration of the U.S. Department of Health and Human Services defines the word "rural" as encompassing "...all population, housing, and territory not included within an urban area. Whatever is not urban is considered rural." Typical rural areas have a low population density and small settlements. Agricultural areas are commonly rural, though so are others such as forests. Different countries have varying definitions of "rural" for statistical and administrative purposes.

For 70 percent of the world's poor who live in rural areas, agriculture is the main source of income and employment (World Bank report, UN's Food security and Agricultural Organization). But depletion and degradation of land and water pose serious challenges to producing enough food and other agricultural products to sustain livelihoods here and meet the needs of urban populations. Most people who live in the rural areas practice agriculture or farming and they rely heavily of this profession.

Agriculture is practiced at corporate level where corporate organizations engage in farming as corporate entities and individual farming as individual entities. The first type of agriculture is commercial farming while the second type is subsistence farming. However though, some farmers may practice agriculture on small scale for the purpose of selling to corporate entities hence commercializing the farming though on small scale while others may farm on huge tracks of land for the purpose of consuming. This sector of the economy boosts by creating so many job opportunities for the rural population all over the world.

1.1.1 Agricultural Farming in Kenya

Agriculture remains the backbone of the Kenyan economy. It is the single most important sector in the economy, contributing approximately 25% of the GDP, and employing 75% of the national labour force (Republic of Kenya 2005). Over 80% of the Kenyan population live in the rural areas and derive their livelihoods, directly or indirectly from agriculture. Given its importance, the performance of the sector is therefore reflected in the performance of the whole economy. The development of agriculture is also important for poverty reduction since most of the vulnerable groups like pastoralists, the landless, and subsistence farmers, also depend on agriculture as their main source of livelihoods. Growth in the sector is therefore expected to have a greater impact on a larger section of the population than any other sector. The development of the sector is therefore important for the development of the economy as a whole. The importance of the sector in the economy is reflected in the relationship between its performance and that of the key indicators like GDP and employment. Trends in the growth rates for agriculture, GDP and employment, show that the declining trend experienced in the sector's growth especially in the 1990s, is reflected in the declines in employment and GDP.

1.1.2 Sugarcane Farming in Kenya

More than five million people directly or indirectly depend on sugarcane farming in Kenya. Most farming is in western Kenya. Previously some sugarcane was grown in parts of Coast Province. Eighty eight per cent of area under sugarcane in Kenya is under out growers. The majorities are small-scale growers; the remaining is under sugar factories in the form of nucleus estates. Currently, six sugar factories in Kenya function out of which one is entirely private (West Sugar company). Mumias Sugar Company was privatized in 2001, with Government majority shareholding. The remaining factories are government owned-South Nyanza, Nzoia, Muhoroni and Chemelil.

The sugar sub-sector plays an important role in the country's economy. It generates an estimated Sh 12 billion annually, provides about 500,000 jobs and supports livelihood of about six million people. Total production of sugar stands at approximately 450,000 metric tonnes. Total demand for sugar in Kenya is 610,000 tonnes-the deficit is filed by imported sugar. Of the imported sugar, between 80,000 to 100,000 tonnes are used as raw materials in the manufacture of

beverages, confectionary, pharmaceuticals and other industrial products. Farmers and government companies have been involved in the production and milling of white sugar and related products. The value of marketed sugarcane increased from sh11.7 billion in 2007 to sh12.2 billion in 2008.

1.1.3 Sugarcane Farming in Mumias Sugar belt and Western Kenya

The Mumias Sugar Company (MSC), a leading sugar producer in Kenya, is located in Mumias District, in Kenya's Western Province. MSC has the largest sugarcane factory in Kenya, and works with approximately 70,000 out-grower farmers, whose plots encompass an area of 120 square kilometers, in several districts in the province. The company is strongly dedicated to innovation, experimentation and good service delivery to farmers.

The department of Agriculture in whose docket sugarcane growth is and availability is managed is strongly dedicated to research on good sugarcane husbandry, good fertilizers that match existing soils, dedicated research and agricultural extension services to its out growers farmers which comprises of more than 90% of cane suppliers, weather monitoring, harvesting and transport services, agricultural engineering services, and quality seed cane supply. Most of the suppliers of raw material for cane processing are out growers' farmers whose farm sizes ranges between 2-3acres (1-2 Hectares).

This are small-scale famers who rely completely on Mumias sugar (MSC) for the supply of all necessary services including professional advices on good farming methods and practices, farm inputs such as fertilizer,seedcane,harvesting and transport. The company, on return charges farmers for these services. The best practices on the land are hardly achieved as the company does not get timely response from farmers on the problems being experienced at that time.

1.1.4 Use of ICT's to Improve Productivity and Market Success of Sugarcane

Sugarcane information system that interfaces farmers and the company is a good step in improving the sugarcane productivity and create successful markets for the rural farmer.

Integration of the company owned agricultural management information system (AMS) and Agricultural extension information system (Farmer care) using ICT platform is a gesture towards seriously addressing farming issues affecting farmers on real time.Expedoius addressing of farmers concerns as far as good farming practices, land preparation schedule, farm inputs supply schedule, farm visitation by company staff schedule, crop harvest time schedule, harvested crop transport schedule, crop yield responses(tonnages) and cash proceeds accrued are concerned is a paramount step towards encouraging farmers to participate fully on issues affecting their crop. Sugarcane information system will remove the bottlenecks assocatiated with lack of prior information to farmers as far as the company's operations in their fields are concerned. Mumias Sugar Company on the other hand will be reaping from increased quality supply of raw materials to feed its high capacity milling plant.

1.2 Statement of the Research Problem

Mumias Sugar Company has an elaborate agricultural Management system (AMS) that tracks down all the operations of the company from recruitment of farmers, land preparation for cane planting, soil testing and other agronomical activities, seed cane supply, fertilizer supply, harvesting planning and execution, transport planning and execution, cane weighing and finally payments. This serves to assist the company perform its activities efficiently. However communication with farmers at every stage of AMS is not attained. A farmer is not aware of the next move of the company as far as his/her piece of land is concerned. The aim of this research is to evaluate and recommend a model upon which a successful information system that bring the farmer on board and make the farmer aware of the plans and outcomes of activities intended or performed by the company on his/her parcel on land at any time is built. This model will seek to improve quality, reliability and efficiency of information supplied to farmers in regard to the company's operations in the out growers' land.

1.3 Research Objectives

The study's general objective was to develop an evaluation model for agricultural management information system in providing extension services to sugarcane farmers in rural areas of kenya. Consequently, the study's specific objectives included:

(i). To research on the factors for evaluating the success of agricultural management information system in providing agricultural extension services to sugarcane farmers in rural areas of Kenya through exploration of existing conceptual frameworks

(ii). To evaluate the success of agricultural information system in providing agricultural extension services to sugarcane farmers in rural areas of Kenya.

(iii). Propose a model that can be used to evaluate agricultural management information system in providing agricultural extension services to sugarcane farmers in rural areas of Kenya

1.4 Research Hypothesis

This research project seeks to investigate the following hypothesis:

H1a: Information quality significantly affects success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H1b: The Information quality moderated by staff training significantly affects success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H1c: The information quality moderated by management support plays a significant role in the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2a: The system quality significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2b: The system quality moderated by user involvement significantly affects the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2c: The system quality moderated by management support significantly affects the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3a: The service quality has a significant effect on the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3b: The dervice quality moderated by user involvement significantly affects the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3c: The Service quality moderated by staff training significantly affects the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company

1.5 Significant of the Study

The results of this research will be analyzed and conclusions be arrived at. Such conclusions will play a significant role of aiding strategic decisions with regard to the implementation of sound sugarcane information system that responds to quickly according to the desires of both farmers and the company management. Such responses will encourage farmers to put extra energy in cane cultivation hence improves productivity to their benefit as well as the company.

1.6 Justification of Study

Application of ICT in agricultural extension for sugarcane growing farmers in the rural areas is a concern that should be taken seriously if cane farmers want to be engaged at an early stage of the cane growing cycle. Farmers have faced huge losses due to lack of communication and interaction between the stakeholders such as sugarcane grower's societies, sugar mill and farmers themselves. The research conducted annual farmer hearings at the sub location level and the hearings were mostly complaints of non-transparency of survey data, weighing data on cane harvested, loss/theft of supply tickets, and delays in payments etc. Moreover, the farmers had to travel all the way to the mill/society offices to find out their supply ticket details.

To address the issue of lack of communication and interaction between the three key stakeholders, it will be found out that almost all the sugarcane farmers had access to mobile phones and internet cafes existed within close distance to villages. The medium of mobile phones computers and internet access will be utilized to streamline interaction between the stakeholders by ICT. The stakeholders will then be called to discuss the possibilities of transforming the situation with the help of ICT. The medium to provide the needed information will be in detail and the options would be websites and SMS/Query SMS system.

1.7 Limitations of the Study

This study will be limited to sugarcane farmers in western Kenya because the problems they face are unique by virtue of their geographical locations and type of crop they are cultivating. The assumptions made are done so within the breadth of the prevailing circumstances and time under which this research was carried out. By virtue of extended considerable time this research might be updated to reflect the situation as it might be at that time. This research is limited by virtue of time and prevailing level of ICT infrastructure in the country.

1.8 Scope of the Study

Research will be centered in the Mumias Sugar Company (MSC) cane growing zone with a population of about 6800 small holder farmers who, as out-growers, sell sugarcane raw material to the firm. The study is concerned only in evaluating the success of the existing AMS in providing extension services to sugarcane farmers in the rural areas of Kenya with special reference to Mumias Sugar Company.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The role of information systems (IS) in providing business a competitive edge has recently been the subject of much debate. However, it has been argued that not the IS but their utilization is what provides the competitive advantages. However, because these systems are always advancing, they are very costly. Therefore, to reduce their costs, organizations must recognize the factors that affect the success of their information system.

2.2 Case in Mumias sugar belt

The Mumias Sugar Company (MSC), a leading sugar producer in Kenya, is located in Mumias District, in Kenya Western Province. MSC has the largest sugarcane factory in Kenya, and works with approximately 70,000 out-grower farmers, whose plots encompass an area of 400 square kilometers, in several districts in the province. The company is strongly dedicated to innovation and experimentation. Over the past decade, the MSC agronomy department has been active in testing new cane varieties, fertilizers, and herbicides.

Currently the company uses AMS information system to manage all its agricultural processes. The agricultural management information system has different modules that encompasses out growers development sections that handles farmers recruitment, Agricultural engineering that prepares land, FSS that supplies fertilizer and seed cane, agronomy that handles soil testing, harvesting that harvest cane and transport that transports harvested sugarcane. However there is no system that responds to farmer queries. The conceptual framework that brings farmers on board, a system that allows a farmer from his/her comfort zone query the company's operations on his land is desirable.

2.3 Problem with Information Systems success models in use

Information system (IS) success and its determinants have long been considered critical to the field of information systems. Despite many attempts to model success (Delone and McLean, 1992, 2003), IS success definition and measure is still problematic for many factors. The first factor is the mixture of the technical and social aspects of an IS. IS success is a perspective that emerges from the social and technical interplay within organizations (Kanellis, Lycett and Paul, 1998). Second, Alter (2000) argues that information technology and work practices are now so intertwined that it is difficult to identify their respective contribution to success. Other researchers link the difficulty of defining IS success to the methodological aspects involved in measuring IS success "Specifying a dependent variable is difficult because of the many theoretical and methodological issues involved in measuring IS success" (Garrity and Sanders; 1998, p. 14in paper submitted at 6th Global conference on business and Economics at Gutman Centre USA).

Seddon, Staples, Patnayakuni, and Bowetell, (1999) argue that IS success is a fuzzy concept contingent upon different stakeholders and different types of IT. In the practice community, Markus and Tanis (2000) claimed that there is a fundamental gap in both practical and academic thinking about information systems lack of consensus and clarity concerning the meaning of success where information systems are concerned.

The problem of IS definition and measurement becomes more difficult and more complicated because of cultural terms such as values and assumptions which may be at the heart of the differing perceptions and interpretations of IS success (Ishman, 1998; Garrity and Sanders, 1998, Pauleen et al., 2006). Shing-Kao (1997) argues that "Research has shown that people notice, interpret and retain information based on their values, assumptions and expectations. Different assumptions and values lead to different ways of looking at the same thing" (p. 13).

Researchers agreed that the measurement of IS success is not an easy task. The major problem with existing IS success models is that, first, they are very abstract and don't rend service to managers who are always searching for more practical tools and techniques. Second, they are used independently from the organizational and national contexts. The organizational context has

been largely documented by strategic alignment researchers such as Henderson (), Venkatraman () and Luftman () and others who built a large body of knowledge that stressed the necessity to align and to fit IS and organizational strategies.

2.4 Models available for evaluating for IS Success

2.4.1 Technology Acceptance Model (TAM)

Davis [2] and Davis et al. [4] introduced Technology Acceptance Model (TAM), for modeling user acceptance of information systems. TAM starts by proposing external variables as the basis for tracing the impact of external factors on two main internal beliefs, which are perceived usefulness and perceived ease of use, while perceived ease of use also affects perceived usefulness over and above external variables. These two beliefs both influence users' attitude toward using IS. Attitude toward using IS, sequentially has influence on behavior intention to use, which is the key factor for determining actual conditions of system use as shown in Figure (1).

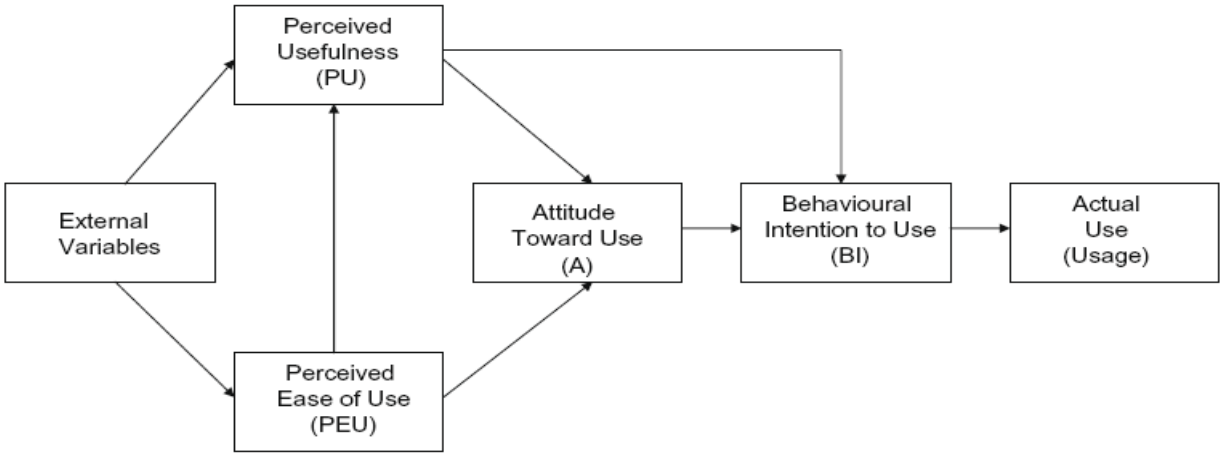


Figure 1: Showing modified TAM model (Davis and Bagozzi and Warshaw 1989, page 985)

The technology acceptance model (TAM) proposed that ease of use and usefulness predict applications usage. Researchers had conducted several studies to examine the relationship between perceived ease of use, perceived usefulness, attitudes, and the usage of other

information technologies in recent years [5, 6, 7, 8 & 9]. Perceived usefulness (U) is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organization context. Perceived ease of use (EOU) refers to the degree to which the prospective user expects the target system to be free of effort. (Davis, 1989). However TAM is perceived to have limitations (Venkatesh and Davis) in explaining the reasons for which a person would perceive a given system useful.

2.4.2 Technology Acceptance Model (TAM) 2

The original TAM was adopted and modified by Davis and Venkatesh in 2000 to TAM 2 as Shown in figure 2 below. The reasons for this were that the original TAM had limitations in explaining the reasons for which a person would perceive a given system usefulness. Hence they proposed that additional variables could be added in TAM. They called this new model, the TAM 2 model.

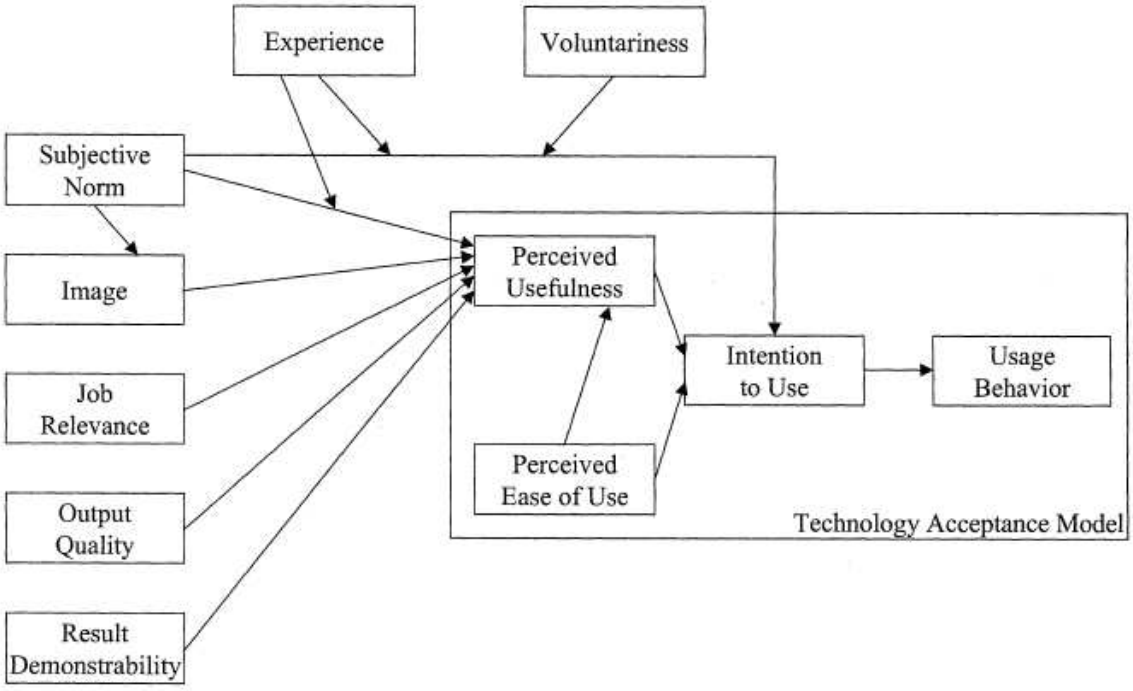


Figure 2: Showing TAM 2 model: source Venkatesh and Davis (2000)

Using TAM 2 model, Venkatesh and Davis were able to provide more detailed explanations for the reasons participants found a given system useful. Their results also indicated that TAM 2 performed well in both voluntary and mandatory environment with the exception that subjective norm had no effect in voluntary settings but did in mandatory settings.

2.4.3 Technology Acceptance Model (TAM) 3

A second important extension of the TAM model is by Venkatesh (2000), who was interested in identifying the antecedents to the perceived ease of use variable in the TAM model.AS shown below in figure 3, Venkatesh identified two main groups of past history for perceived ease of use : anchors and adjustments. Anchors were considered as general beliefs about computers usage whereas adjustments were considered as beliefs that are shaped based on direct Experience with the target system. In both groups, Venkatesh (2000) proposed several Determinants that are mostly derived from previous research on identifying the antecedents To PEOU (Davis et al)

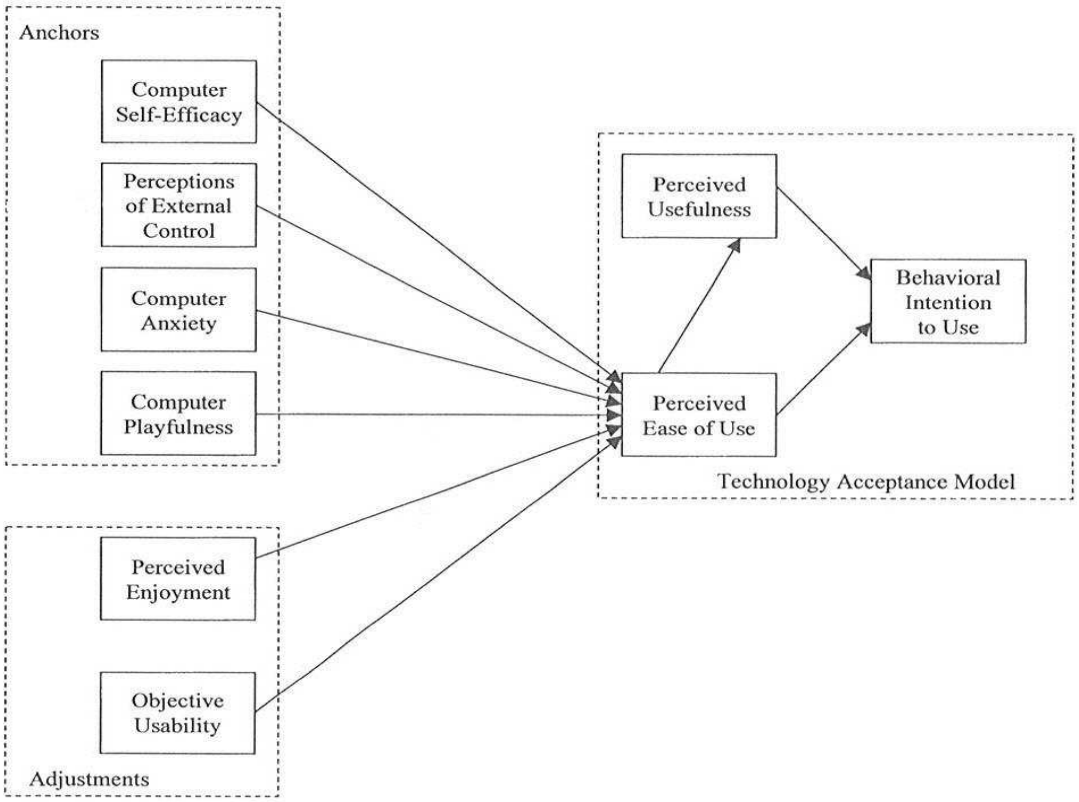


Figure 3: Technology Acceptance model TAM 3.Showing Extending TAM to include Determinants for perceived Ease of use

Source: Venkatesh (2000)

2.4.4 Conclusions on TAM Models

The Technology Acceptance model is indeed a very popular model for explaining and predicting system use. To date, there have been an impressive number of studies on TAM, but while several confirmatory results have been obtained, there are skepticisms shared among some researchers regarding the application and theoretical accuracy of the model. Consequently, it is tempting to conclude that research on TAM has reached a saturation level, such that future research will focus in developing new models that would exploit the strengths of the TAM models while discarding its weaknesses.

2.4.5 DeLone and McLean Information System Success Model (D&M)

The primary purpose of the original DeLone and McLean paper (8) was to synthesize previous research involving IS Success into a more coherent body of knowledge and to provide guidance to future researchers. Based on the communications research of Shannon and Weaver [43] and the information 'influence' theory of mason [31], as well as empirical management of information systems (MIS) research studies from 1981,87, a comprehensive ,multidimensional model of IS success was postulated. Shannon and Weaver defined the *technical level* of communication as the accuracy and efficiency of the communication system that produces information. The semantic level is the success of the information in conveying the intended meaning .The *effective* level is the effect of the information on the receiver.

DeLone and McLean [1] in 1992 conducted a comprehensive review of IS success literature and proposed a model of IS success. This model provided a robust indicator of the success of information systems by identifying six interrelated dimensions of IS success: 'System Quality', 'Information Quality', 'Use', 'User Satisfaction', 'Individual Impact' and 'Organizational Impact'. Later, DeLone and McLean [3] in 2003 revisited their own model and made minor

modifications to it. They defined their updated model dimension as: Systems quality, Information quality, Service quality, Use, User satisfaction, and Net benefits as shown in Figure (2). the organization context …….etc" [8, p.80] emphasis added.

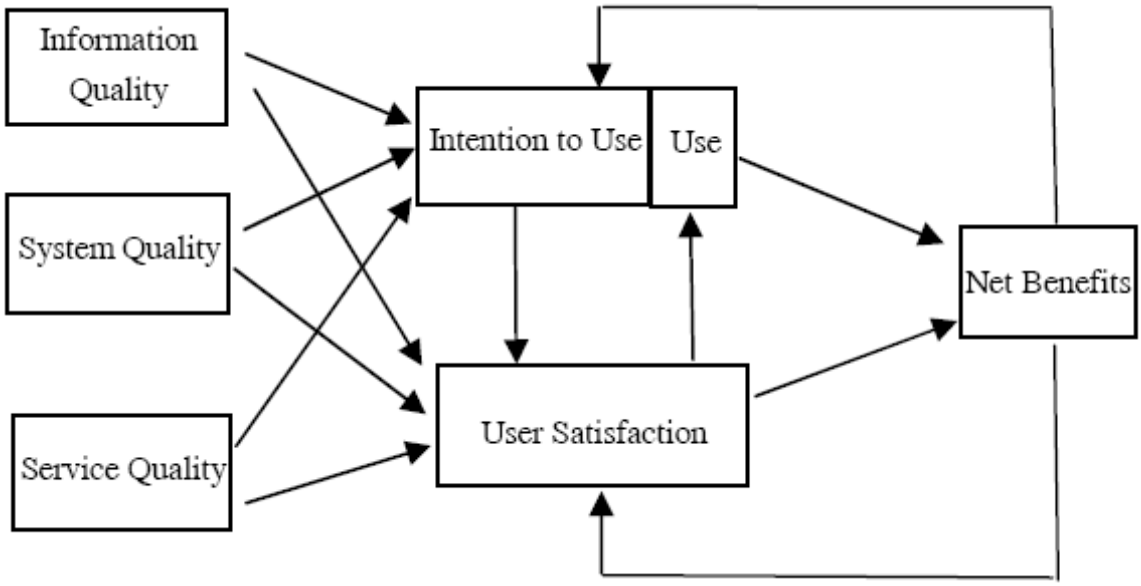


Figure 4: The updated DeLone and McLean's 2003 Model

Many empirical studies supported the updated DeLone and McLean (D&M) model. The findings of these studies provided several important implications for using (D&M) model in research and practice. Also, it encouraged Governmental and Private Authorities to include measures for information quality, system quality, service quality, system use, user satisfaction, and perceived net benefit in their valuation techniques of information system success. (10, 11, 12, 13, 14, 15, 16 & 17).

2.4.6 Integrated Success Model (ISM)

In accordance with (TAM) and D&M updated model, integrated model ISM is also used for evaluating IS success. In this model, ten dimensions were proposed for measuring information system success. Behavior intention; Information quality; Management support; Perceived ease of use; Perceived usefulness; Service quality; System quality; Training; User satisfaction; and User

involvement. The model assumes that information quality, system quality and service quality are linked to management support, training and user involvement, and these in turn; influence perceived usefulness and perceived ease of use which affect on behavior intention and user satisfaction as shown in Figure (3).

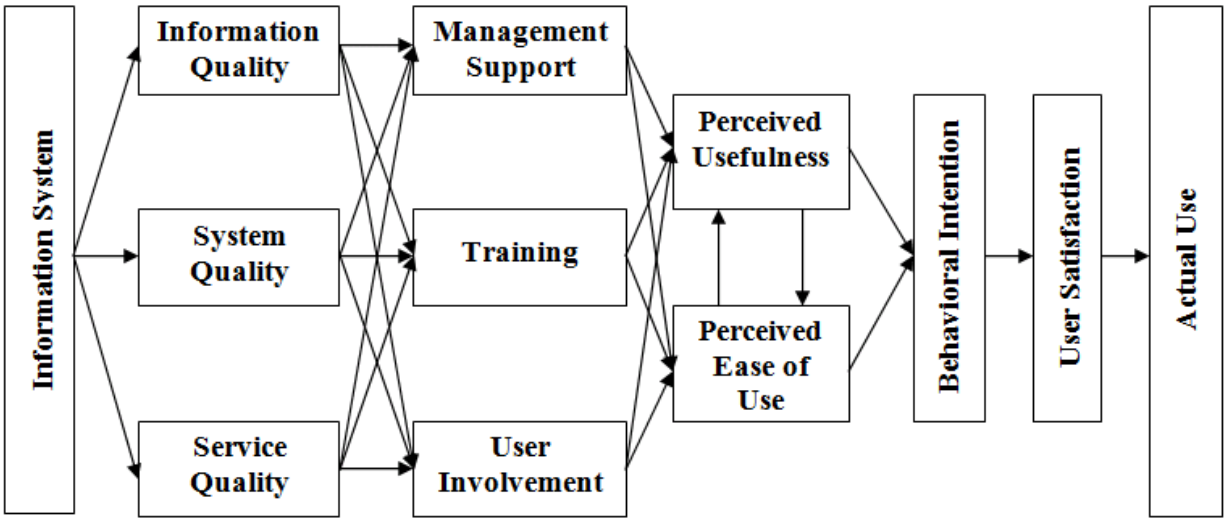


Figure 5: Integrated success model (ISM)

2.4.7 Unified Theory of Acceptance and use of Technology (UTAUT) Model

The UTAUT proposed by Venkatesh et al., (2003), through the incorporating eight famous Models/Theories in the diverse discipline. The Models/Theories were integrated in terms of their conceptual differences as well as empirical resemblances (Jackson, Park & Probst, 2006). The idea behind the unifications of these Models/Theories is to arrive at the unified view of user acceptance of IT (Venkatesh et al., 2003).

A recommendation by Venkatesh et al., (2003), suggested that future studies on UTAUT model should include developing deeper understanding of the dynamics that may influence user acceptance of information technology by concentrating on construct that can add to the prediction of intention and behavior over and above what is known and understood in understanding the organizational outcomes associated with success of new Information System.

In a later research, the perceived usefulness has been associated with performance expectancy while perceived ease of use has been equated to effort expectancy (Venkatesh et al., 2003). Performance expectancy and effort expectancy is by extension been posited as determinant of an individual intention to use particular technology. Studies by Venkatesh et al., (2003), established that performance expectancy remain robust in both voluntary and mandatory environments. Most often out-come has been the indicator of measuring effectiveness in an organization without considering the vital roles associated with these two levels of effectiveness.

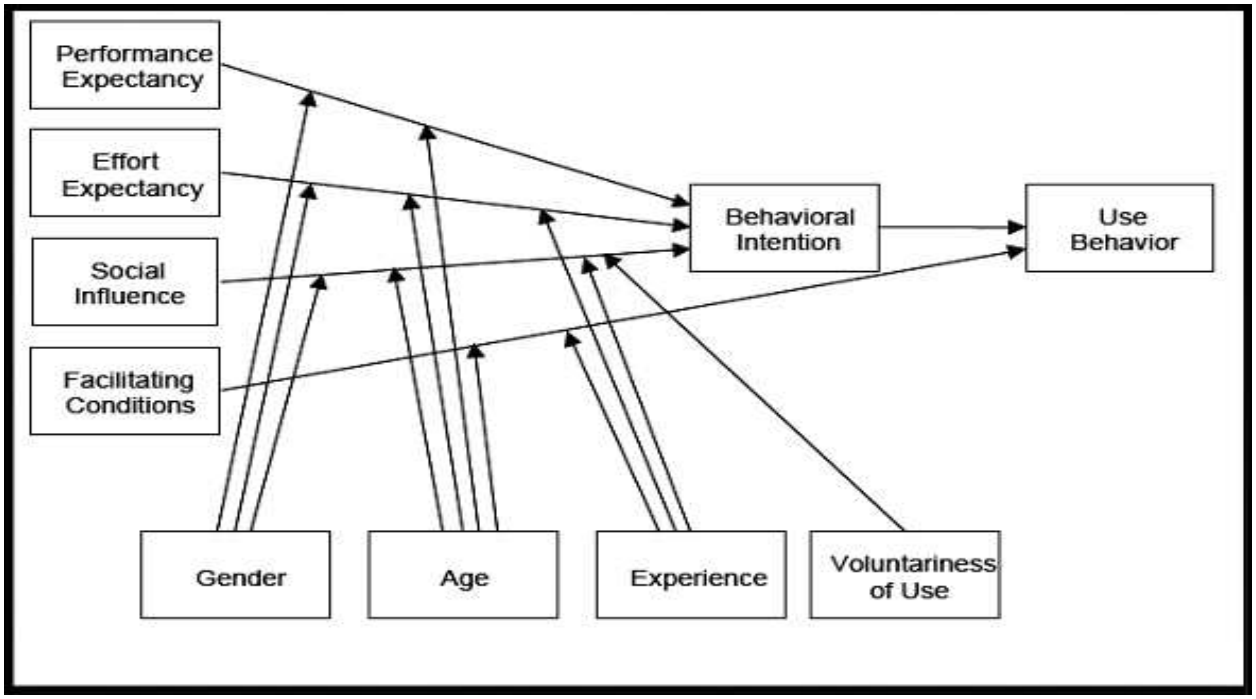


Figure 6 showing UTAUT

2.4.8 Diffusion of Innovation (DOI)

Diffusion is the "process by which an innovation is communicated through certain channels over a period of time among the members of a social system". An innovation is "an idea, practice, or object that is perceived to be new by an individual or other unit of adoption". "Communication is a process in which participants create and share information with one another to reach a mutual understanding" (Rogers, 1995). Diffusion of innovation theory predicts that media as well as interpersonal contacts provide information and influence opinion and judgment. Studying how

innovation occurs, E.M. Rogers (1995) argued that it consists of four stages: invention, diffusion (or communication) through the social system, time and consequences.

The information flows through networks. The nature of networks and the roles opinion leaders play in them determine the likelihood that the innovation will be adopted. Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium, such as the Internet. Opinion leaders exert influence on audience behavior via their personal contact, but additional intermediaries called change agents and gatekeepers are also included in the process of diffusion. Five adopter categories are: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. These categories follow a standard deviation-curve, very little innovators adopt the innovation in the beginning (2,5%), early adopters making up for 13,5% a short time later, the early majority 34%, the late majority 34%and after some time finally the laggards make up for 16%.

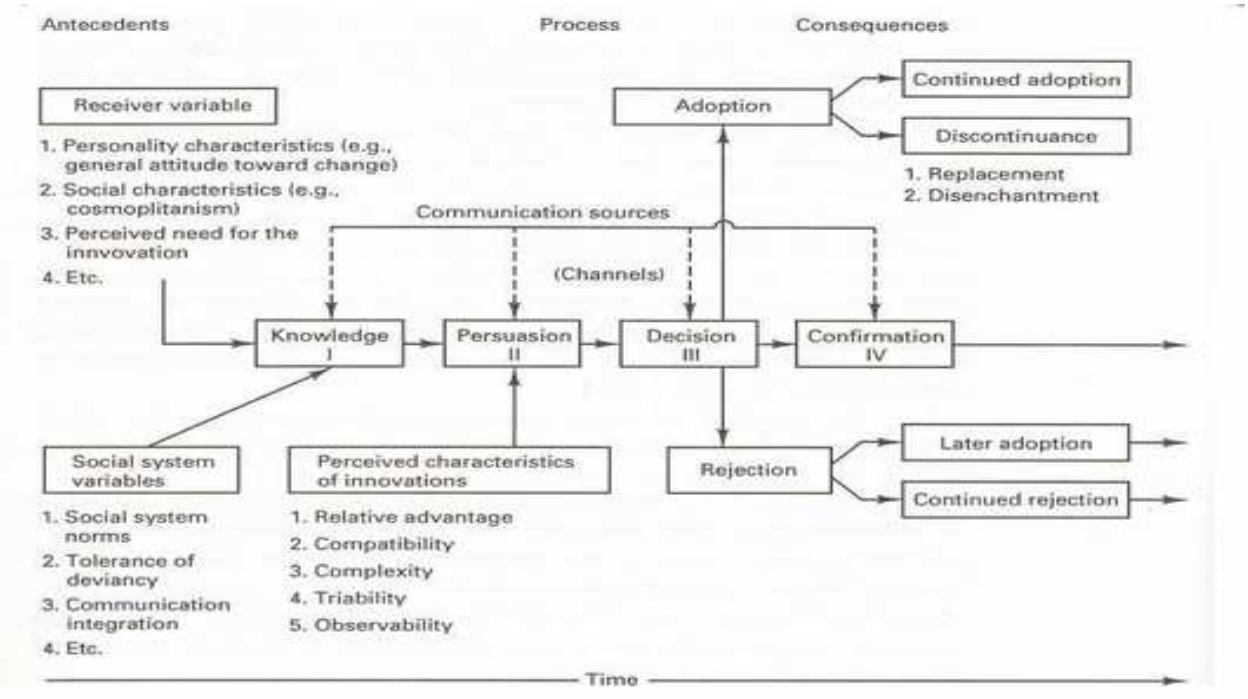


Figure 7 above shows diagram of diffusion of innovation theory.

Diffusion research has focused on five elements: (1) the characteristics of an innovation which may influence its adoption; (2) the decision-making process that occurs when individuals consider adopting a new idea, product or practice; (3) the characteristics of individuals that make them likely to adopt an innovation; (4) the consequences for individuals and society of adopting an innovation; and (5) communication channels used in the adoption process.

2.5 Comparison of the IS Success Models in Use

This literature review analyzed the state of research of multi-dimensional IS success measurements and models. Therefore, literature between 2007 and 2011 was evaluated. The literature pool of relevant sources consisted of 26 empirical studies and 11 non-empirical articles. The analysis focused on empirical literature, which was ana-lyzed in depth. The review clarifies that the D&M success models still enjoy huge popularity. By now, the majority has switched to the updated D&M success model published in2003. The review also shows that different models are often combined to grant justice to the subject of research. While every empirical article analyzed an individual level, only nine of 26 studies consider an organizational point of view. Studies including both perspectives ensure a more comprehensive success measurement, but also increase the effort of data gathering. Data is usually gathered from users by conducting surveys. In general, a type of IT or IT application is evaluated.

The gathered data is mostly analyzed by structural equation modeling. The limitations mentioned by Urbach et al. [65] are also applicable in this review: on the one hand, the sources are limited to chosen journals and conference articles. Thus, relevant articles may be excluded. Further, books were not considered, as it was assumed that articles of importance were also published in leading journals and conferences. On the other hand, the approach of search using databases could distort the result. Articles of relevance may be excluded if they do not match the criteria of the search requests (referring to title, abstract, keywords). Furthermore, the search requests contain a bias towards the D&M success model. Another limitation is caused by only conducting English queries. In this research, the Integrated Success Model will be adopted and modified to fit the objective of this study.

2.6 Proposed Framework

The research framework below (Figure 8), adapted from the D&M and TAM IS success models, is based on them any studies that have validated the model (Seddon and Kiew, 1994; Seddon, 1997; Taylor and Todd, 1995). The constructs representing Information Quality, System Quality, Service Quality Management support, User involvement, Training Perceived ease of use, Perceived usefulness; Service quality; Training; and User involvement will be used to measure the success of information system. The Figure8 below shows the diagram for the constructs that have been selected from the literature, contingent on the context and objectives of the investigation are presented below.

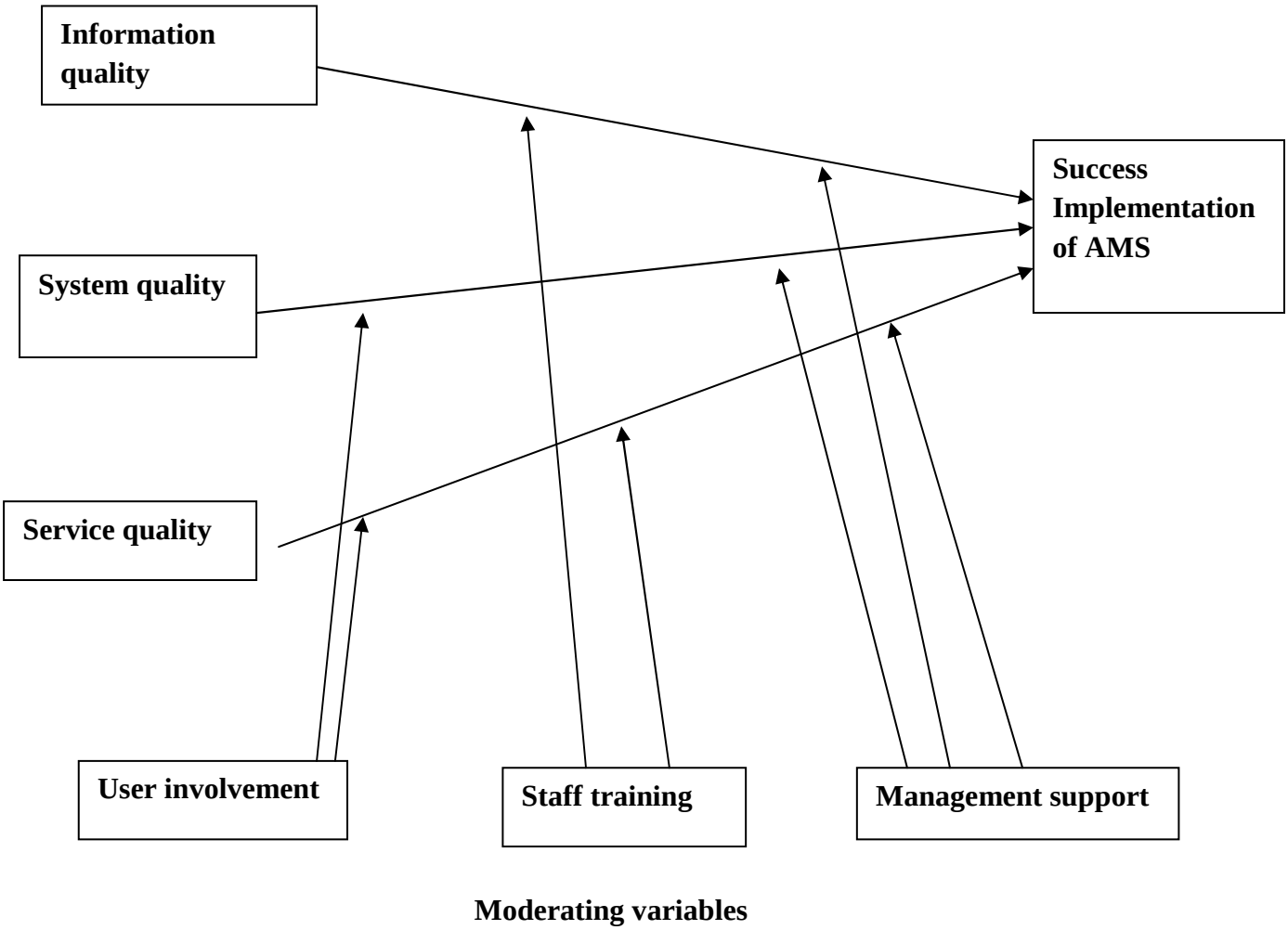


Figure 8. Proposed AMS Success framework

Source: Researcher's Conceptualization

The model has been widely used by IS researchers for understanding and measuring the dimensions of IS success. The model assumes that information quality, system quality and service quality are linked to management support, training, user involvement, Organisation culture and Communication and these in turn; influence perceived usefulness and perceived ease of use which affect Behavior intention, user satisfaction as shown in Figure (8) above. The listed above factors are called dimensions or variables. Five items were selected to measure each dimension; these elements were adapted primarily for this particular evaluation of Mumias sugar company Agricultural management system (AMS). The elements are as follows:

2.6.1 Description of Proposed Research Framework

2.6.2 Independent Variables

In the proposed research model, the following independent variables are described:

Quality Constructs

The quality construct is used to measure the IT-Artefact or technology element of IS.

Information-Quality is concerned with the quality of the information produced by the system, for example in reports and on-screen. The measures which have been developed and successfully measured according to gable et al (2008) include relevance; Completeness; Understandability; Security; Availability; and Accuracy. These elements were selected to be used in this project.

System-Quality

Measures the success of IS from a technical and design perspective. This focuses on performance characteristics of the system under study. Some researchers had looked at resource utilization and investment utilization, reliability, response time, aggregation of details, human factors, and system on performance characteristics of the system under study. Some researchers had looked at resource utilization and investment utilization, reliability, response time, aggregation of details,

human factors, and system trust and accuracy. In this work, the selected system quality elements are: Reliability; Usability; Adaptability; Trust; and Maintainability.

Service Quality

Service quality is a measure of how well the service level delivered matches customer expectations. The selected service quality elements are: Availability; Reliability; Integrity; Functionality; and Efficiency.

2.6.3 Moderating Variables

Top Management Support

Management support refers to management approval and continuous support not only during the IS project implementation but also throughout the operational phase of the system. It is extremely important that top management do not forget about a project after the planning stage but instead are commitment at the time of system implementation. By being directly involved in a project, top management guides the implementation team, allocating resources for projects, and stepping in to solve critical issues likely to affect implementation. The selected management support measures are: management's encouragement; providing all necessary resources; discussing problems associated with the system; appreciating the optimal use of the system; and having sufficient knowledge of the system.

Training

Employee skills in relation to information system being one of the most important factors within an organisation are critical in achieving success. If the employee does not meet the requirements/skills needed to carry out the required tasks, it can affect productivity and efficiency. It is also important that a business has a well-established training program for new employees in order to gain the appropriate skills that may be required specific to the company.

The level of training an organization's employees undergo with respect to information systems will have a positive relationship with implementation success. The selected training measures are: training programs on the application; the clearance of training programs; users' role; availability of training material; and support.

User Involvement

User involvement is defined as matter of importance and personal relevance that users attach to a given system. The selected user involvement measures are: user's involvement in input design; user's involvement in output design; perceptions of service evaluations; perceived value; and customer attitude.

2.6.4 Dependent Variable

Success of AMS

Success of the AMS was measured in terms of the perceived usefulness and ease of use. Perceived usefulness is an individual's perception that use of technology will improve Performance. The selected elements are performance; effectiveness; productivity; risk perception; and trust.

Perceived ease of use, refers to the degree to which an individual believes that learning to adopt a technology requires little effort. The selected perceived ease of use elements are, easy to learn; easy to manage; self efficiency; simplicity; and ccompatibility.

The success of the AMS can be confirmed when the system is put into the actual. This includes the nature of use, navigation patterns, number of site visits and number of transactions executed. This process will then gauge whether the system is satisfactory to the user or not which was measured using self-efficacy; repeat visits; personalization; perceived risk; and enjoyment.

Table 1: Operational table

Variable	Evaluation Parameter	Description
1.System Quality	Reliability	The information system performs the order right the first time the request is launched.
	Usability	The information system is readily available and flexible to use by AMS users.
	Adaptability	It easy to use information system
	Trust	The information system fulfils all its intended obligations. The AMS is trustworthy.
	Maintainability	Information system is easy to maintain and is up-to-date
2.Information Quality		
	Completeness	The information system provides complete information that accomplishes the user's needs.
	Understandability	The information retrieved from information system is easy to understand.
	Security	The information retrieved from information system is secure.
	Availability	Information system makes information easily available
	Accuracy	Information provided by system is accurate and free from error
3.Service Quality		
	Availability	Information system provides

		information ready and easily accessible.
	Reliability	The information system performs the order right the first time.
	Integrity	The information received from the information system is adequate.
	Functionality	The information system in use is customized to operations and always up to date.
	Efficiency	The information system makes users finish their tasks quickly
4.Management		Management encouragement
Support		Providing all necessary resources
		Discussing problems associated with the system
		Appreciating the optimal use of the system
		Having sufficient knowledge of the system
5.Training	Training programs on the application	
	Clearance of training programs	
	Users role	Organization offers training programs regarding information system application Training material is available during training Trust The information system

		usually fulfils the commitments
	▪ Availability of training ▪ materials	
	▪ Support	
6.User involvement		
	▪ Input design	
	▪ Output design	
	▪ Perception of service evaluations	Users were involved at both input and output design stages
	▪ Perceived Value	
	▪ Customer attitude	
7.Perceived usefulness		
	▪ Performance	Using the information system will improve performance of job
	▪ Effectiveness	The functions of the information system can easily be used to do work
	▪ Productivity	Can the information system improve productivity
	▪ Risk perception	Considerations that the information system takes into account about repercussions that their actions could have on the users.
	▪ Trust	The information system usually fulfils the commitments it assumes.
8.Perceived ease of use		
	▪ Easy to learn	Learning to operate and interact with the information system is easy for the user.
	▪ Easy to manage	User feels that information system

		forms integral part of him. In addition it's easy to get information system do the job which the user wants to do.
	▪ Self efficacy	Frankness and clarity of the services that information system offers defines this parameter. In addition It is easy for user to become skilful by using the information system.
	▪ Simplicity	Interacting with the system is a clear and understandable process. It is simple to use the system
	▪ Compatibility	The information system provides sufficient information. In addition it contains compatible topics the user is searching for.
9.User satisfaction		
	▪ Self efficacy	Frankness and clarity of the services that information system offers defines this parameter. In addition It is easy for user to become skilful by using the information system.
	▪ Repeat visits	The frequency of use with the eServices website system is high with the information system.
	▪ Personalization	The design of the information system takes into account the desires and needs of its users.
	▪ Perceived risk	The information system is

		concerned with the present and future interests of its users.
	Enjoyment	The use of information system is enjoyable and interesting.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This study describes the research methodology used by indicating the research design, target population, data collection methods and data analysis that will be utilized in investigating the implementation model for evaluation of Agricultural Management Information system in providing extension services to sugarcane farmers of Mumias Sugar company.

3.2 Research design

"A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure" (Kothari, 2004). The research design to be used will provide qualitative evidence through data collection, analyzing and reporting on the level of success in Agricultural Management information system (AMS) in providing extension services to sugarcane farmers and its implementation. The research design will form the conceptual structure within which the research is conducted; the plan for collection, measurement and analysis of data.

The goal of sound research design is to provide results that are credible. Credibility here means extent to which results approximate reality and are judged trustworthy and reasonable. This means that research design is the logical model of proof that allows the researcher to draw inferences concerning causal relationships among the variables under investigation. In this study, the researcher adopted a case study. A case study is the in-depth investigation of an individual or a group or an institution with primary motive to determine factors and relationships that have resulted in the behavior of the study (Robson 2002).The researcher

undertook a case study of Mumias Sugar Company as it has an elaborate farmer's base of which it is serving.

3.3 Target Population

Population is defined as a complete set of individuals or objects with some common observable characteristics (Mugenda and Mugenda, 1999).It's this population that the researcher is going to generalize the results. Mumias Sugar Company has a population of employees actively using AMS of 394.About 80% of this population are staff of lower cadre whose daily work entails encounter with AMS at a percentage of 97% of their working hours. Amongst the staff using AMS includes Engineering surveyors, GIS staff, agricultural engineers, Crop scientists, out growers Services staff, farmer services staff, financial accountants, procurement officers, fertilizer supply staff, Sugarcane seedcane supply staff, agronomy staff, land preparation staff and cost accountants.

The target population includes those working in different sections within Agricultural department. This includes agricultural engineering section (survey, land preparation, nucleus estates), Fertilizer supply section- FSS, Agronomy, Fleet management,Outgrowers Development section-ODS,Quality section and Research and extension services section.Each section will be targeted. External customers targeted will be farmers who do not use the system but benefits a lot from the services of the system. There will be representation from all stakeholders who benefits either directly or indirectly. The following table shows the distribution of modules or stakeholders used in AMS in mumias Sugar Company.

Table 2. Showing the distribution of module used in AMS within Mumias Sugar Company

Module	Section	Activitiy it handles
ODS	ODS	Farmer recruitment
		Farmer termination
		Farmer complaints
		Crop protection
		Crop care
		Overall land management
AE	AE	Land preparation i.e
		Land plough
		land hurrow
		land furrow
		Survey
AGRONOMY	AGRONOMY	Soil tests
		Seedcane variety test
FSS	FSS	Suppply of seedcane
		Supply of fertilizer
QUALITY	QUALITY	checks quality of
		overall land preparation
HARVESTING	HARVESTING	Concerned with tracking lan
		ready for cane harvesting
TRANSPORT	TRANSPORT	Transportation of harvested
		cane
OCA	OCA	Payment of farmers supplie
Management	Management	Computing whats due
Accounts	Accounts	to farmer for payment

The above modules are used intensively within the respective departments. The following table illustrates the distribution of the number of people per module who use AMS in their daily work.

Table 3: showing the number of people (Employees) using AMS at section level

MODULE	SECTION	NO.STAFF USING AMS
ODS	ODS	150
AE	AE	40
AGRONOMY	AGRONOMY	36
FSS	FSS	32
QUALITY	QUALITY	35
HARVESTING	HARVESTING	25
TRANSPORT	TRANSPORT	20
OCA	TREASURY	26
MANAGEMENT ACCOUNTS	MA	30
TOTALS		**394**

Table 4: Showing the number of people (Farmers) being served by AMS

ZONE	Total number Farme
EAST WANGA 1	300
EAST WANGA 2	2000
NORTH WANGA 1	2500
NORTH WANGA 2	1000
BUSIA North	500
BUSIA South	500
Total	**6800**

3.4 Sampling Procedure/Design

Sampling design is a plan of obtaining a sample from the population. It is the technique/procedure adopted in selecting the items to include in the sample, Kothari (2004).A sample is part of the population chosen for study (n < N where n is the sample size and N the population size).In this study N will be chosen from different data, one comprising employees using AMS While the other comprises farmers for which AMS Services are focused to. The study undertook to sample all the sections using AMS as well a few farmers who are served by AMS.To overcome the limitations of this study the researcher employed stratified sampling that the stratified population structure is reflected in the sample structure, subject to some criterion and simple random sampling to select sixty two (62) respondents employees from the target population of three hundred and nighnty four (394) and six hundred eighty (680) respondents (Farmers) from a target population of six thousands eight hundred (6800).

The researcher categorized the respondents into 2 major groups. Farmers and Employees. Simple random sampling was then used to proportionately select respondents from each stratum at between 10% and 16% of the study population. According to Mugenda and Mugenda (2003) a good sample population should be in the range of 10% to 30% of the entire population, this study selected 15.73% of entire population of employee group and 10% of entire population of farmers group which is a recommended threshold. The table 4 and 5 below shows the population to be sampled in each group:

Table 5: Sampled Sections of Employee Group

Section	Total population	Population to be sampled	Male	Female	%of sample representation
ODS	150	23	13	10	15.33
AE	40	6	3	3	15
Agronomy	36	6	3	3	16.7
FSS	32	5	4	1	15.63
Quality	35	6	2	4	17.14
Harvesting	25	4	4	0	16
Transport	20	3	2	1	15
OCA	26	4	1	3	15.38
Management Accounts	30	5	2	3	16.7
Totals		**62**	34	28	15.73

Table 6: Sampled Sections of Farmers Group

Zone	Total population	Population to be sampled	% of sample representation
East Wanga 1	300	30	10
East Wanga 1	2000	200	10
North Wanga 1	2500	250	10
North Wanga 2	1000	100	10
Busia North	500	50	10
Busia South	500	50	10
Totals	6800	680	10

3.5 Data Collection

This study collected both primary and secondary data relating to the success of Agricultural Management Information System in providing extension services to the sugarcane farmers in Mumias Sugar Company. Primary data was collected by use of questionnaires. The questionnaires were developed to carter for different target population (Employees and Farmers).The employees questionnaire contained both open and closed ended questions and is divide into 4 sections, A, B, C and D. Section A focused on the demographics of the respondent while section B focused on factors affecting information quality of Agricultural Management Information System in providing extension services to rural cane farmers. Section C was concerned with system quality of AMS while section D concentrated on service quality of AMS in providing extension services to sugarcane farmers. The questionnaires were dropped and picked from the respondent after a reasonable period of time .Secondary data was gathered through close observation.

The farmer's questionnaire contained both open and closed ended questions and is divided into 3 sections. A, B and C. Section A focused on the demographics of the respondent while section B

focused on the rating of service quality pertaining to provision of extension services farmers received from Mumias Sugar Company. The questionnaires were administered to the farmers by the field staff recruited to carry out the research.

3.6 Reliability and Validity of the Instrument

3.6.1 Pilot Test Report

A pilot test was first carried out with a sample of 15 employees and 68 farmers. The 83 respondents were not included in the actual survey but were part of the sample of 742.This study enabled the researcher to be familiar with research and its administration procedure and also modify the questionnaires where need be. The result enabled the researcher to correct inconsistencies arising from the instruments, which ensured that they measured what was intended. Reliability refers to the consistency of measurement and is frequently assessed using the test-retest reliability method. Reliability is increased by including many similar items on a measure, by testing a diverse sample of individuals and using uniform testing procedures.

3.6.2 Reliability Analysis

Reliability of the two set of questionnaires was evaluated through cronbach's Alpha which measures their internal consistency. The Alpha measures internal consistency by establishing if a certain item measures the same construct.Nunnally (1978) established the Alpha value threshold at 0.6 which the study benchmarked against.Cronbach Alpha was established for every objective in order to determine if each scale (objective) would produce consistent results should the research be done later on. The study found that the instrument had reliability (α = 0.889) for the employees questionnaire and (α = 0.885) for the farmers questionnaire. This illustrates that all the four scales were reliable as their reliability values exceeded the prescribed threshold of 0.6, thus the instrument was reliable to use in collecting data as it will help to achieve the desired research objective.

3.7 Data Analysis

After the questionnaires were administered and responses received they were checked for consistency accuracy and uniformity .In addition they were edited for completeness and consistency. A content analysis and descriptive analysis were employed. The content analysis was used to analyse the respondents' views about success of AMS in providing extension services to sugarcane farmers. The data was coded to enable the responses to be grouped into various categories. Descriptive statistics such as means, median, mode and standard deviation was used to help in data analysis. Tables and other graphical presentations as appropriate were used to present the data collected for ease of understanding and analysis. The study used ANOVA (Analysis of Variance) to test the research hypothesis while Pearson product moment correlation was used for correlation analysis. Regression analysis and Factor analysis was used to study the three independent factors in isolation. A multivariate regression model was applied to determine the relative importance of each of the variables with respect to the success of AMS in providing extension services to sugarcane farmers.

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

Data was edited by checking and adjusting for errors, omissions, legibility and consistency in order to ensure completeness, consistency and readability of the data. This was done using frequency distribution in SPSS. Data was coded by assigning numbers to each answer and edited before it was entered into SPSS. Each question or item in the questionnaire has a unique variable name, some of which clearly identify the information such as gender and age.

4.2 Preliminary Analysis

4.2.1 Missing Data Analysis

There were some responses in the collected data that were not usable. Some questions were not answered while others were wrongly answered. Such responses were therefore treated as 'spoilt'. The output below was produced after the missing data analysis was performed. The missing data was less than 5% therefore the research data was usable.

Table 7: Missing Data Analysis **Warnings**

There are no variables with 5% or more missing values. TTEST table is not produced.
There are no categorical variables. CROSSTAB is not produced.
There are no variables with 5% or more missing values. MISMATCH table is not produced.

The univariate statistics produced the following output.

Table 8: Univariate Statistics

	N	Mean	Std. Deviation	Missing		No. of Extremes(a,b)	
				Count	Percent	Low	High
Gender	509	1.37	.484	0	.0	0	0
Education	508	2.06	.731	1	.2	0	0
Age	509	2.53	.500	0	.0	0	0
Duration	509	2.17	.601	0	.0	.	.
Computer_Skills	507	1.39	.487	2	.4	0	0
AMS_user	509	1.36	.480	0	.0	0	0
AMS_usage	509	1.40	.491	0	.0	0	0
USERINVOLVEMENT1	509	1.52	.577	0	.0	0	0
USERINVOLVEMENT2	509	1.66	.718	0	.0	0	0
MANAGEMENTSUPPORT1	509	1.62	.667	0	.0	0	0
MANAGEMENTSUPPORT2	508	1.58	.671	1	.2	0	0
TRAINING1	509	1.54	.612	0	.0	0	0
TRAINING2	509	1.56	.574	0	.0	0	0

IQACCURACY	509	4.01	.677	0	.0	.	.
IQAVAILABILITY1	509	2.38	.660	0	.0	0	0
IQAVAILABILITY2	509	2.42	.494	0	.0	0	0
IQCOMPLETENESS1	509	2.71	.454	0	.0	0	0
IQCOMPLETENESS2	509	3.18	.463	0	.0	.	.
IQSECURITY1	509	4.13	.689	0	.0	0	0
IQSECURITY2	509	4.24	.796	0	.0	0	0
IQSECURITY3	509	3.85	.749	0	.0	0	0
IQUNDERSTANDABILITY1	509	1.78	.673	0	.0	0	0
IQUNDERSTANDABILITY2	509	1.87	.699	0	.0	0	0
IQUNDERSTANDABILITY	509	1.76	.700	0	.0	0	0
SYQADAPTABILITY1	508	3.08	.495	1	.2	.	.
SYQADAPTABILITY2	509	3.08	.521	0	.0	.	.
SYQMAINTAINABILITY1	508	3.03	.507	1	.2	.	.
SYQMAINTAINABILITY	509	1.77	.802	0	.0	0	32
SYQRELIABILITY	509	2.95	.578	0	.0	.	.
SYQTRUST	508	3.05	.549	1	.2	.	.

SQAVAILABILITY1	509	2.95	.578	0	.0	.	.
SQAVAILABILITY2	509	3.05	.610	0	.0	.	.
SQEFFICIENCY1	509	1.73	.831	0	.0	0	32
SQEFFICIENCY2	509	4.20	.781	0	.0	0	0
SQFUNCTIONALITY1	509	1.72	.760	0	.0	0	32
SQFUNCTIONALITY2	509	4.06	.758	0	.0	0	0
SQINTEGRITY1	509	1.64	.590	0	.0	0	0
SQINTEGRITY2	509	1.82	.582	0	.0	0	0
SQRELIABILITY1	509	3.10	.582	0	.0	.	.
SQRELIABILITY2	509	2.99	.608	0	.0	.	.
AMSSUCCESS1	509	4.00	.721	0	.0	0	0
AMSSUCCESS2	509	1.91	.709	0	.0	0	0
AMSSUCCESS3	509	1.62	.656	0	.0	0	0

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

b. Indicates that the inter-quartile range (IQR) is zero.

4.2.2 Outlier Analysis

In many data analysis tasks a large number of variables are being recorded or sampled. One of the first steps towards obtaining a coherent analysis is the detection of outlaying observations. Although outliers are often considered as an error or noise, they may carry important information. Detected outliers are candidates for aberrant data that may otherwise adversely lead to model misspecification, biased parameter estimation and incorrect results. It is therefore

important to identify them prior to modeling and analysis (Williams *et al*., 2002; Liu *et al*., 2004).

Outlier detection methods can be divided between *univariate methods* and *multivariate methods* that usually form most of the current body of research. Computation of the Mahalanobis measure revealed that there were no cases with outlier characteristics.

4.3 Normal Distribution Analysis

Normality can be assessed by obtaining skewness and kurtosis values. Skewness describes asymmetry from the normal distribution in a set of statistical data. Skewness can come in the form of "negative skewness" or "positive skewness", depending on whether data points are skewed to the left (negative skew) or to the right (positive skew) of the data average. In probability theory and statistics, kurtosis is any measure of the "peakedness" of the probability distribution of a real-valued random variable.

4.3.1 Descriptive Statistics

Table 9: Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Gender	509	.534	.108	-1.721	.216
Education Level	508	-.095	.108	-1.123	.216
Age	509	-.122	.108	-1.993	.216
Duration Of Work	509	.838	.108	1.634	.216
Computer Skills	507	.467	.108	-1.789	.217

AMS user?	509	.587	.108	-1.662	.216
Level of AMS usage	509	.398	.108	-1.849	.216
I m involved in input design	509	.553	.108	-.660	.216
I m Involved in output design	509	.599	.108	-.870	.216
The management encourages using the system and appreciates the optimal use of the system to meet its goal.	509	.617	.108	-.669	.216
The management discusses problems regarding the information quality and provides all necessary resources to improve it.	508	.742	.108	-.561	.216
The organization offers training programs regarding AMS information system application and quality	509	.672	.108	-.503	.216
Training material is available during training	509	.408	.108	-.760	.216
The information provided by the information system accurate and free from errors	509	-.017	.108	-.811	.216
It is easy to find what you were looking for	509	-.590	.108	-.668	.216
AMS allows information to be readily accessible to me	509	.332	.108	-1.898	.216
The output of AMS information system complete	509	-.935	.108	-1.131	.216
AMS information system provides information precisely according to my need	509	.594	.108	.562	.216
The output information of AMS is secure	509	-.175	.108	-.897	.216
Overally, I trust the AMS security measures	509	-.465	.108	-1.275	.216

AMS information system usually fulfills the commitments it assumes	509	.255	.108	-1.185	.216
The output information of AMS is easy to understand	509	.288	.108	-.819	.216
It is easy to find what you're looking for when using the AMS information system	509	.177	.108	-.947	.216
AMS information system is available and flexible to use	509	.368	.108	-.926	.216
It is easy for me to become skilful at using the information system.	508	.167	.108	.968	.216
I find the information system easy to use.	509	.098	.108	.597	.216
The information system is up-to-date.	508	.059	.108	.891	.216
The information system is easy to maintain.	509	1.179	.108	1.397	.216
The information system performs the order right the first time.	509	.001	.108	-.012	.216
Security privacy policies are accessible	508	.027	.108	.309	.216
It was easy to find what you were looking for.	509	.001	.108	-.012	.216
The information system allows information to be readily accessible to me.	509	-.024	.108	-.309	.216
Using information system in my job would enable me to accomplish tasks more quickly	509	1.189	.108	1.097	.216
By using the functions of the information system, I can upgrade the efficiency of my work.	509	-.371	.108	-1.274	.216
The information system in use is always up to	509	1.372	.108	2.444	.216

date.					
The information system provides customized operations.	509	-.099	.108	-1.254	.216
The information received from the information system is adequate.	509	.292	.108	-.679	.216
It is easy for me to fine find out and get the desired information.	509	.044	.108	-.287	.216
The information system performs the order right the first time.	509	-.012	.108	-.111	.216
Relevant order confirmation details are sent to the user.	509	.006	.108	-.283	.216
The frequency of use with the AMS services website system is high	509	.000	.108	-1.071	.216
The AMS information system is concerned with the present and future interests of all its users in providing extension services to sugarcane farmers	509	.137	.108	-1.004	.216
The use of information system is enjoyable and interesting	509	.593	.108	-.652	.216
Valid N (listwise)	503				

Skewness of near 1 indicates moderate skewness. Kurtosis values less than 1 are negligible, values from 1-10 indicate moderate non-normality while values greater than 10 indicate severe non-normality. The maximum skewness value in this research was 1.372 and maximum kurtosis was 2.444.

4.3.2 Demographic Information

The study sought to ascertain the demographic information on the respondents involved in the study. In the employees group, information relating to the gender, age, and marital status, length of service, rank, and academic qualification was ascertained. The bio data points at the respondents' suitability to participate in the study. Details are presented below. In the farmers group, information relating to the gender, age, marital status, period of cane cultivation, level of education, Knowledge of information technology.

4.3.2.1 Respondents' Age

Table 10: Respondents' Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30 Years	239	47.0	47.0	47.0
	31-40 Yrs	270	53.0	53.0	100.0
	Total	509	100.0	100.0	

4.3.2.2 Respondents' Gender and Education Level

The study requested the respondents to state their gender and their education level. Table 7(a and b) presents the distribution of the received sample according to gender and educational level for both employees and farmers.

Table 11 (a): Respondents' Gender and Education Level {Employees group)

Gender and Educational level	**Total**		**Men, Mean= 58.33%**		**Women, Mean = 41.67%**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Below Certificate	6	10%	4	11.43%	2	8.00%
Certificate	10	16.67%	5	14.29%	5	20.00%
Diploma	18	30%	11	31.43%	7	28.00%
Bachelor	18	30%	10	28.57%	8	32.00%
Master	8	13.33%	5	14.29%	3	12.00%
Total	**60**	**100%**	**35**	**100.00%**	**25**	**100.00 %**

Table 11 (b): Respondents' Gender and Education Level {Farmers group}

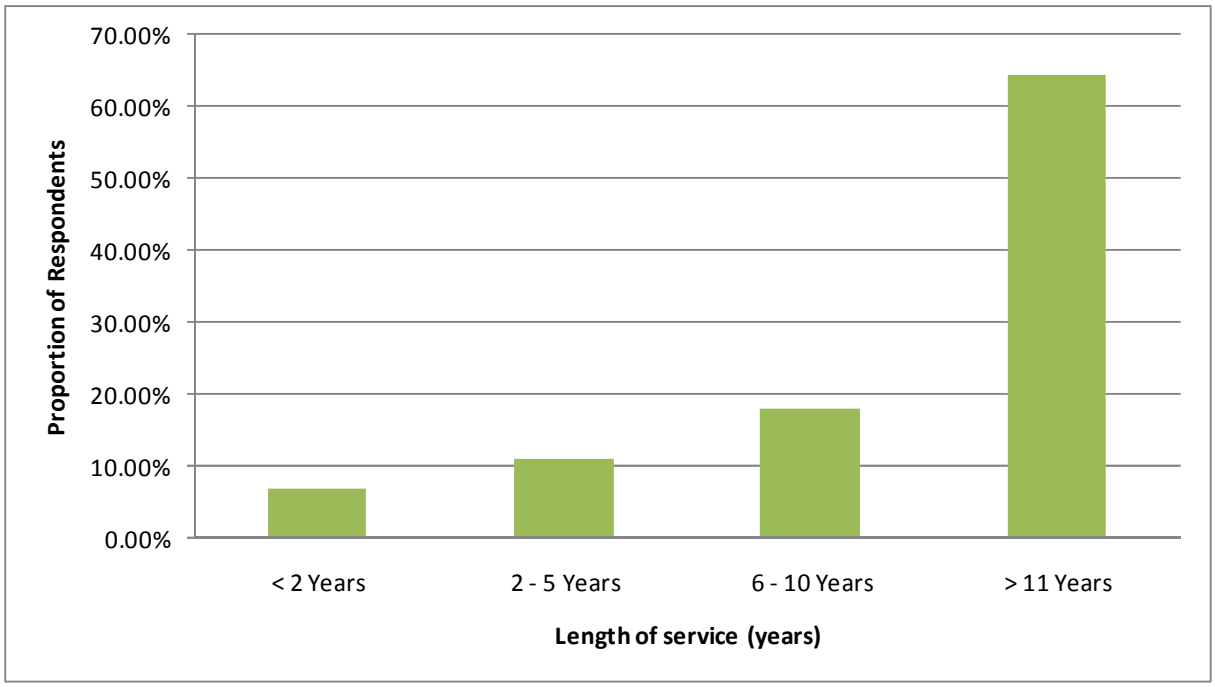
Gender and Educational level	**Total**		**Men, Mean = 58.15%**		**Women, Mean =41.85%**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Below Certificate	150	29.46%	85	28.72%	65	30.52%
Certificate	143	28.09%	80	27.03%	63	29.58%
Diploma	110	21.61%	61	20.61%	49	23.00%
Bachelor	100	19.64%	66	22.30%	34	15.96%
Master	6	1.20%	4	1.35%	2	0.94%
Total	**509**	**100%**	**296**	**100.00%**	**213**	**100.00 %**

From the results above, majority of the respondents were male consisting a representation of 58.33% from employees group and 58.15% from farmers group) while women consisted of 41.67% from employees group and 41.85% from farmers group of the respondents. From employees group, Majority of the respondents had a Bachelor (30%), Diploma (30%), and Certificate (16.67%) while Master had 13.33% .Those without any formal training i.e below certificate but with O-level certificate and below were 10% within the group of employees. For the case of farmers group, majority of respondents had no higher training i.e below certificate (29.46 %.), Certificate 28.09%, Diploma 21.61%, Bachelor 19.64% while masters at only 1.2%.

4.3.2.3 Respondents' Length of Service and Duration of Planting Sugarcane

The employees respondents were asked to indicate the duration they have worked in the section while farmers were asked to indicate the years they have planting sugarcane hence interacting with Mumias Sugar company. Findings are presented in figure 9 (a) and (b) below

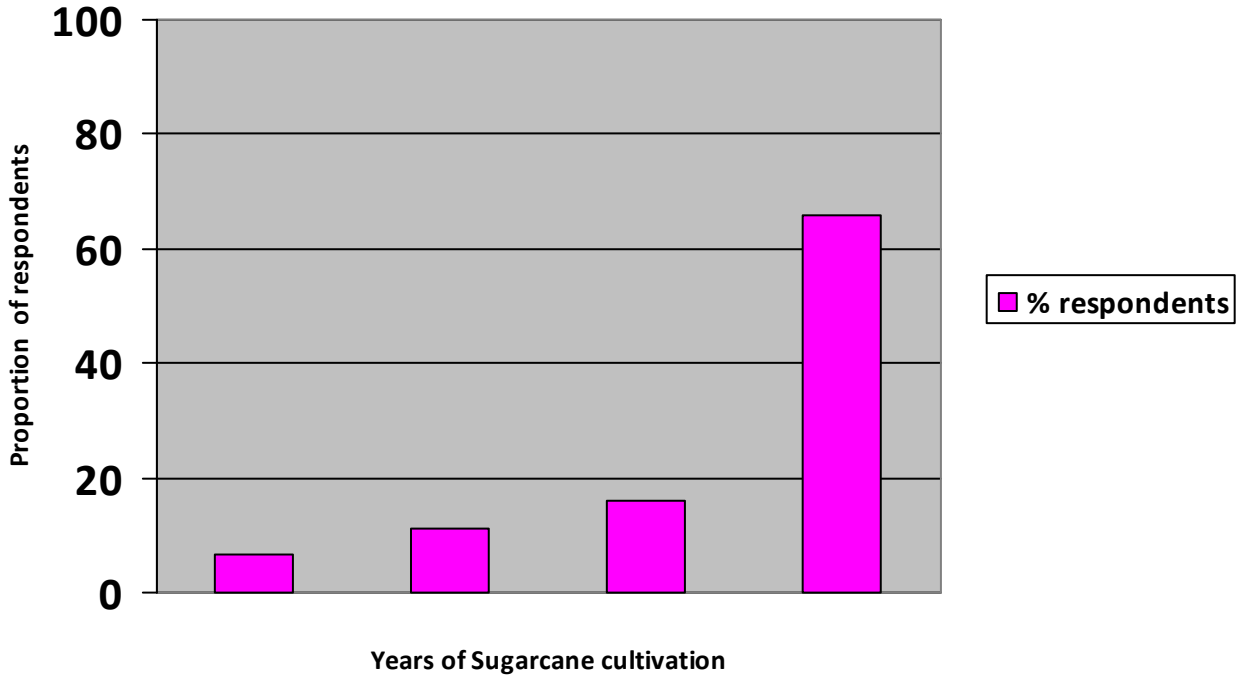
Figure 9 (a): Respondents' Lengthy of Service



(Source: Research Data, 2013)

From the results in figure 4.1, majority of the respondents (64.40%) had worked at the section for more than 11 years, 17.80% for 6 to 10 years, 11% for 2-5 years and 6.80% for less than 2 years. These findings mean that most of the respondents had worked for a long duration of more than 6 years, and hence had rich information.

Figure 9 (b): Respondents' duration of sugarcane cultivation

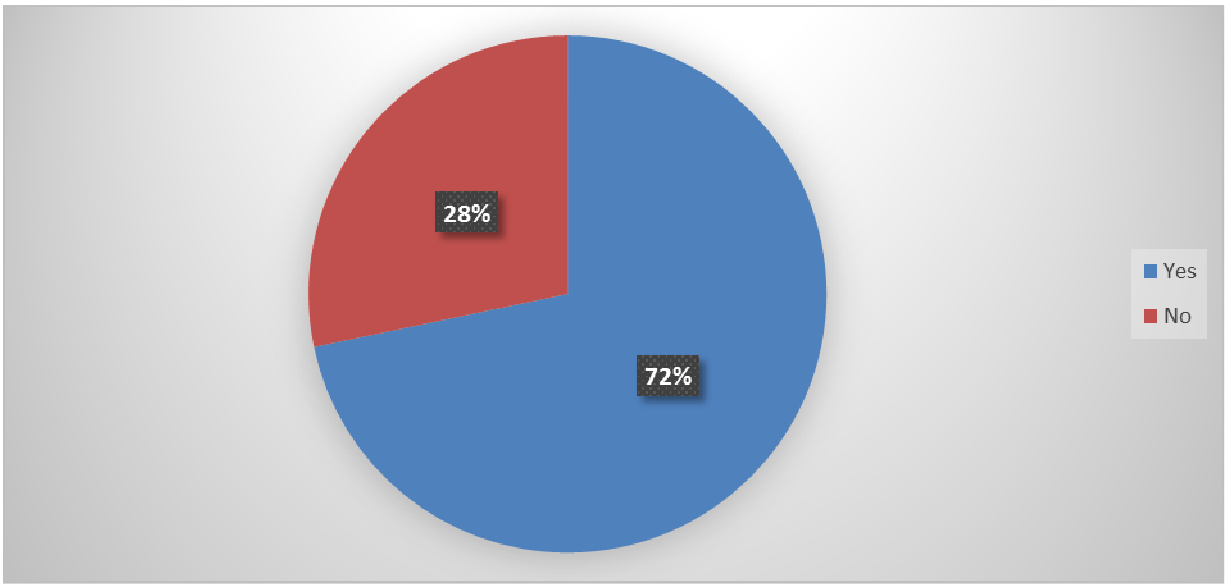


From the results in figure 4.1 (b) above, majority of the respondents (66%) had grown sugarcane and supplied to Mumias Sugar company for more than 10 years, 16% for 6 to 10 years, 11.3% for 2-6 years and 6.70% for less than 1 year. These findings mean that most of the respondents had grown sugarcane hence interacted with Mumias Sugar for more than 6 years, and hence had rich information regarding the quality of services they receives from Mumias Sugar Company.

4.3.3 Computer Skills

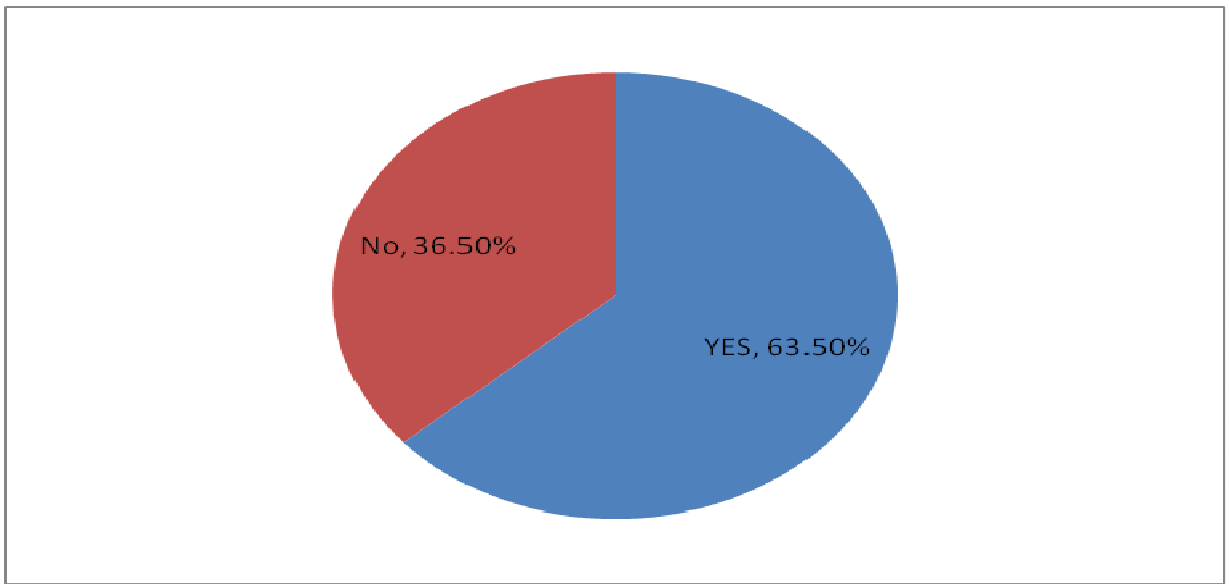
The respondents were asked to indicate whether they have computer skills. Findings are presented in figure 10 (a) and 4.2 (b).

Figure 10 (a) Respondents' Computer Skills {Employees Group)



From the findings above, 72% of the respondents indicated that they have computer skills while 28% have no computer skills. The results indicate that majority of the respondents had computer skills.

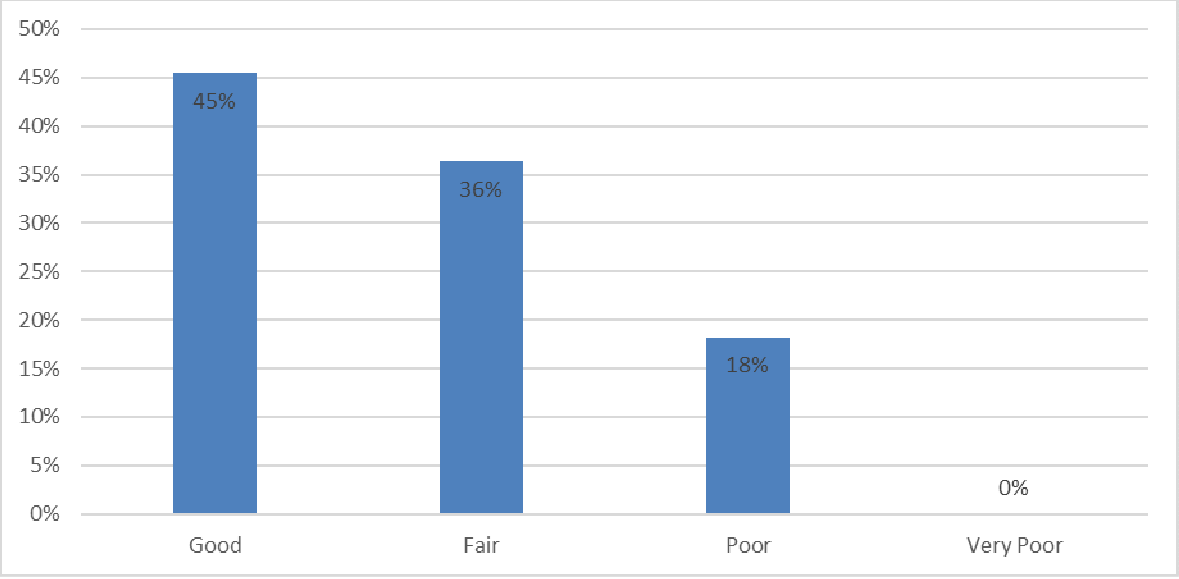
Figure 10 (b) Respondents' Computer Skills {Farmers Group)



From the findings above, 63.5% of the respondents indicated that they have computer skills while 36.5% have no computer skills. For those who indicated they have computer skills said so in regard to themselves or a member of their family. The results indicate that majority of the respondents or their family member had computer skills.

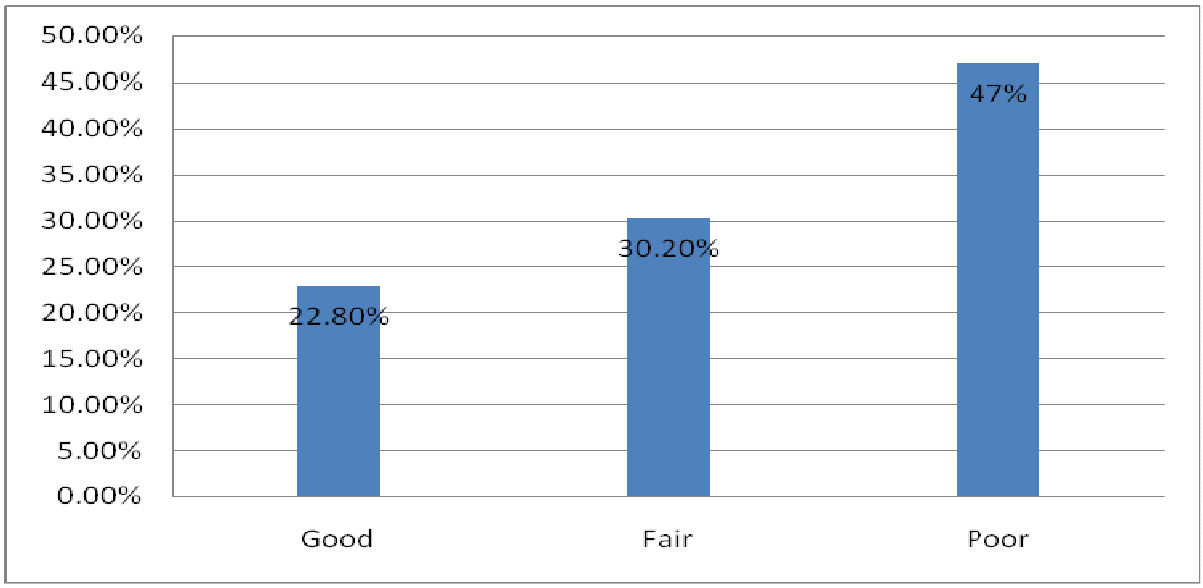
Respondents who indicated that yes they have computer skills were then asked to rate them on how good or bad they are. Findings are presented in a figure 11 (a) below for employees and 4.3 (b) for farmers

Figure 11 (a) Employees Quality of computer skills



Majority of the respondents (45%) indicated that their computer skills were good, Fair (36%), while poor had 18%.

Figure 11 (b) Farmers Quality of computer skills



4.4 Descriptive Statistics

This section sought to provide a description of the variables used in describing the relationship between variables. Results are presented using figures.

4.4.1 Information quality

Table 12: Information Quality

	N	Mean	Std Dev.
The information provided by the information system accurate and free from errors	509	4.01	.677
It is easy to find what you were looking for	509	2.38	.660
AMS allows information to be readily accessible to me	509	2.42	.494
The output of AMS information system complete	509	2.71	.454
AMS information system provides information precisely according to my need	509	3.18	.463
The output information of AMS is secure	509	4.13	.689
Overally, I trust the AMS security measures	509	4.24	.796
AMS information system usually fulfills the commitments it assumes	509	3.85	.749
The output information of AMS is easy to understand	509	1.78	.673
It is easy to find what you're looking for when using the AMS information system	509	1.87	.699
AMS information system is available and flexible to use	509	1.76	.700
Valid N (listwise)	509		

4.4.2 System quality

Table 13: System Quality

	N	Mean	Std Dev.
It is easy for me to become skilful at using the information system.	508	3.08	.495
I find the information system easy to use.	509	3.08	.521
The information system is up-to-date.	508	3.03	.507
The information system is easy to maintain.	509	1.77	.802
The information system performs the order right the first time.	509	2.95	.578
Security privacy policies are accessible	508	3.05	.549
Valid N (listwise)	507		

4.4.3 Service quality

Table 14: Service Quality

	N	Mean	Std Dev.
It was easy to find what you were looking for.	509	2.95	.578
The information system allows information to be readily accessible to me.	509	3.05	.610
Using information system in my job would enable me to accomplish tasks more quickly	509	1.73	.831
By using the functions of the information system, I can upgrade the efficiency of my work.	509	4.20	.781
The information system in use is always up to date.	509	1.72	.760
The information system provides customized operations.	509	4.06	.758
The information received from the information system is adequate.	509	1.64	.590
It is easy for me to fine find out and get the desired information.	509	1.82	.582
The information system performs the order right the first time.	509	3.10	.582
Relevant order confirmation details are sent to the user.	509	2.99	.608
Valid N (listwise)	509		

4.4.4 Success Implementation of AMS

Table 15: Success Implementation of AMS

	N	Mean	Std Dev
The frequency of use with the AMS services website system is high	509	4.000	0.721
The AMS information system is concerned with the present and future interests of all its users in providing extension services to sugarcane farmers	509	1.906	0.709
The use of information system is enjoyable and interesting	509	1.617	0.656
Valid N (listwise)	509		

4.5 Factor Analysis

The main applications of factor analytic techniques are to *reduce* the number of variables and to *detect structure* in the relationships between variables that is to *classify variables*. Therefore, factor analysis is applied as a data reduction or structure detection method.

There are two types of factor analysis:

4.5.1 Principal component analysis

In this method, original data is reconstructed from the data collected. It looks at the total variance among the variables. The solution generated will include as many factors as there are variables although it is unlikely that they will all meet the criteria for retention

4.5.2 Common factor analysis

This method uses an estimate of common variance among the original variables to generate the factor solution. Here, the number of factors will always be less than the number of original variables.

This research used principal component analysis with verimax rotation to analyze the data using SPSS 15.

4.5.3 Preliminary Analysis and Assumptions of factor analysis

These are the characteristics that the research data must satisfy in order for factor analysis to be conducted.

Multivariate Normality

Most significance statistics build on the normal distribution, so it is unusual for the common underlying distribution to be normally distributed. The dependent variables should be normally distributed for each combination of independent variables. The smaller the sample size, the more important it is to screen data for normality.

Homoscedasticity

Homoscedasticity means a situation in which the variance of the dependent variable is the same for all the data. Homoscedasticity facilitates analysis because most methods are based on the assumption of equal variance. Homoscedasticity was checked by testing the residuals and assuring that they were dispersed randomly throughout the range of the estimated dependent variable.

No outliers

Outliers can impact correlations and thus distort factor analysis. This research used Mahalanobis distance to identify cases which were multivariate outliers.

Linearity

Any non linearity will bring problems in a solution. Factor analysis being linear process so there needs to be a careful examination of any departures from linearity. Small sample sizes are vulnerable to non-linearity. The sample size of this research was 509 respondents which makes it free from non-linearity.

4.5.4 Factorability of correlation matrix

The researcher must look for correlations that are great than 3. If several values in the correlation matrix exceed 0.3 then it is appropriate to use factor analysis. The anti image correlation matrix is used to assess the sampling adequacy of each variable. Only variables with sampling adequacy of greater than 0.5 are included in the analysis. Both Bartlett's test of sphericity and Kaiser Meyer-Olkin (KMO) measure of sampling adequacy can be used to determine the factorability of the matrix as a whole. If Bartlett's test of sphericity is significantly large among some of the variables, and Kaiser Meyer-Olkin index is greater than 0.5 then factorability is assumed.

No selection bias

The exclusion of relevant variables and the inclusion of irrelevant variables in the correlation matrix being factored will affect the factors being uncovered substantially. Additionally, if the analyst deletes variables arbitrarily in order to have a cleaner factor solution, erroneous conclusions will result.

Limited Multicollinearity

Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated, meaning that one can be linearly predicted from

the others with a non-trivial degree of accuracy. Multicollinearity increases the standard error of factor loadings, making them less reliable and thereby making more difficult the process of inferring labels for factors. To detect Multicollinearity in factor analysis, KMO statistics may be used, or data first screened in regression analysis using Variance Inflation factor (VIF) or Tolerance. KMO and correlation matrix were used to detect Multicollinearity and collinear terms were eliminated prior to factor analysis.

Adequate sample size

At a minimum there must be more cases than factors. The sample size of this research was 509 respondents which makes it a suitable candidate for factor analysis.

4.6 Kaiser Meyer Olkin (KMO) and Bartlett's Test of Sphericity

Kaiser Meyer Olkin (KMO) measures sampling adequacy while Bartlett's Test is a test of sphericity. Bartlett's Test examines the hypothesis that the group of variances is the same and dependent variables are uncorrelated in the population. The KMO statistic varies between 0-1. Values nearest 1 are desirable for factor analysis. It is also desirable that Bartlett's value $p<0.05$.

Table 16: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.781
Bartlett's Test of Sphericity	Approx. Chi-Square	1,065.730
df		12.500
Sig.		0.000

The above results are acceptable the basis on which factor analysis was done.

4.7 Reliability Analysis

Reliability analysis allows you to study the properties of measurement scales and the items that compose the scales. The Reliability Analysis procedure calculates a number of commonly used measures of scale reliability and also provides information about the relationships between individual items in the scale. Cronbach's Alpha was used to measure the scale of reliability. Cronbach's Alpha value varies from 0-1, with higher values being desirable. The average Cronbach's Alpha for our data was 0.784.

4.7.1 Reliability Statistics

Table 17: Reliability Statistics

Cronbach's Alpha	N of Items
.784	83

4.8 Factor Extraction

The different methods of factor analysis first extract a set a factors from a data set. These factors are almost always orthogonal and are ordered according to the proportion of the variance of the original data that these factors explain. In general, only a (small) subset of factors is kept for further consideration and the remaining factors are considered as either irrelevant or nonexistent (i.e., they are assumed to reflect measurement error or noise).

The extraction method used was principal component analysis (PCA) with varimax rotation method.

Table 18: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.126	32.243	32.243	5.157	27.143	27.143
2	3.024	15.914	48.157	2.767	14.563	41.706
3	2.496	13.136	61.293	2.671	14.060	55.767
4	1.661	8.744	70.036	2.146	11.293	67.059
5	1.468	7.724	77.760	1.605	8.445	75.505
6	1.087	5.722	83.483	1.516	7.978	83.483
7	.727	3.826	87.309			
8	.657	3.459	90.768			
9	.608	3.198	93.966			
10	.414	2.178	96.144			
11	.332	1.747	97.891			
12	.161	.845	98.736			
13	.085	.448	99.185			
14	.072	.377	99.561			
15	.049	.258	99.819			
16	.020	.103	99.922			
17	.010	.053	99.975			

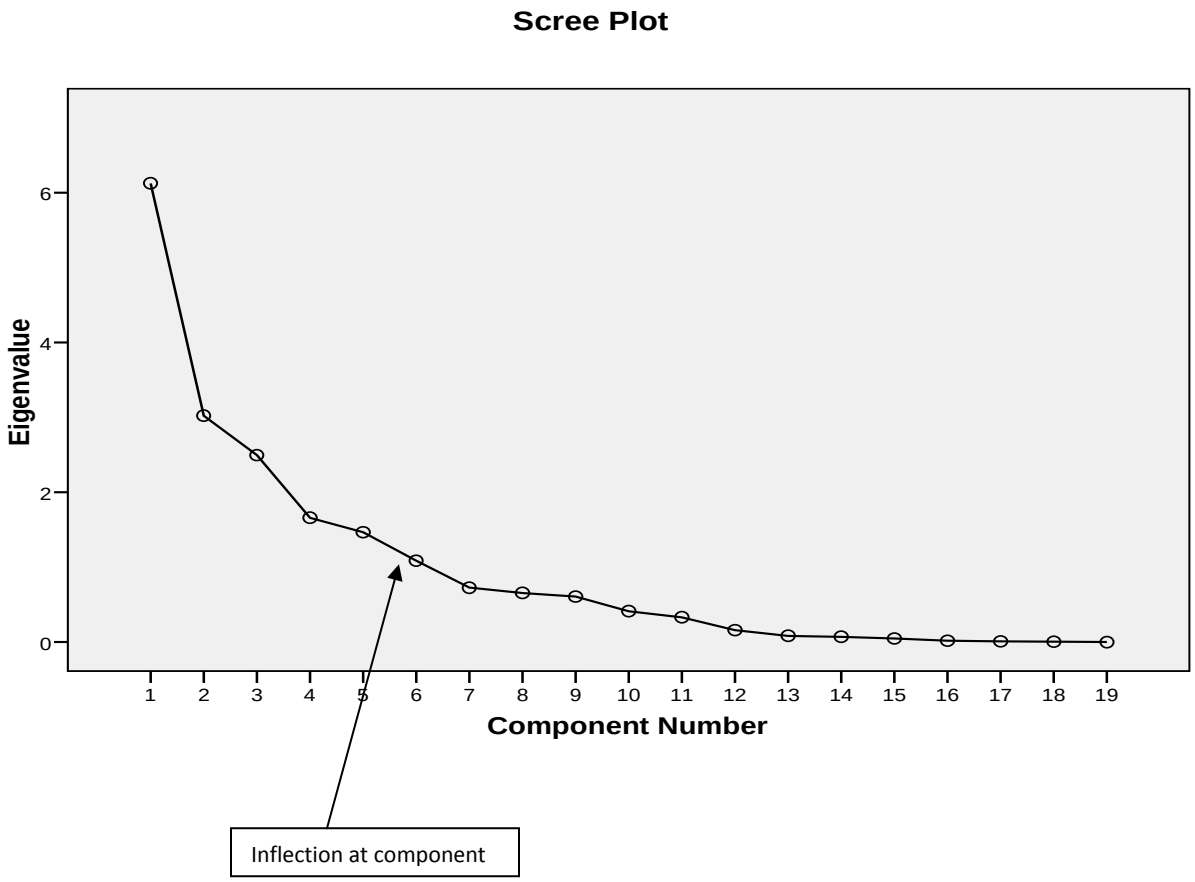
18	.004	.022	99.997			
19	.001	.003	100.000			

Extraction Method: Principal Component Analysis.

In running factor analysis not all factors are retained in the analysis. The eigenvalues associated with each factor represent the variance explained by that particular linear component and SPSS also displays the eigenvalues in terms of variance e.g. factor 1 explains 32.243% of variance. SPSS extracts all factors with eigenvalues greater than 1 thus leaving 6 factors which are displayed in the columns labeled *Extraction Sums of Squared Loadings*. The values which are not moved to the above column are discarded. The factors after rotation are displayed in the columns Rotation Sums of Squared Loadings. Rotation optimizes the factor structure thus the relative importance of the six factors is equalized.

This preliminary analysis therefore resulted in a solution of 6 factors selected for further analysis. In addition to eigenvalues analysis, a scree plot inspection can also give a useful insight to the relative importance of each factor.

Figure 12: Scree Plot



The cut off for selecting factors is at the inflexion point of the curve. As seen in the scree plot above, the inflexion point is at component 6 which agrees with the eigenvalues table above.

4.9 Factor Rotation

In order to make the interpretation of the factors that are considered relevant, the first selection step is generally followed by a rotation of the factors that were retained. This procedure simplifies the factor structure and therefore makes its interpretation easier and more reliable (i.e., easier to replicate with different data samples).

Normally researchers accept a loading of an absolute value of more than 0.3 to be important. Where the scale has an acceptable loading on more than one component, one of these loadings can be reduced to the component with the highest value.

Table 19: Rotated Component Matrix

Rotated Component Matrix(a)						
	Component					
	1	2	3	4	5	6
INFORMATION QUALITY1	-0.204	0.085	-0.090	0.167	0.835	-0.258
INFORMATION QUALITY2	0.404	0.011	0.062	0.555	0.107	0.530
INFORMATION QUALITY3	-0.255	0.062	-0.111	0.812	0.038	0.112
INFORMATION QUALITY4	0.787	-0.519	-0.147	0.099	0.065	-0.104
INFORMATION QUALITY5	0.937	-0.133	-0.178	-0.103	-0.112	-0.056
INFORMATION QUALITY6	0.729	-0.165	0.182	-0.234	-0.147	0.141
INFORMATION QUALITY7	-0.211	0.035	-0.125	-0.164	0.787	0.363
INFORMATION QUALITY8	-0.105	0.937	-0.077	0.161	-0.004	-0.084
INFORMATION	-0.118	0.941	-0.024	0.139	0.083	0.057

QUALITY9						
INFORMATION QUALITY10	-0.429	0.093	0.600	-0.215	0.131	-0.176
SYSTEM QUALITY1	-0.100	0.053	0.085	-0.007	-0.017	0.920
SYSTEM QUALITY2	0.275	-0.028	0.811	0.151	-0.211	0.093
SYSTEM QUALITY3	-0.292	0.335	0.660	-0.448	-0.083	0.099
SERVICE QUALITY1	-0.358	0.655	0.495	-0.049	0.129	0.241
SERVICE QUALITY2	0.926	-0.070	-0.102	-0.102	-0.228	0.020
SERVICE QUALITY3	0.869	-0.202	-0.060	0.090	0.041	-0.033
SERVICE QUALITY4	0.017	-0.211	-0.051	-0.842	0.052	0.116
SERVICE QUALITY5	0.010	-0.104	0.886	0.028	-0.078	0.061
AMS SUCCESS1	-0.055	0.387	-0.003	0.654	-0.067	0.460
AMS SUCCESS2	-0.087	0.508	-0.419	-0.124	-0.654	0.084

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 6 iterations.

4.9.1 Scale for factor rotation

Table 20: Scale for factor rotation

INFORMATION QUALITY1	The information provided by the information system accurate and free from errors
INFORMATION QUALITY2	It is easy to find what you were looking for
INFORMATION QUALITY3	The output of AMS information system complete
INFORMATION QUALITY4	The output information of AMS is secure
INFORMATION QUALITY5	Overally, I trust the AMS security measures
INFORMATION QUALITY6	AMS information system usually fulfills the commitments it assumes
INFORMATION QUALITY7	The output information of AMS is easy to understand
INFORMATION QUALITY8	It is easy to find what you're looking for when using the AMS information system
INFORMATION QUALITY9	AMS information system is available and flexible to use
INFORMATION QUALITY10	It is easy for me to become skilful at using the information system.
SYSTEM QUALITY1	The information system is up-to-date.

SYSTEM QUALITY2	The information system performs the order right the first time.
SYSTEM QUALITY3	Security privacy policies are accessible
SERVICE QUALITY1	The information system allows information to be readily accessible to me.
SERVICE QUALITY2	By using the functions of the information system, I can upgrade the efficiency of my work.
SERVICE QUALITY3	The information system provides customized operations.
SERVICE QUALITY4	The information received from the information system is adequate.
SERVICE QUALITY5	The information system performs the order right the first time.
AMS SUCCESS1	The frequency of use with the AMS services website system is high
AMS SUCCESS2	The AMS information system is concerned with the present and future interests of all its users in providing extension services to sugarcane farmers

4.9.2 Interpretation of the factors obtained

All the conceptual framework variables had loadings of more than 0.3 therefore all were supported by results of factor analysis. These variables include:

Independent variables

1. Information quality
2. System quality
3. Service quality

Dependent variable

AMS Success

4.10 Multiple Regression Analysis

Regression analysis is a statistic technique used to investigate the relationships between a dependent variable and one or more independent variables. Multiple linear regression is used in this study investigate the relationship between the AMS success and the three independent variables. Regression coefficients can be used to evaluate the strength of the relationship between the independent variable and the dependent variable.

Multiple regression analysis was used in this study to test the research hypothesis. The regression model can be presented as follows;

AMS Success=a+b1IQ+b2SYQ+b3SQ +e

Where

IQ=Information Quality

SYQ=System quality

SQ=System quality

a= the constant where regression intercepts the y axis

b= regression coefficients

e = random error

4.10.1 Assumptions for Regression Analysis and Analysis of Variance (ANOVA)

Before regression is carried out on any data sample, there has to be some sample characteristics which must be met. These assumptions are as below:

Condition index

Many researchers suggest condition indexes over 15 indicate possible Multicollinearity and over 30 indicate serious Multicollinearity problems.

Table 21: Condition index

Dependent Variable	Independent Variables	CI
AMS Success	Information quality	10.044
	System quality	17.887
	Service quality	15.814
AMS Success		
	Staff Training	6.387
	Information quality and Staff Training	10.314
	Management Support	
	Information quality and Management Support	11.838
AMS Success		

	User Involvement	9.202
	Management Support	6.02
	System quality and User Involvement	18.669
	System quality and Management Support	14.116
AMS Success		
	User Involvement	14.129
	Management Support	14.736
	Staff Training and	14.526
	Service quality and User Involvement	8.936
	Service quality and Management Support	4.344
	Service quality and Management Support	6.445

The maximum condition index for the sample was 18.669 thus suitable for regression analysis.

4.11 Tolerance

If the tolerance value is less than 0.20, the independent should be dropped from the analysis due to Multicollinearity.

Table 22: Tolerance

Dependent Variable	Independent Variables	Tolerance
AMS Success	Information quality	0.677
	System quality	0.636
	Service quality	0.350
AMS Success		
	Staff Training	1.000
	Information quality and Staff Training	0.783
	Management Support	
	Information quality and Management Support	0.798
AMS Success		
	User Involvement	0.996
	Management Support	1.000
	System quality and User Involvement	0.720
	System quality and Management Support	0.937
AMS Success		
	User Involvement	0.952

	Management Support	0.563
	Staff Training and	0.563
	Service quality and User Involvement	0.997
	Service quality and Management Support	0.634
	Service quality and Management Support	0.998

No value was less than 0.20 thus absence or minimal Multicollinearity

4.12 Variance Inflation Factor (VIF)

This is the reciprocal of tolerance. When VIF is greater than 4.0, Multicollinearity is the problem. The maximum VIF value for the sample was 2.856.

Table 23: Variance Inflation Factor

Dependent Variable	Independent Variables	VIF
AMS Success	Information quality	1.478
	System quality	1.583
	Service quality	2.856
AMS Success		
	Staff Training	1
	Information quality and Staff Training	1.321

	Management Support	
	Information quality and Management Support	1.299
AMS Success		
	User Involvement	1.004
	Management Support	1
	System quality and User Involvement	1.457
	System quality and Management Support	1.068
AMS Success		
	User Involvement	1.05
	Management Support	2.244
	Staff Training and	2.249
	Service quality and User Involvement	1.003
	Service quality and Management Support	0.701
	Service quality and Management Support	1.002

4.12.1 Absence of Outliers

This was tested by computing the Mahalanobis distance which did not show any extreme values.

Linearity

Examining the residual scatter is the most common way to identify any nonlinear patterns in the data. The scatter plot of standardized residuals versus the fitted values was visually inspected. The plots did not reveal any non linear patterns in the data indicating a linear relationship in all the regression models in this study. Refer to the appendix scatter plots

Normally distributed Error term

A histogram and a normal probability (P-P plot) are the methods to use to assess whether the error terms are normally distributed. This research tested normality using these two methods as shown in the appendix

Independent error terms (No autocorrelation)

Uncorrelated error term in a data set means the current values should not be correlated with previous values. I.e. for any two observations within the data series, it's assumed that knowing one observation treatment tells nothing about the other observation**.** Dubin-Watson coefficient tests auto-correlation. Durbin-Watson values should be between 1.5 and 2.5 to indicate independence of observations. Positive autocorrelation means standard errors of the beta coefficients are too small while negative autocorrelation means standard errors are too large.

Table 24: Independent error terms

Dependent Variable	**Independent Variables**	1.899
AMS Success	Information quality	1.243
	System quality	1.754
	Service quality	1.583
		1.928

AMS Success		2.1635
	Staff Training	1.784
	Information quality and Staff Training	1.935
	Management Support	1.7935
	Information quality and Management Support	1.175
AMS Success		1.92
	User Involvement	1.9875
	Management Support	1.501
	System quality and User Involvement	1.675
	System quality and Management Support	2.285
AMS Success		2.0665
	User Involvement	1.98895
	Management Support	1.899
	Staff Training and	1.243
	Service quality and User Involvement	1.754
	Service quality and Management Support	1.583
	Service quality and Management Support	1.928

4.13 Hypothesis Testing

4.13.1 Testing for Independent Variables

There are four independent variables, Information quality, System quality and service quality in the regression model. These factors were regressed against AMS success and provided the results in the table below.

Table 25: Coefficients (a,b)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	Std. Error	Beta		
Information Quality	0.218	0.121	0.041	0.919	0.127
System Quality	0.107	0.106	0.098	1.698	0.222
Service Quality	0.040	0.083	0.210	5.472	0.00

All independent variables obtained positive beta weights hence have positive effect on the success of AMS. Service quality had the most effect on AMS success (ß=0.210) followed by system quality (ß=0.098) then by Information quality (ß=0.041)

4.13.2 Testing Moderating Effects

With respect to interaction variables, the relationships are measured by Beta values, which represent the strength of the relationship. The Beta for the interaction of the moderator with the variable provides information regarding the interaction effect.

The Beta values should not be less than 0.1 and if they go beyond 1, there is a sign of Multicollinearity. The scale for Beta values is as follows:

- Less than 0.1 denotes lack of effect on the variable
- If the Beta value is between 0.1 and 0.3, there is small effect
- If the value is 0.3 and 0.50 there is a medium effect
- Above 0.50 denotes a large effect

Table 26: The moderating effect of User Involvement

	Beta	**Sig**
System quality* User Involvement	0.095	0.212
Service quality* User Involvement	0.144	0.025

User involvement has beta values of 0.095 on system quality, and 0.144 on service quality. User involvement only moderates service quality and not system quality since the beta value is less than 0.1.

Table 27: The moderating effect of Staff Training

	Beta	**Sig**
Information quality*Staff Training	0.076	0.201
Service quality*Staff Training	0.111	0.205

Staff training has beta values of 0.076 on information quality, and 0.111 on service quality. Staff training only moderates service quality and not information quality.

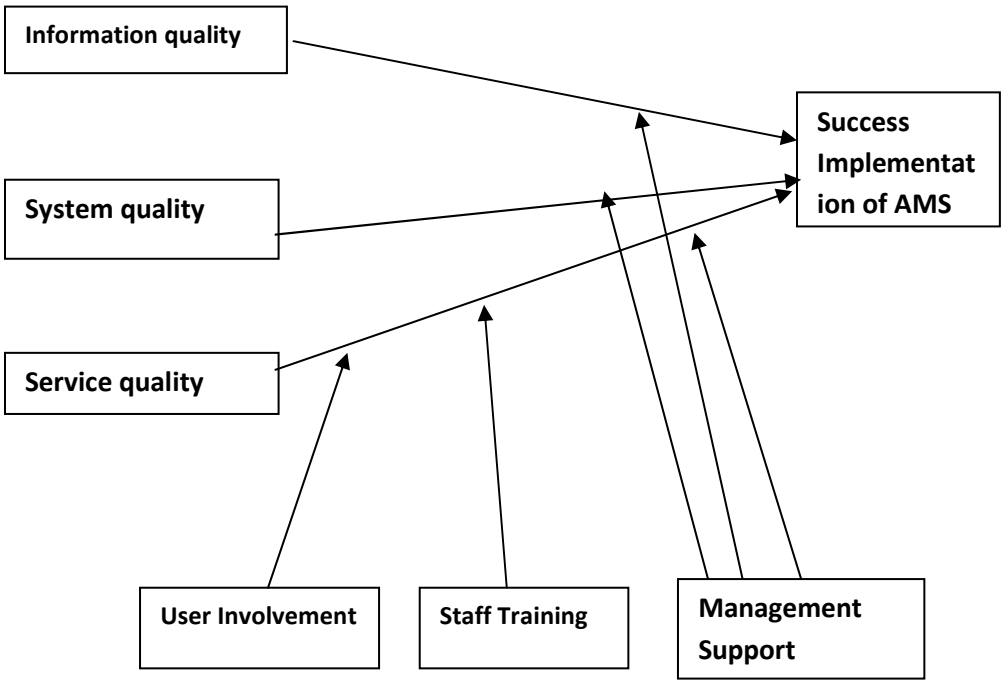
Table 28: The moderating effect of Management Support

	Beta	**Sig**
Information quality* Management Support	0.110	0.254
System quality* Management Support	0.124	0.169
Service quality* Management Support	0.135	0.002

Management Support has beta values of 0.110 on information quality, and 0.124 on system quality and 0.135 on service quality. Management support therefore has a moderating effect on all the three independent variables.

4.13.3 The resulting model

Figure 13: Resultant Model



4.13.4 Hypothesis Discussion

This research intended to test the following hypothesis

H1a: Information quality significantly affects Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H1b: The Information quality moderated by staff training significantly affects Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H1c: The information quality moderated by Management support plays a significant role in the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2a: The system quality significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2b: The system quality moderated by user involvement significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H2c: The system quality moderated by Management Support significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3a: The Service quality has a significant effect on the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3b: The service quality moderated by user involvement significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

H3c: The service quality moderated by staff training significantly affects the success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company

From the analyzed data, the following was realized:

For H1a: Information quality significantly affects Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H1b: The Information quality affects Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company but *it is not moderated by staff training*.

For H1c: The information quality moderated by Management support plays a significant role in the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H2a: The system quality significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H2b: The system quality significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company and *is not moderated by user involvement.*

For H2c: The system quality moderated by Management Support significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H3a: The Service quality has a significant effect on the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H3b: The Service quality moderated by user involvement significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company.

For H3c: The Service quality moderated by staff training significantly affects the Success of Agricultural Management Information system in providing extension services to sugarcane farmers at Mumias Sugar Company

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The objective that was to determine the model for evaluating the success of agricultural management information system in providing extension services to sugarcane farmers in rural areas of Kenya. The study found that majority of the respondents was male consisting a representation of 58% while women consisted of 42% of the respondents. It found that majority of the respondents (64.40%) had worked at the section for more than 11 years for sample of company employees while 60% had interacted with AMS products frequently for farmers group and that most of them were computer literate.

The study found that information quality, system quality and service quality affects the success of AMS.In addition Management support, staff training and user involvement moderates the success of AMS.

The study established that the success of AMS has been moderate because of lack of staff training, Management support and user involvement. The service quality of AMS is low because of lack of training, low management support and not involving the end user in the system

5.2 Conclusions

AMS has been of less impact as far as service quality is concerned. Management should involve end user, training and support the system at all times.

5.3 Recommendations

The management should encourage using of the AMS system and also invest heavily in training users. In addition users should be involved in the design and improvement of AMS system.

REFERENCES

Agarwal, R., and Prasad, J. (1997), The role of innovation characteristics and perceived, Voluntariness in the acceptance of information technologies: Decision Sciences, 28(3) pp. 557–580.

Alter, S. (2000). The Siamese Twin Problem: A Central Issue Ignored by Dimensions of Information Effectiveness. *Communication of AIS.* 2(20) pp.1-55.

Bailey, J.E., and Pearson, S.W, (1983)," Development of a tool for measuring and analyzing, Computer user satisfaction," Management Science, 29(5) pp. 530–545.

Brynjolfsson, E (1996), The contribution of information technology to consumer welfare. Information Systems Research, 7(3) pp. 281–300.

Clemons, E.K., and Row, M.C (1993), Limits to interfirm coordination through information Technology: Results of a field study in consumer goods packaging distribution, Journal of Management Information Systems Vol.10 No. 1, pp. 73–95.

Clemons, E.K.; Reddi, S.P.; and Row, M.C (Fall 1993), The impact of information technology on the organization of economic activity: The "move to the middle" hypothesis. Journal of Management Information Systems, Vol.10 No. 2, pp. 9–35.

C.R Kothari (2004), Research Methodology: Methods and Techniques, New Age international.

D'Ambra, J., and Rice R.E (2001), Emerging factors in user evaluation of the World Wide Web. Information & Management Vol. 3 No. 6, pp. 373–384.

DeLone, W.H., and McLean, E.R (1992), Information systems success: The quest for the dependent Variable. Information Systems Research, Vol.3 No. 1, pp.60–95.

DeLone, W.H and McLean, E.R (2003). The Delone and McLean model of Information systems success: A ten-year update. *Journal of Information Systems Management* Vol.19 No.4 pp. 9-26.

Doll, W.J., and Torkzadeh, G (1998), Developing a multidimensional measure of systems use in an organizational context. Information & Management Vol (33) No. 4 pp. 171–185.

Etezadi-Amoli, J., and Farhoomand, A.F, (1996), A structural model of end user computing satisfaction and user performance: Information & Management Vol.30 No. 2 pp. 65–73.

Garrity and Sanders, (1998), Paper submitted on business and economics at 6th Global conference at Gutman USA pp.14

Gable, G.G., Sedera, D. and Chan, T. (2008). Re-conceptualizing information system success: the IS-impact measurement model. Journal of the Association for Information Systems, Vol.9 No.7 pp., 377-408.

Ishman, M. (1998). Measuring Information Success at the individual level in cross-cultural Environments. *In* E.J. Garrity and G.L, Sanders (dir), *Information Systems Success Measurement*. Idea Group Publishing.

Mugenda, O.M and Mugenda, A.G. (2003), Research Methods: Quantitative and qualitative approaches. Nairobi Acts Press

Mugenda, O.M and Mugenda (1999), Research Methods: Quantitative and qualitative approaches. Nairobi Acts Press.

Markus, M.L and Tanis, C. (2000). The Enterprise System Experience – From Adoption to Success. *In* R. Zmud (dir.), *Framing the Domain of IT Management* (p. 173-207). Pinnaflex.

P.K Kanellis, M Lycen, RJ Paul (1998), An interactive approach to the measurement of information systems Success from concept to practical application. A journal of information systems measurement pp.133-151.

Rogers, E.M. (1995). *Diffusion of innovations (4th edition)*. The Free Press. New York

Seddon, P. B. Staples, D. S., Patnayakun, R., and Bowtell, M. J. (1999), The dimension of information system success. Journal for the Communication of the Association for Information Systems, Vol. 2 Article 20.

Seddon, P. B. and Kiew, M.-Y. (1994). A Partial Test and Development of the DeLone and McLean Model of IS Success, Proceedings of the 15th International Conference on Information Systems (ICIS 94), December 14-17, Vancouver, Canada.

Seddon, P. B. (1997). A Respecification and Extension of the DeLone and McLean Model of IS Success, Information Systems Research, Vol.8 No.3 pp. 240-253.

Shing-Kao, L. (1997). A study of National Culture versus Corporate Culture in International Management. *Dissertation abstract international*, Nova South-eastern University.pp.13

Taylor, Shirley, and Peter A. Todd (1995), "Understanding Information Technology Usage: A Test of Competing Models", Information Systems Research Vol. 6 pp.144-176.

Venkatesh, V (2000). Determinants of Perceived Ease of Use: Integrating Perceived Behavioral Control, Computer Anxiety and Enjoyment into the Technology Acceptance Model, *Information Systems Research*, Vol. 11 pp.342-365.

Venkatesh, V., Morris, M.G., Davis, F.D., and Davis, G.B (2003). User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* Vol. 27, pp. 425-478.

APPENDIX 1: QUESTIONNAIRE (Employees Questionnaire)

AMS SUCCESS AND IMPLEMENTATION QUESTIONNAIRE

My name is Johnson Matete, a student at the University of Nairobi School of computing and informatics pursuing Master degree in information Systems. Currently I'm engaged on a research project titled**: A model for the evaluation of the success of agricultural Management information system in providing agricultural extension services to sugarcane farmers in rural areas of Kenya. A case of mumias Sugar Company.** The main purpose of this study is to establish the level at which Agricultural Information system has been used to provide extension services to farmers.

This Questionnaire is subdivided into 4 sections namely: Respondent's Demographics, Information Quality, System Quality, and service Quality.

Instructions

- This information is confidential and will only be used for the sole purpose of this study
- Writing of your name is optional
- Please indicate the appropriate option by a tick (✓
- Kindly respond to all items

Section A: Demographics

1. Your Name…… (Optional)

2 .Gender: Male [ ] Female [ ]

3. Highest academic Qualifications: Master [ ] Bachelor [] Diploma [ ] Certificate [ ] other

4. What is your profession……

5. Please indicate your age……

6. Which Section do you work in: Please write.....?

7. What is your designation? /rank…….

8. Number of years you've worked in this section……

9. Do you have computer skills Yes [ ] No [ ]

If yes how do you rate them (a) Very poor [ ] (b) Poor [ ] (c) Fair [ ] (d) Good [ ]

10. Are you a user of Agricultural information system…….?

11. Please gauge your level of usage of AMS:

Above 90% [ ], Between 70-89% [ ] Between 60-69%, [ ] Between 50-59%, [ ] Between 45-49%, [ ] Below 45%, [ ]

12. According to your knowledge, to what extent do you agree with each of the following statements that relate to your daily usage of Agricultural Management Information System (AMS)? *Please respond by clicking on the box besides the question.*

Section B: Information Quality

This section deals with rating the information quality of AMS in providing extension services to sugarcane farmers, for example in reports and on-screen.

According to your knowledge, to what extent do you agree with each of the following statements that relate to your daily usage of Agricultural Management Information System (AMS)? *Please respond by clicking on the box besides the question.*

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	Level of Agreement				
	5	4	3	2	1
Accuracy					
Is the information provided by the information system accurate and					

free from errors					
Is the information system provides the precise information I need					
Availability					
Is it easy to find what you were looking for?					
Do an AMS allow information to be readily accessible to me?					
Completeness					
Is the output of AMS information system complete?					
Does AMS information system provide information precisely according to my need?					
Security					
Is the output information of AMS secure?					
Overally, do you trust the AMS security measures?					
Does the AMS information system usually fulfill the commitments it assumes?					
Are the AMS Security privacy policies accessible?					
Understandability					
Is the output information of AMS easy to understand?					
Is it easy to find what you're looking for when using the AMS information system?					

Do you find the AMS information system available and flexible to be used?					
Management Support					
The management encourages using the system and appreciates the optimal use of the system to meet its goal.					
The management discusses problems regarding the information quality and provides all necessary resources to improve it.					
Training					
The organization offers training programs regarding AMS information system application and quality					
Training material is available during training					

Section – B: System Quality

This section deals with rating the quality of AMS information system in providing extension services to sugarcane farmers. This section will tend to Measure the success of AMS from a technical and design perspective.

Please indicate by ticking in box that best describes your level of agreement or disagreement in the below stated questions:

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	**Agreements**				
	5	4	3	2	1
Adaptability					
It is easy for me to become skilful at using the information system.					

I find the information system easy to use.					
Maintainability					
The information system is up- to-date.					
The information system is easy to maintain.					
Reliability					
The information system performs the order right the first time.					
Relevant order confirmation details are sent to the user.					
Trust					
The information system usually fulfils the cor					
Security privacy policies are accessible					
User Involvement					
I m involved in input design					
I m Involved in output design					
What is your general attitude of the AMS					
System quality?					
Management Support					
The management encourages using the system and appreciates the optimal use of the system to meet its goal.					
The management discusses problems regarding the system quality and provides all necessary resources to improve it.					

Section C: Service Quality

This section measures how well the service level of AMS delivered matches customer expectations. The section will also find out whether User involvement, staff training and Management Support affects AMS delivery of service to customers.

Please indicate by a number that best describe your level of agreement with the following statements

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	**Ag Reements**				
	5	4	3	2	1
Availability					
It was easy to find what you were looking for.					
The information system allows information to be readily accessible to me.					
Efficiency					
Using information system in my job would enable me to accomplish tasks more quickly					
By using the functions of the information system, I can upgrade the efficiency of my work.					
Functionality					
The information system in use is always up to date.					
The information system provides customized operations.					
Integrity					
The information received from the information system is adequate.					
It is easy for me to fine find out and get the desired information.					

Reliability					
The information system performs the order right the first time.					
Relevant order confirmation details are sent to the user.					
User Involvement					
I m involved in the improvement of AMS service delivery					
I m involved in input design					
Management Support					
Management encourages participates in the improvement of service of AMS					
Management has programs that enhance quality service quality of AMS.					
Management discusses problems regarding the service quality and provides necessary resources to improve it.					

Section D: AMS Success and Implementation

This section gauges respondents their perception on the overall success of AMS as compared to its initial objectives. The initial objectives were to satisfy users, improved perceived usefulness where users perceive the AMS system as being useful and perceived ease of us where users (participants) perceive the system as easy to use.

D (1) Evaluating the Perceived Usefulness of AMS in providing extension services to farmers.

This section measure the individual's perception that use of AMS will improve performance.

Please indicate with a number to what level you agree with the following: 5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) strongly Disagree:

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	Level of Agreement				
	5	4	3	2	1
Performance					
Using AMS will improve performance on the job as far as provision extension services to farmers is concerned					
Effectiveness					
The functions of the AMS information system can easily be used to work in providing extension services to farmers					
Productivity					
AMS system can be used to improve productivity					
Risks Perception					
AMS System takes into account the repercussions that their actions could have on users.					
Trust					
The AMS information system fulfils the commitment it assumes.					

D (2) Evaluating the Perceived Eases of use of AMS in providing extension services to farmers.

This section measure the degree to which an individual believes that learning to adopt AMS requires little effort.

Please indicate with a number to what level you agree with the following: 5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) strongly Disagree

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	**Level of Agreement**				
	5	4	3	2	1
Easy to learn					
Learning to operate and AMS system is easy for me					
Learning to interact with AMS is easy for me					
Easy to manage					
I find it easy to get the AMS information system to do what I want it do in providing extensions services to sugarcane farmers					
Self Efficacy					
It is easy for me to become skillfully by using the AMS system					
The AMS system is characterized by frankness and clarity of services it offers to users					
Compatibility					

AMS information system contains necessary topics to complete all related works that pertains to provision of extension services to sugarcane farmers in Mumias sugar					
The information provided by AMS is sufficient					

D (3) User satisfaction of using AMS in providing extension services to farmers

This section measures the overall effective response to a perceived discrepancy between prior expectations and perceived performance of AMS after usage.

Please indicate a number that best describe your level of agreement or disagreement in regard to the following questions by numbers,

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree -- - (1) strongly disagree

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	**Level of Agreement**				
	5	4	3	2	1
Self efficacy					
The AMS information system is characterized by frankness and clarity of the services that it offers to the users					
Repeat visits					
The frequency of use with system is high					
Perceived risks					
The AMS information system is concerned with the present and future interests of all its users in providing extension services to sugarcane					

farmers					
Enjoyment					
The use of information system is enjoyable and interesting					

Do you have any comments in regard to this interview……?

Thank you so much for taking this time to respond to this interview. The information provided will be kept confidential and used as stated above.

Thank you

APPENDIX II: QUESTIONNAIRE (Farmers Questionnaire)

AMS SUCCESS AND IMPLEMENTATION QUESTIONNAIRE

My name is Johnson Matete, a student at the University of Nairobi School of computing and informatics pursuing Master degree in information Systems. Currently I'm engaged on a research project titled**: A model for the evaluation of the success of agricultural Management information system in providing agricultural extension services to sugarcane farmers in rural areas of Kenya. A case of mumias Sugar Company.** The main purpose of this study is to establish the level at which Agricultural Information system has been used to provide extension services to farmers.

This Questionnaire is subdivided into 2 sections namely: Respondent's Demographics and service Quality.

Instructions

- This information is confidential and will only be used for the sole purpose of this study
- Writing of your name is optional
- Please indicate the appropriate option by a tick (✓
- Kindly respond to all items

Section A: Demographics

1. Your Name…… (Optional)

2 .Gender: Male [ ] Female [ ]

3. Highest academic Qualifications: Master [ ] Bachelor [] Diploma [ ] Certificate [ ] other

4. What is your profession……

5. Please indicate your age……

6. Which sugarcane growing zone do you live: Please write.....?

7. How many hectares of sugarcane do you plant?…….

8. Number of years you've been a sugarcane farmer……

9. Do you have computer skills? Yes [ ] No [ ]

10. Is any member of your family have computer skills? Yes [ ] No [ ]

11. If yes how do you rate them (a) Poor [ ] (b) Fair [ ] (c) Good [ ]

12. Please enumerate the extension services you receive from Mumias Sugar Company in regard to sugarcane farming:

i. ……

ii. ……

iii. ……

iv. ……

v. ……

vi. ……

vii. ……

viii. ……

ix. ……

x. ……

Please continue to section B

Section B: Service Quality

This section measures how well the service level of AMS delivered matches customer expectations.

Please indicate by a number that best describe your level of agreement with the following statements regards the quality of service you receive from Mumias Sugar Company in regard to the above mentioned extension services.

5): Strongly agree - (4) Agree – (3) Average – (2) Disagree – (1) Strongly disagree	**Agreements**				
	5	4	3	2	1
Efficiency					
There are no delays in delivery of services from the company					
Am able to meet my deadlines because I get served within the time stipulated.					
Accuracy					
Information regarding the services I receive from the company is accurate					
Any discrepancy in delivery in the services is comprehensively addressed with the company to my satisfaction					
Quality					
The services I receive from the company serve me as expected.					
All the services I received from the company are of the right standard.					
Integrity					
There are no mischief among the staff serving me in the company					
The staff are well trained on their job and hence serve me professionally					

Reliability					
The services I receive are dependable and meet the intended purpose.					
I cannot compare the services I receive from this company with others elsewhere because they are above board..					

Give comments on you general perception on the quality of service received from Mumias Sugar Company as far as extension services are concerned

……
……
……
……
……

Thank you for Cooperation