2015

Enhancing DeLone & McLean model to improve effectiveness of academic management systems: case of Strathmore University

Danny Ronald Nyatuka
Faculty of Information Technology (FIT)
Strathmore University

Enhancing DeLone & McLean Model to Improve Effectiveness of Academic Management Systems: Case of Strathmore University

Nyatuka Danny Ronald
079127

Dissertation submitted in partial fulfillment of the requirements of the Degree of Master of Science in Computer-Based Information Systems (MSc.IS)

Faculty of Information Technology

Strathmore University

Nairobi, Kenya

March, 2015

Declaration

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, this work contains no material previously published or written by another person except where due reference is made in the dissertation itself.

…….. ……..

Danny Ronald Nyatuka **Date**

Admission No. 79127

APPROVAL

This dissertation was reviewed and approved for purposes of examination by:

……..... **……..**

Prof. Vitalis Otieno-Onyango **Date**

Centre for Applied Research in Mathematical

Sciences (CARMS), Strathmore University

Dean, School of Graduate Studies

Abstract

The massive investment in Information and Communication Technologies (ICTs) witnessed in higher education institutions (HEIs) in the recent past has led to constrained budgets. As a result, the relevant authorities now demand for accountability on performance of these investments from managers. Consequently, this situation has prompted the need for appropriate tools to measure the effectiveness of these investments however; evidence from literature has indicated a paucity of academic (or formal) ICT evaluation research in the higher education (HE) sector.

Being unexceptional to the aforementioned issues, Strathmore University (SU) is faced with similar challenges. According to SU Internal Audit Report of 2014, risk-based internal IT audits were being used in evaluating its Academic Management System (AMS). However, this approach has been considered insufficient since it is faced with several limitations hence could not measure the system's effectiveness exhaustively to facilitate appropriate corrective action. More so, SU management has recognized AMS among platforms to be used in strengthening institutional capacity to implement the University's strategic plan 2015/2015.The aim of this study therefore, was to enhance DeLone & McLean model in SU context to improve the effectiveness of AMS, towards achieving the University goals. A case study approach was adopted whereby 3 senior staff were interviewed while online surveys were used to collect data from a total sample population of 311 respondents, who were users of AMS from within SU community. An enhanced version of D&M model was developed in SU context to improve the effectiveness of AMS. The new model incorporates the theory of formative continuous participative evaluation (formative CPE), which provides guidelines for implementing the new model.

Abbreviations/Acronyms

AMS -Academic Management System

BPM -Business Performance Management

CAO -Central Admissions Office

CPA -Public Certified Accountant

D&M Model -DeLone & McLean Model

ERP -Enterprise Resource Planning

HE -Higher education

HEI -Higher Education Institution

CPE -Continuous Participative Evaluation

FIT -Faculty of Information Technology

ICT -Information and Communication Technology

IOT -Institute of Technology

IS -Information System

IS Success -Information System Success

IT -Information Technology

MIS -Management Information System

PDF -Portable Document Format

PC -Personal Computer

SFAE -School of Finance and Applied Economics

SU -Strathmore University

SUMMS -Strathmore University Management and Monitoring System

Definition of Terms

Formative CPE	Refers to "the involvement and participation of stakeholders in continuous evaluation sessions of information system(s) as well as the subsequent decision making process concerning a project for continuous improvement" (Remenyi and Sherwood-Smith, 1999).
IS success	Refers to "a combination of factors necessary for the physical installation of a system within the organization and acts as the foremost conditions for system success, which refers not to merely having the system in place but also its efficient and effective utilization to achieve organizational goals" (Tan & Pan, 2002).
Internal audit	Refers to "the provision of independent assurance that an organization's risk management, governance and internal control processes are operating effectively" (Chartered Institute of Internal Auditors, 2014).

List of Figures

List of Tables

Table of Contents

Acknowledgements

This dissertation would not have been possible without the guidance and help from several individuals who, in one way or another contributed and extended their valuable assistance during its preparation.

First and foremost, my deepest gratitude to Prof. Vitalis Onyango-Otieno, my supervisor and Dr. Ismail Ateya who have been so much helpful in their guidance and direction in the preparation of this work.

Secondly, my special thanks go to my employer, Strathmore University for granting me financial support to undertake this study and giving me some days off to complete this work.

Thirdly, my staff colleagues for understanding my situation thus standing in for me while I was off duty to complete this work.

Lastly but not least, my utmost gratitude goes to my family especially my wife, Gladys, our daughter, Patience and my mother, Pauline for their moral and material support during the preparation of this work.

Dedication

To the Almighty God, who has promised me that I can do all things through Christ who strengthens me (Philippians 4:13) and that with God nothing shall be impossible (Luke 1:37)

To my daughter, Patience and my wife, Gladys who understood my situation and gave me moral support and encouragement during the preparation of this work.

Lastly, to my mother, Pauline who has been an encouragement and has continued to pray for me throughout this journey.

Chapter 1: Introduction

1.1 Background

Higher education institutions (HEIs) have increasingly continued to adopt Information and Communication Technologies (ICT) to automate and integrate their business processes, in search of operational efficiency and competitiveness, a phenomena witnessed all over the world today (Nizamani *et al*, 2013; Kalema *et al*, 2014). This is due to increased student enrolment, fear of competition and economic challenges hence the need to leverage ICT power (Petter, DeLone &McLean, 2008). As a matter of fact, universities are now investing in ICT in order to enhance the achievement of their strategic goals (Ujunju, Wanyembi & Wabwoba, 2012; Phahlane & Kikwaletswe, 2014). More so, the higher education (HE) environment is increasingly becoming dynamic hence the quest by universities to increase ICT investment, particularly in the area of Academic Management in order to effectively integrate and manage academic activities; education being their core business (Kanaracus, 2008; Makokha, Musiega & Juma, 2013).

This has accelerated the adoption of Academic Management Systems (AMS) in HEIs in particular. According to Hassan *et al*.(2010), the main function(s) of an AMS is to assist universities manage their business processes and data including student recruitment, admissions, course syllabus management, registration, finance, examinations among other academic and administrative functions. Sevilla and Shabaya (2007) testify that ICT does play a major role in the day to day operations of universities whereby customers including potential students, current students, lecturers, sponsors and suppliers are demanding for more accurate and faster information, hence the need to capitalize on capabilities of ICT. Various studies have pointed out several benefits

associated with effective use of AMS which include, integration and seamless data flows and business processes, improved internal efficiency of workflow, enhanced information control and management, enhanced organization's future planning, enhanced capacity for data processing, storage and improved service delivery among others (Kalema *et al*. 2014; Carcary *et al.*, 2007; Nizamani *et al*., 2013). In an effort towards achieving this end, university budgets have exponentially expanded in the recent past, following the quest to capitalize on ICT capabilities. Due to the enormous expenditures incurred on these investments, authorities now demand for accountability on performance of these investments from managers, hence the need to know the returns on investment (Remenyi & Sherwood-Smith, 1999; Petter *et al*, 2008; Xia *et al*., 2010; Phahlane & Kekwaletswe, 2014). This therefore calls for the need to evaluate ICT investments in order to determine their effectiveness towards achieving organizational goals.

According to Lin *et al*, 2006, the concept "information system (IS) success" refers to the evaluation of information systems. Tan and Pan (2002) defines IS success as "a combination of factors necessary for the physical installation of a system within the organization and acts as the foremost conditions for system success, which refers not to merely having the system in place but also its efficient and effective utilization to achieve organizational goals". In the effort to determine the effectiveness of its IT systems in supporting business operations, Strathmore University (SU) uses risk-based internal IT audits. Unfortunately, this approach is characterized by several challenges that compromise the independence and objectivity of the audit process (KPMG, 2014; Kaplan Financial, 2012). More so, Carcary (2009, 2010) assert that there is a paucity of formal ICT evaluation literature in the HE sector, whereby the concept of "business performance management (BPM)"is not well understood. This is attributed to the perception that education is not for profit making (Day & Bobeva, 2006).The effort by researchers in the IS community to come up with a

comprehensive framework to define and identify a dependent variable has remained a challenge (Sherkey *et al,* 2010). After conducting an extensive literature review on factors used in IS success literature, DeLone and McLean (1992, 2003) came up with a comprehensive model to measure IS success. The model includes six dimensions of success which include system quality, information quality, service quality, system use, user satisfaction and benefits (IS success). In this case therefore, an AMS is considered as a type of information system hence the attempt to provide an application of D&M model to evaluate AMS in SU context.

1.2 The Genesis of AMS in SU

In an effort to improve operational efficiency in managing its professional courses, SU developed an in-house system (FoxPro) in 1996 to support its operations for professional courses administration particularly to manage students' personal data, admissions, course enrollment, fees payment, examinations, mentorship, and sponsors among others. However, following the introduction of degree programs in 2001 at the university, the legacy system (FoxPro) became inefficient hence MS Access system was adopted in managing the degree programs while Microsoft (MS) Excel was used to handle data that was not managed by either of the systems. It is against this background that the SU management began the search for an AMS which was eventually implemented in the year 2005.The system is among the seven sub-systems initially proposed for the development of an ERP system under the "University Management and Monitoring System (SUMMS) project" that would meet the institution's needs in-line with its ICT strategic plan of 2005/2010 (Sevilla & Shabaya, 2007).The selected system was in use at University of Navarra Spain, Europe. The reason for its selection was that the academic processes in the Spanish system were similar to those at SU hence it would be easier to customize the system

locally. Carcary *et al.* (2007) argue that in order to meet specific student needs adequately, an automated integrated Student Management Information System (MIS) is necessary to improve operational efficiency.

Figure 1.1 is an overview of the initially proposed SU ERP system project (SUMMS) with 7 main subsystems intended to meet the requirements of the University, whereby the AMS was at the heart of this initiative.

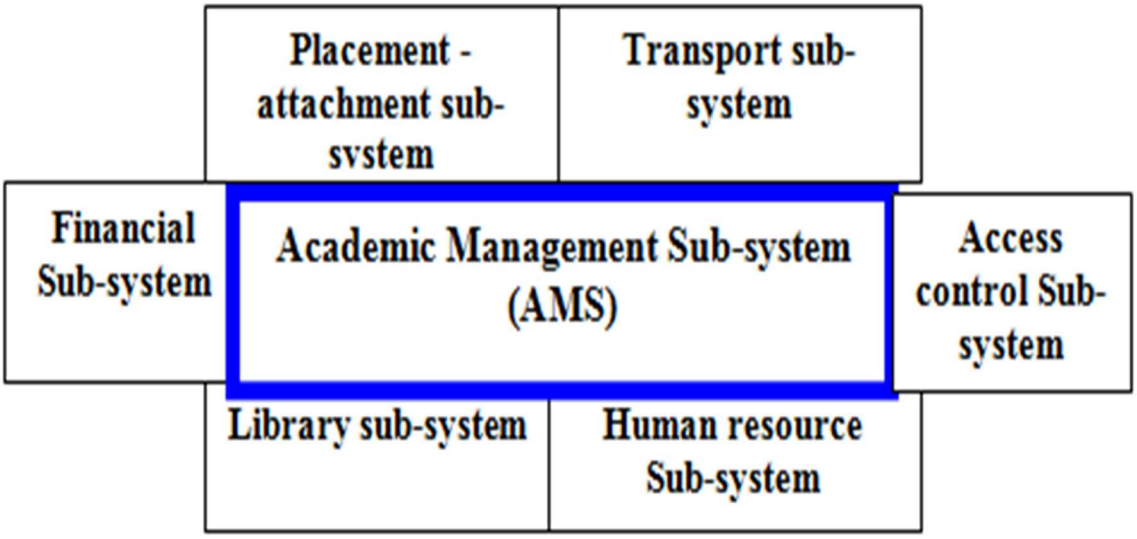

Figure 1.1: The proposed SUMMS ERP project (Sevilla & Shabaya, 2007)

1.2.1 Structure and accessibility of the system

The system is web enabled whereby users interact with it through web browsers installed on Personal Computers (PCs). Reports are generated using either MS Excel or Portable Document Format (PDF) formats hence in order for users to do this their PCs must have appropriate software capable of reading these formats. Users can access the system from links in the university intranet

which is located at http://sagana. All modules are currently accessible only from within the university campus for security reasons except the student module which can be accessed remotely. The system is divided into 7 distinct modules mapped into various academic management functions of the university which include the following: admissions module, academic planning module, finance module, examinations module, mentoring services module, lecturers' module and the student module.

1.2.2 Challenges experienced by in SU prior to implementing AMS

The following are challenges that the university faced prior to implementation of the AMS (Sevilla & Shabaya, 2007):

a) There were three systems used at the same time to capture students' data. The FoxPro System was used to capture data for professional students, Microsoft (MS) Access system for degree students and MS Excel for data that was not handled by either system. This posed a big challenge on integration of data as it resulted in duplication of effort and un-reconciled records.
b) Due to the nature of systems used then, information could be easily lost, which resulted in some information missing when needed, thus embarking on the manual database for extraction of data whenever necessary.
c) There was no confidence in the systems due to many cases of data corruption. Therefore data lacked integrity hence the need to maintain manual records in case it occurred.
d) There was no strong-end database management system to support FoxPro and MS Access, which could not handle large amounts of data as well as security levels required for managing student examinations in particular.
e) There were cases of records duplication whereby student's data was captured all over again whenever a student enrolled for another course. This resulted in duplication of students' data

in the system leading to issuance of multiple student identity (ID) cards. This also complicated debt management due to the use of both FoxPro System and the Pastel Accounting System that were being used then.

f) The reports available from the systems were not accurate as they had limited information to facilitate informed decision making by management.

g) The FoxPro system captured student billing and payments information and exported this data into the Pastel System, a process which was tedious and time consuming with several problems.

h) Lack of efficient management of student records led to difficulties in controlling the business processes of the University including fees and debt management thus hindering revenue collection which led to the university losing money.

i) The unavailability of an appropriate management information system led to inefficient management processes and frustrations to the university management.

1.2.3 The aim of implementing AMS in SU

The overall aim of the AMS was to effectively and efficiently manage all information on students, academic programs, professional programs and resources in an integrated manner as well as supporting efficient academic processes (Strathmore University, 2004).Specific objectives were:

(i) Ensure effective and integrated management of all information related to academic records and student billing.

(ii) Ensure effective and integrated management of all information related to academic and professional programs offered at the University.

(iii) Maintenance of up to date information on resources available for the delivery of academic and professional programs including lecturers, lecture rooms and labs.

(iv) Enable efficient processes related to the entire student life cycle including recruitment, admissions, enrolment, billing, class attendance, activities, examinations, graduation and entry into Alumni.

1.3 Problem Statement

Despite universities investing massively in ICTs, the effectiveness of the investment is sometimes questionable because not all factors that contribute to information systems (IS) effectiveness are accounted for. Among these factors include system quality, information quality, service quality, system use, user satisfaction and benefits (DeLone & McLean, 2003). Phahlane and Kekwaletswe (2014) argue that this situation has resulted to demands by the relevant authorities for accountability from managers; a situation which has accelerated the need for appropriate ICT evaluation tools in organizations. Carcary (2010) assert that there is a paucity of academic (or formal) ICT evaluation research in the higher education sector. This has prompted emergence of a scenario whereby the concept of "business performance management (BPM)" is not well understood; the education sector being perceived as not for profit making (Day & Bobeva, 2006).

Being unexceptional to the aforementioned challenges, Strathmore University (SU) faces similar challenges. According to the University's internal audit report released by KPMG (2014), SU used risk-based internal audit in evaluating its Academic Management System (AMS). However, this method alone was considered inadequate since it is characterized by several challenges, which hinder achievement of organizational success (Kaplan Financial, 2012). Among these challenges include the threat to independence and objectivity of internal auditors to report fraud and errors

freely to relevant authorities. This is occasioned by the fact that internal auditors are employees of these organizations hence the temptation to succumb to fear of internal conflicts thus compromising transparency (Stewart & Subramaniam, 2010). Secondly, informal policies and procedures are used, which are tied to organizational culture and values hence may not be objective (Management Development Corporation, 2011). Thirdly, business owners and employees sometimes learn organizational control systems while they work; thus leading to difficult management situations whereby compliance to internal controls is compromised. Fourthly, IT audit approach only focus on system functionality and security aspects whereby auditors look at confidentiality, integrity and availability of information, while it ignores important aspects of IS evaluation like stakeholder involvement, usability and user satisfaction hence not objective (Fatshul & Namroush, 2006).

Apparently, SU management has recognized AMS as one of the platforms to be used in strengthening institutional capacity to implement the University strategic plan 2015/2015 in order to achieve its strategic goals. During this period, the University intends to engage stakeholders' participation in assessing organizational performance for continuous improvement (Strathmore University, 2014). Under the circumstances therefore, the IT audit approach alone is not sufficient to enable management to effectively detect deviations in AMS in order to take corrective action, which is critical towards realizing organizational goals. Therefore, there is need for a comprehensive, separate evaluation approach for AMS to supplement existing tools to help in critical decision making.

It's against this understanding of the context and direction the University is taking that this research was proposed. The aim of the study is to enhance DeLone & McLean model (D&M Model) in SU

context to improve the effectiveness of AMS; within the framework of formative continuous participation evaluation (Formative CPE).

1.4 Research Objectives

The main objective of this study is to propose enhancement of D&M model to improve the effectiveness of AMS as a case study of Strathmore University.

The following are specific objectives of the study:

(i) To investigate existing IS evaluation models/frameworks and tools used in SU

(ii) To establish the challenges experienced in evaluating AMS in SU

(iii) To propose enhancement of D&M model in SU context to evaluate AMS in order to supplement existing tools

(iv) To validate the new model

1.5 Research Questions

(i) What are the existing IS evaluation models/frameworks and tools used in SU?

(ii) What challenges are experienced in evaluating AMS in SU?

(iii) How can D&M model be enhanced in SU context to evaluate AMS in order to supplement existing tools?

(iv) How can the new model be applied in SU context?

1.6 Justification

SU uses audits to measure the effectiveness of the AMS, which is ineffective since it only focuses on compliance with internal controls. Therefore, the full value of the system is not yet understood since many aspects of system evaluation are ignored, despite a few benefits that may have been

realized through use of the system. More so, the University identified AMS as one of the pillars for strengthening institutional capacity to implement its strategic plan 2015/2015, hence the need to conduct this study (Strathmore University, 2014).

Evidence from literature has shown that there is a paucity of academic ICT evaluation literature in the HE sector. However, ICT evaluation is still an essential requirement to enable HEIs managements to determine the value of ICT-based investments in relation to the achievement of intended business goals; and to facilitate proactive remedial action hence the need for more research (Carcary, 2008).

Organizations' investment in ICT continues to expand in search of competitiveness hence the need for accountability. For instance in the year 1998, the ICT budget in the developed world was more than 50% of organizations annual investments while the investment was anticipated to account for 5% of revenues by the year 2010 (Avison *et al*, 1999). Therefore, there is need to put in place mechanisms to help monitor and valuate business investment performance for appropriate decision making.

ICT investment is done in the quest for increased competitive advantage (Piccoli & Ives, 2005); while at the same time it's viewed as a strategic enabler and tool to impart positive organizational change (Gregor *et al.*, 2006). Therefore, there is need for checks and balances to facilitate continuous improvement to ensure that expected investment performance goals are achieved.

1.7 Scope

This study focused on investigating the challenges hindering the effectiveness of AMS in SU, which encompassed seven modules handling various business processes of the University in order

to come up with an appropriate solution. These included the Admissions module, Academic planning, Finance, Mentoring, Examinations, Lecturers and the Student modules. The study proposed enhancement of D&M success model in SU context to improve the effectiveness of AMS. The output of the research was focused on the SU environment, which was not necessarily similar to other universities.

To the best of the researcher's knowledge, SU was among the first universities in Kenya both public and private, to implement an AMS. The researcher's assumption was that SU as an institution and community as a whole had substantial experience of the system hence would provide valid feedback to inform the study accordingly and therefore the reason the institution was selected for purposes of this study.

1.8 Limitations

There was the challenge of getting retrospective feedback from respondents based on past experiences however; the researcher used triangulation method, which involved use of both interviews and surveys in order to compare the responses. Another challenge was non-cooperation from some of the potential respondents due to suspicion and fear for victimization, which was a challenge since participation in the study was voluntary whereas their contribution was critical to this study. The researcher however, assured them confidentiality in handling the information they would provide and that it was to be used for research purposes only.

1.9 Inclusion & exclusion criteria

In order for the research to accomplish its purpose, only departments that were using AMS in SU were selected to participate in this study. Participants included staff i.e. senior management, administrators and lecturers as well as students, who had used the system for a period of not less

than 6 months. Participants were required to be well versed with the system and must have received sufficient education on use the system appropriately. For purposes of ensuring validity of data to be collected, only current IT students enrolled in various academic programs at the Faculty of Information Technology (FIT), in degree and masters level participated in the study. The assumption of the study was that IT students had a better understanding of technical terms used in the questionnaire hence the likelihood to collect valid data.

Chapter 2: Literature Review

2.1 Introduction

This chapter will attempt to give an introduction to AMS, investigate existing IS success models & frameworks as well as tools used to evaluate AMS in SU and a conceptual model towards developing a comprehensive evaluation solution for AMS.

The purpose of AMS is basically to process information concerning student academic and administrative records especially that which is associated with students' academic progress as well as personal details. According to Nyandiere *et al. (*2012), there are no significant differences in terms of AMS needs among HEIs but, they are similar across the globe. Universities have implemented such systems including academic enterprise resource planning systems(ERPs) to capture and process information in the following core-business processes: student applications, recruitment and admissions management, student registration, financial aid, accounts receivable and fees assessment, examinations management, library services, course syllabi and subject management, student academic progression and graduation records, mentoring services among others (Carcary *et al.*, 2007;Sevilla & Shabaya, 2007; Hassan *et al.*,2010; Kalema *et al.*,2014;).

During her study on evaluating a Student Management Information System (Student MIS) in tertiary education, Carcary (2010) identified various operations in five National Institutes of Technology (IOTs) with the corresponding system functionalities to address those needs. The study found the following as the main system modules used in the five institutions which include: admissions, course catalogue, registration, accounts, examinations and graduations; all of which also apply in the SU context. This gives an idea of the kind of information handled by AMS in

HEIs. However, the study being Irish oriented may not fully apply in the local situation, owing to the fact these are two different institutions with different backgrounds despite the similarity in most of the requirements.

Figure2.1 provides an overview of the IOT Student MIS system functionality and operations

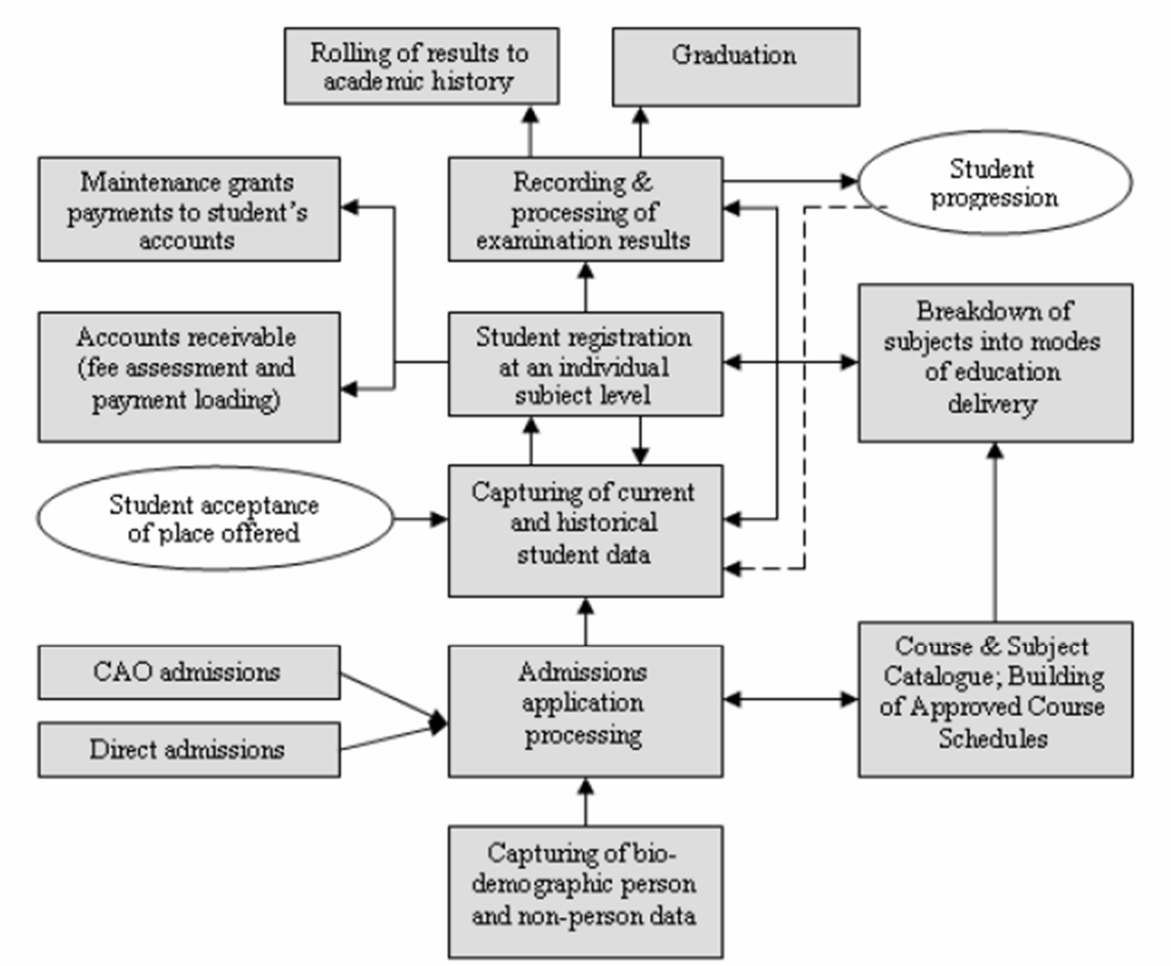

Figure 2.1: The functionality and operations of IOT Student MIS

Table 2.1 below gives an overview of the IOT student MIS modules with detailed explanations on the kind of information handled by each module:

Table 2.1: IOT Student MIS modules

Catalogue	The database of courses and subjects offered by an Institution
Approved Course Schedule (ACS)	The listing of subjects linked to a course; it outlines teaching hours, examination and continuous assessment components
Sections and Blocks	Breaks down subjects into specific delivery modes, such as lecture, practical and tutorial hours. Students are registered on these sections. A block is a grouping of sections by stage
CAO Interface	Enables download of student data from the Central Applications Office website. The CAO is the body responsible for recording all student applications to third level education institutions in Ireland
Admissions	Stores applicant data and processes applications. It supports both CAO and direct admission applicants
General Person	Captures biographical and demographic data
General Student	Records current and historical student data. The record is originally created when an applicant accepts a course place offered
Registration	Records registration information for a given term
Maintenance Grants	Facilitates grant payments to a student's bank account
Accounts Receivable	Tracks financial transactions such as student fee assessment, contract assignment, payments, and receipt, invoice and journal production
Examinations	Facilitates student exam results and production of relevant reports
Academic History	Enables historical academic results to be recorded in the Student MIS
Web for Faculty	Empowers academics to enter student results, and view class and student details. Grades are broken into their component parts through electronic gradebook functionality
Letter Generation	Enables selected data to be merged with predefined letters
Graduation	Produces graduate lists and records data relating to graduation ceremonies

(Carcary, 2010)

2.1.1 A comparison between SU and IOTs' systems functionalities

The following is a comparison between the functionalities of the two systems (Carcary, 2010; Strathmore University, 2011):

(i) **Admissions module**-is the entry point of all students into the university right from recruitment up to graduation. It's used by admissions staff to capture and maintain admissions records which include applicant's data, entrance exam results and student course enrollment details into various courses. On the other hand the Irish-based system has a similar module to process admissions but has two interfaces for both direct admissions and a central applications office (CAO) whereby applicants may apply and be admitted directly or apply through a central office processing admissions nationally; unlike the SU case where admissions are processed directly being a private institution.

(ii) **Academic planning module**-is the central point of operation for faculty staff from which student academic records are maintained including: admission of students into the faculty, enrolling students into an academic year, course registration, booking self-registration appointments, formalizing registration, maintenance of syllabi subjects and generate reports. However, the Irish system does not have a similar module according to its structure despite the fact that both systems are meant to serve the same purpose.

(iii) **Finance module**-it enables finance staff to do the following: invoice students, raise debit /credit notes, transfer credits, reversal of receipts, enter fees payments, bank imports, maintain tariffs and generate reports from student statement(s). The Irish system has a similar module with two functionalities i.e. accounts receivables for fees processing and payment loading as well as the maintenance of grants payments unlike the SU case whereby there's only one functionality to capture and process both fees and grant payment.

(iv) **Exams module**-used by examinations staff to maintain exam records including the following: closing lecturers mark sheets, recording approved exam marks/grades,

generation of final exam mark sheets, publishing exam results, adjustment of results after appeal, closing final exam mark sheets. Both systems have similar functionalities specifically handling examination results, rolling results to academic history/progress report and graduation.

(v) **Mentoring module**-comprises of mentoring director's module and mentoring module.

Mentoring director's module: used by the Mentoring services director to add a mentor into the system and assign mentees.

Mentoring module: used by mentors to record the number of sessions they have had with their respective mentees, check class attendance, coursework results, exam results and mentee's personal details. The IOT system does not have a similar module for mentoring purposes like SU. This shows the differences between the two systems as a result of varying organizational contexts and requirements.

(vi) **Lecturer's module**-enables lecturers to update students' class attendance, course-work, exam marks and generating reports. The Irish system has a similar module for lecturers known as "Web for Faculty". Therefore similar kind of information is entered in both systems by lecturers in this regard.

(vii) **Student's module**-students use it to view and inspect their academic progress reports, coursework grades, exam results, fee statements and self-registration. There's no separate module for student in the Irish case but students do use the Web for Faculty module to access their details in the system, unlike as is the SU case where the students have their own module.

2.2 Models and frameworks

This section will focus on IS success models/frameworks and the tools used at SU.

2.2.1 DeLone & McLean IS success model

According to DeLone and McLean (1992), D&M is a comprehensive and multidimensional IS success framework comprising of six dimensions which include system quality, information quality, use, user satisfaction, individual impact and organizational impact; all of which are presented as the dependent variable for measuring AMS. The taxonomy of the six categories is based on both process and causal considerations whereby the various dimensions are interdependent as shown by the arrows in the diagram below:

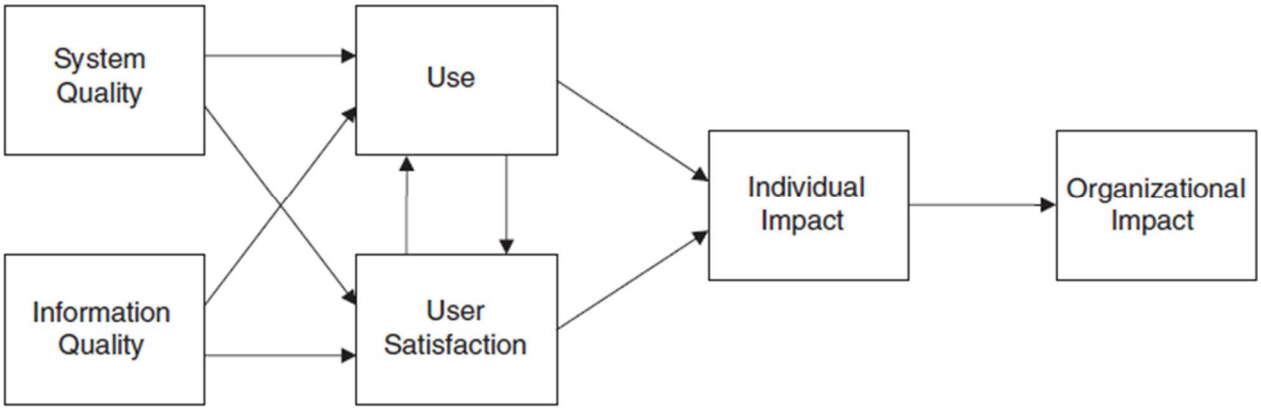

Figure 2.2: Original D &M IS Success model (DeLone & McLean, 1992)

The original framework (Figure 2.3) was modified after a decade, following criticisms from other researchers after which three new dimensions were introduced to original model i.e. “service quality”, “intension to use” and “net benefits”(DeLone & McLean, 2003). Both the individual and organizational impact dimensions were removed and replaced by net benefits. Table 2.2 presents

a summary of both definitions of the six success categories of D&M model with some of the corresponding empirical measures as identified in literature (DeLone & McLean, 1992; Seddon, 1997; Tan & Pan, 2002; DeLone & McLean, 2003; Lin et al, 2006; Petter *et al*, 2008; Sharkey *et al*, 2010; Urbach & Muller, 2012; Nizamani *et al*, 2013):

Table 2.2: D&M success model dimensions and the corresponding measures

	Dependent Variable	**Independent variable/constructs**
(i)	**System quality**-refers to a measure of system appropriateness and suitability of software and hardware	• Ease of use • Flexibility • Integration • Reliability • Sophistication • Response time • Accessibility • Navigation • Security, • Availability • Easy of learning
(ii)	**Information quality**-refers to a measure of the quality of the output(s) of the information system.	• Availability • Completeness • Accuracy • Reliability • Format • Usability • Understandability • Relevance • Timeliness
(iii)	**Service quality** –refers to the quality of technical support and services provided to end users by IT department/personnel	• Empathy. • Assurance • Tangibles (hardware and software) • Competence • Responsiveness • Accuracy • Reliability • Training • Relationship quality • Intrinsic quality

(iv)	**System use**-refers to the extent and nature of system utilization i.e. consumption of the system output by users	• Degree of use • Frequency of use • Time of use • Usage pattern • Number of accesses • Purpose for use • Number of queries • Number of reports generated • Degree of dependency
(v)	**User satisfaction** – refers to the extent to which users belief that the system available meets their information requirements	• Information satisfaction • Enjoyment • Adequacy • Effectiveness • Efficiency • System satisfaction • Overall satisfaction
(vi) **(vii)**	**Net benefits –** refers to the extent of IS contribution towards success at various levels i.e. individuals, organizations and the society as a whole in achieving their goals	• Quality of decision making, • Timely decision making, • Decision effectiveness • Improved employee productivity • Improved organizational performance • Increased cost reduction, • Improved customer satisfaction,

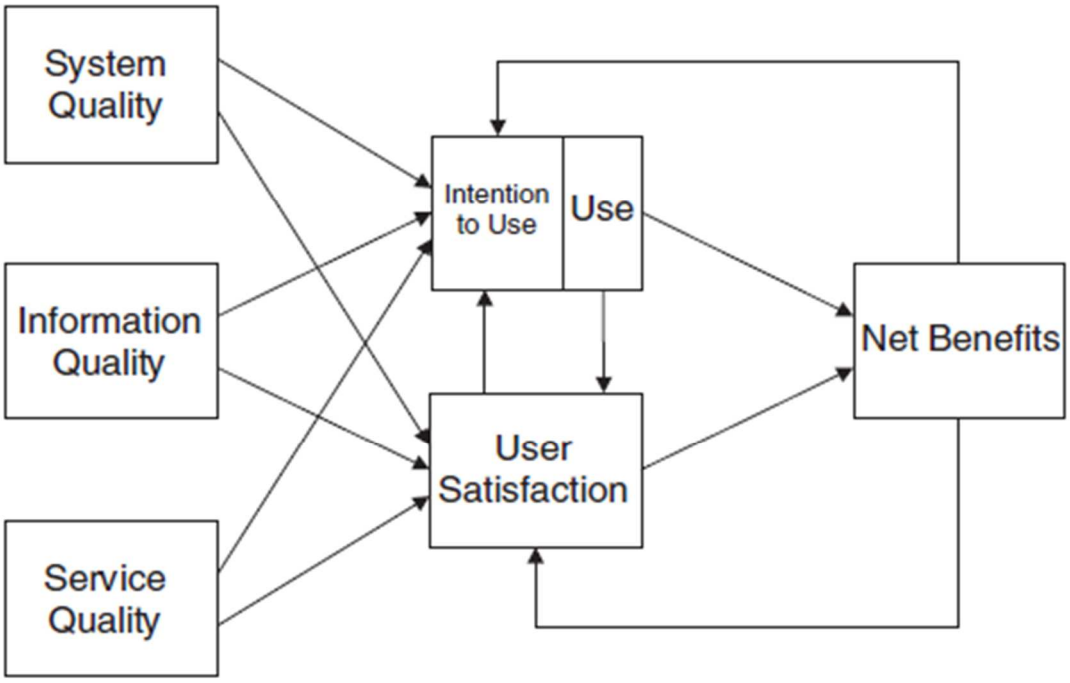

Figure 2.3: Updated D&M IS Success model (DeLone & McLean, 2003).

2.2.1.1 Interrelationships between D&M model Dimensions

The D&M success model is a combination of both a process and causal models; with arrows demonstrating flows in the same direction (DeLone & McLean 1992, 2003; Seddon, 1997).

The process model demonstrates a process through the creation of a system, use of the system and the consequences of using the system. Therefore system quality and information quality influence system use and user satisfaction; which then directly influences individual impact and eventually organizational impact. On the other hand the causal model demonstrate the interrelationships resulting from causality flows towards the same direction i.e. higher system quality, higher information quality and higher service quality cause higher user satisfaction levels, which leads to

higher level of system use, which leads to individual impact and eventually leading to organizational impact (DeLone & McLean, 2003).

2.2.1.2 Analysis of DeLone & McLean mod*el*

D&M model is strong in the sense that it champions IS evaluation research with several studies including Seddon (1997), Lin *et al.(*2006), Urbach (2009), Sharkey *et al (*2010) among others having replicated and extended the framework to different applications (DeLone & McLean,2003; Petter *et al*, 2008). The model has been extensively tested and validated in various contexts including ERP systems (Tan & Pan, 2002; Lin *et al*, 2006), student MIS systems (Rai *et al*, 2002), accounting systems (Seddon & Kiew, 1996), e-commerce systems (Sherkey *et al*, 2010). The model provides a comprehensive framework for better understanding and measurement of the complex dependent variable in IS evaluation research (Petter *et al*, 2008). The D&M framework provides both temporal and variance factors to measure its six dimensions which display relationships between various constructs thus making it richer and popular (DeLone & McLean, 2003; Lin e*t al,* 2006; Petter *et al*., 2008). Since its first update, there has been evidence of strong support for the model's accuracy and parsimony from both empirical and theoretical studies which have confirmed existence of significant relationships between the various dimensions of the model thus providing a theoretical basis for investigating IS success (Lin *et al*, 2006; Petter *et al*., 2008; Urbach & Muller, 2012). It's against this background that this study proposed adoption of the model to AMS context. However, a major weakness of this model is that it lacks the ability for continuous evaluation and stakeholder participation hence the gap the proposed study will seek to address.

2.3 Functional-Operational misalignment model

The model is centered on theoretical underpinnings of formative continuous participative evaluation (CPE) theory in evaluating a Student Management Information System (MIS) already in use while focusing on functional-operational misalignment. The main characteristic of this model is that it emphasizes stakeholder participation in the system implementation and development process; which was adopted during a study by Carcary (2010) conducted across five National Institutes of Technology (NIOs) in Ireland.

The study provides the following five step by step guidelines to guide the evaluation process for a Student MIS system.

Step One:

Considering evolving organizational requirements including education delivery modes like:

Modularization, semesterization, e-learning, distance learning, modification of student profiles and records e.g. student unit exemptions, repeat units, students enrolling for more than one course, students on scholarship etc.

Step Two:

Considering evolving system capabilities due to: system improvements from the vendor and change of business process (business re- engineering) etc.

Step Three:

Considering the requirements-capability match analysis in order to:

Ascertain the degree of convergence between operational requirements and system capabilities and determine how effectively the organizational needs are met by the system as well as its utilization.

Step Four:

Examine and interpret the findings from the requirements–capability match analysis which may be either:

(i) A state of functional-operational alignment (functionality available for each requirement) or

(ii) A state of functional-operational misalignment (unexploited functionality or unavailability of a required functionality).

Step Five:

Taking appropriate decisions whereby misalignment(s) if any are then fixed by:

System improvement to better address operational requirements by coming up with more innovations to customize the system accordingly, investing resources to make use of important un-exploited functionality and training of users on new system functionality.

2.3.1 Analysis of the Functional-Operational Model

The strengths of the Functional-Operational model lies on its identification and involvement of primary stakeholders including the system developer/vendor, top management, technical team and system users; which helps to unearth problematic areas of the system for improvement especially feedback obtained from system users' experience. It focuses on cross-examination of functional-operational alignment. It is driven by formative CPE approach which is suitable in assessing and determining system capabilities and operational requirements towards successful implementation

throughout system life cycle. The major weakness of this model however, is its narrow scope in terms of evaluation criteria, since it only emphasize the functional and operational requirements while ignoring other critical factors of IS success. However, the study having been conducted in a higher education setup, in the context of a student MIS which is similar to AMS, the study is relevant to this research hence shall borrow ideas to build the proposed research model.

2.4 Formative CPE Framework

Formative continuous participative evaluation (formative CPE) is an information system (IS) evaluation approach which emphasize involvement of stakeholders in the evaluation process of an IS (Remenyi & Sherwood-Smith, 1999). Stakeholders, who are mainly the users of the system, play a central role in the evaluation process, since they are the ones that use IS to deliver the benefits of investment. The reason behind this argument is that users understand strengths and weaknesses of a system better than any other person. Lagsten (2011) defines a stakeholder as "a person or group that holds a stake in the IS or in its evaluation process. This is achieved through continuous scanning of the IS environment whereby such conditions like organizational, technical, individual, social, cultural and political factors are closely monitored (Kalema *et al.*, 2014). Being an iterative process, formative CPE methodology is considered most appropriate in dynamic environments, where organizational requirements evolve constantly hence the need to ensure maximum contextualization of information systems in order to meet the real business needs rather than just an investment (Carcary, 2010; Makoha *et al.*, 2013).

The formative CPE methodology involves 6 steps which include: establishing the need for formative evaluation, forming an evaluation team, defining the criteria for evaluation, choosing

metrics, establishing an evaluation schedule and a consultative mind-set (Remenyi & Sherwood-Smith, 1999).

Advantages of this approach include: ability to promote awareness and continuous corporate learning, system enhancement and acceptance among users since stakeholders are involved, the ability for continuous system development/improvement (Remenyi & Sherwood-Smith, 1999). Given its merits, the CPE framework would be relevant to the SU context for purposes of implementing the proposed solution (model). However, the major weakness of the framework is that it does not propose a specific criteria for evaluating IS hence ambiguous and subjective; a gap this study will seek to address.

2.5 Other Success frameworks

Some studies have suggested alternative IS success frameworks without necessarily criticizing the D&M success model. Grover *et al*, (1996) came up with the IS effectiveness framework, based on theory of organizational effectiveness which complement D&M model. The framework is built on unit of analysis and evaluative based context dimensions. The study proposes six dimensions, similar to those of D&M model which include organizational impacts, market parameters, economic parameters, usage parameters, perceptual parameters and productivity parameters. All the six success categories of the framework are similar to those in D&M model except the market category. The difference between the two is that the IS effectiveness framework considers both system and information quality categories as antecedent factors of effectiveness while D&M model perceive them to be important factors of IS success itself. Nonetheless, IS effectiveness framework plays a major role in validating D&M model from a theoretical angle while suggesting an extension of market impacts (DeLone & McLean, 2003).

Smithson and Hirschheim (1998) suggested a conceptual IS evaluation framework and tested its usefulness in evaluating IS success in an outsourcing context. The framework proposes three dimensions including: efficiency, effectiveness and understanding. Examples of corresponding metrics to measure these dimensions include software metrics, cognitive psychology, sociology and organizational behavior among others. Some of the metrics of the framework are similar to those of D&M model such as hardware and software, user satisfaction, cost effectiveness, system use among others. However, one of the major weaknesses of this framework is its ambiguity since it does not provide for specific measures to its three dimensions thus making it difficult to apply in practice (DeLone & McLean, 2003).

2.6 Tools used in evaluating AMS at SU

The study established that SU uses risk-based internal IT audits to evaluate the effectiveness of AMS. The Chartered Institute of Internal Auditors (2014) defines internal audit as "the provision of independent assurance that an organization's risk management, governance and internal control processes are operating effectively". The aim of internal audits in SU is to ensure continuous improvement on AMS security and functionality through risk management and system controls to check on the confidentiality, integrity and availability of information (Fatshul & Namroush, 2006).

2.6.1 Methodology of internal IT audit

According to KPMG (2014), the following is the methodological approach used to execute the internal audit process in SU:

(i) Strategic analysis

The audit process is conducted according to the University strategic plan which is aligned to the University's strategic goals.

(ii) Enterprise Risk Assessment

The audit process is guided by pre-determined potential risks facing the University hence risk-based. This determines the areas which have potential risk hence must be audited in order to mitigate the risks.

(iii) Internal Audit Plan Development

Given the specific organizational requirements including the vision, mission, goals etc., an internal audit plan is established which should guide internal auditors.

(iv) Execution and Reporting

After the audit is carried out using the laid down procedure, the report is then handed over to management for action.

The audit approach is considered important in SU in the sense that it helps in the development and provision of assurance to management that the control systems designed by various departments to control the use of AMS are working effectively. It serves as a safeguard to maintain key controls as per the prescribed policies and procedures in specific areas of the system.

2.6.2 Limitations of internal audits in evaluating AMS

Despite being used to evaluate the effectiveness of AMS in SU, this approach is not sufficient given its obvious limitations, which hinder organizational success. The major problem with this method is that it is risk-based whereby it only focuses on areas that are considered to have potential vulnerable to risk(s) hence it lacks objectivity in measuring AMS success (Kaplan Financial, 2012). Therefore, the scope covered is too narrow considering the factors of IS success. Also, the approach relies on informal policies and procedures which are tied to organizational culture & values hence biased (Management Development Corporation, 2011). Staffs sometimes learn the

organizational control systems and procedures while working especially newly appointed staff or whenever organizational policies are revised. This situation complicates management of the organization since compliance to the established controls is violated. Due to fear of conflicts by internal auditors, non-conformances and errors may not be reported to the relevant authorities for action. Therefore, independence and objectivity of internal auditors being key aspects in the success of the audit process, transparency are compromised thus impacting negatively on organizational success (Stewart & Subramaniam, 2010). Considering aspects the aspects involved in determining IS success, it's apparent that the audit approach alone is not adequate given its narrow scope alongside other limitations (Fatshul & Namroush, 2006). The audit approach is not proactive in detecting deviations to warrant prompt action hence lagging. Therefore, the audit approach being a universal framework for checking compliance to internal system controls, evaluating IT systems, SU is not exceptional to these either since the institution uses the same approach in evaluating its AMS.

2.7 Conceptual model

The proposed research is an empirical study of updated D&M success model in Figure 2.3. The effectiveness of AMS is expected to enhance system use and user satisfaction. Strong evidence from both theoretical and empirical literature has shown that system quality, information quality and service quality have a positive relationship to both system use and user satisfaction. Consequently, both system use and user satisfaction have a positive relationship to IS success (DeLone & McLean, 1992; Seddon & Kiew, 1996; Rai *et al*, 2002; DeLone & McLean, 2003; Lin *et al*, 2006; Petter *et al*, 2008; Urbach & Muller, 2012). Based on this evidence therefore, this study proposes an enhancement of D&M model in SU context to improve the effectiveness of AMS.

Therefore, the proposed model shall incorporate the formative CPE factor to enhance D&M model by improving dimensions of system quality, information quality and service quality, which shall consequently enhance system use and user satisfaction towards achieving organizational success. Figure 2.4 is a conceptual model of the proposed stsudy.

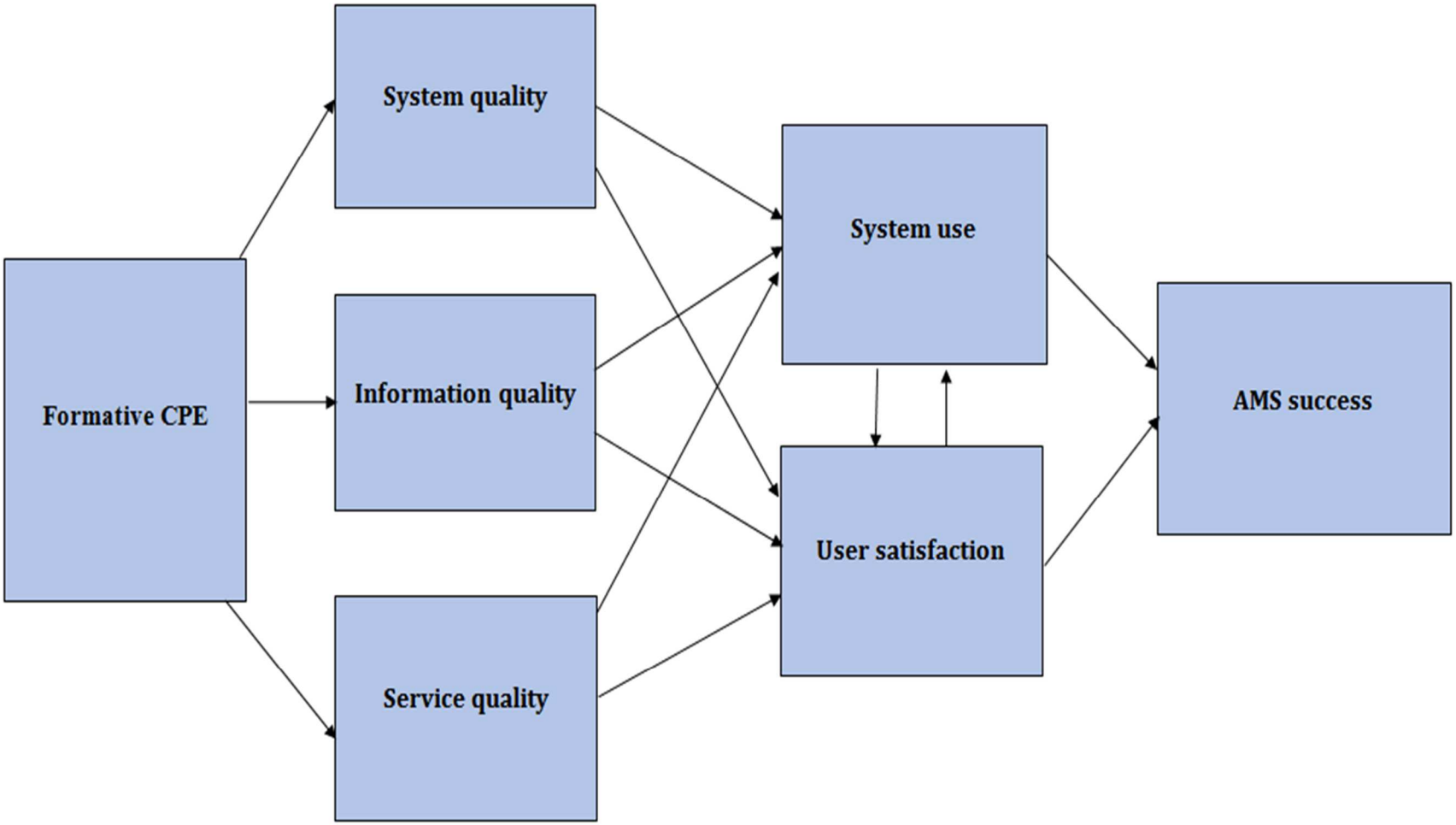

Figure 2.4: Conceptual Research Model for AMS Success

Chapter 3: Research Methodology

3.1 Introduction

According to Kothari (2004), the concept "Research methodology" is defined as a way to systematically solve a research problem scientifically. It involves all methods, techniques and procedures that are used in undertaking a research. This chapter provides a detailed systematic approach on how the proposed study was conducted. It includes sections on research design, study population, sample size, data collection methods, data analysis, the research quality and ethical considerations.

3.2 Research Design

According to Kothari (2004), a research design is a guideline developed and adopted by the researcher to answer research questions validly, objectively, accurately and economically. A case study approach was used in the study for exploratory and descriptive purposes (Shuttleworth, 2008). This research adopted triangulation method whereby both qualitative and quantitative methods were used, operating side by side during the study (Gray, 2009).The main advantage of triangulation is that the two methods supplement and compensate the weaknesses of each other, whereby the results from both data sets were analyzed and compared.

3.3 Population and Sampling

Mugenda & Mugenda (2003) defines the concept of population as "a complete set of individuals, cases or objects with common observable characteristics". On the other hand, sampling can be defined as "the process of selecting a sample from a bigger group to become the basis of predicting the prevalence of a situation regarding the bigger group" (Kumar, 2005). The target population of

the study was drawn from AMS users including staff and IT students from FIT in SU. The composition of the population included 1,162 students, 150 lecturers, 100 administrators and 12 senior staff.

Stratified random sampling was used to select participants from three of the subgroups i.e. lecturers, administrators and students. This technique was used in order to achieve the desired representation sample(s) from each of the subgroups of the study population. Another advantage of this technique is that it takes into consideration the inclusion, in the representative sample, of small subgroups that are likely to be omitted by other sampling techniques (Mugenda & Mugenda, 2003).

On the other hand, convenience sampling was used to select participants from the senior staff category. The researcher's assumption was that given the nature of their busy schedule; availability of senior staff to participate in the study could be a challenge. More so, this was the group to provide policy related information since they were involved in the decision making process hence had better understanding of the situation. Also the researcher understood the fact that not all senior staff were involved or associated with operations of AMS hence the reason convenience sampling was used.

3.4 Sample size

According to Kothari (2004), sample size is the number of items selected from a study population to obtain a representative sample of the study population's characteristics without bias for purposes of ensuring validity and reliability of the research findings. The researcher sought to obtain an optimum sample which could meet the requirements of efficiency, representativeness, reliability and flexibility.

While considering the aspect of population validity, the researcher used the following formula to determine the sample size (Survey Monkey, n.d):

$$\text{Survey sample size} = \frac{N}{(1+N*e^2)}$$

Where**:**

N = the size of the entire population to be represented

e =the percentage margin error

Sample Size= $1,412/ (1+1,412*.05^2)$ =311

3.4.1 Stratified Random Samples

Strata sample size were determined by the following formula (Stat Trek, n.d):

Stratified Sample Size: $n_h = (Nh / N) * n$

Where: n_h= the sample size for stratum (h)

N_h=the total population size for a stratum

N = the total population size

n = the total sample size

3.4.1.1 Students' sample

The total estimated population of the students, n_h= 1,162, the total population size, N = 1,432

Then: n_h= (1,162/1,412)*311 = 256

3.4.1.2 Lecturers' sample

The total estimated population of lecturers, n_h= 150

Then: n_h= (150/1,412)*311 = 33

3.4.1.3 Administrators' sample

The total estimated population of administrators, n_h= 100

Then: n_h= (100/1,432)*311 = 22

3.5 Data collection tools and sources

The study used both interviews and online surveys to collect data. Interviews were specifically used to collect data from the senior management staff. Kumar (2005) defines interview as "person-to-person interaction between two or more individuals with a specific purpose in mind". The interviewer used structured interviews with open-ended questions for purposes of providing greater insight into the research phenomena. The advantages of this method is that it creates an opportunity for clarification of ambiguous questions if any, for the respondent(s), the interviewer is also able to supplement information obtained from responses with those obtained through observation of non-verbal reactions and it also provides for respondents' in-depth responses (Kothari, 2004; Mugenda & Mugenda, 2003).

Online questionnaires with closed questions were distributed to the users i.e. lecturers, students and administrators. The main advantages of using questionnaires in this study is that the method is free from bias since it is filled in the absence of the researcher, it gives respondents adequate time to provide in-depth responses to questions and the fact that large samples can be used hence

a higher probability of dependability and reliability of results (Kothari, 2004).Figure 3.1 shows the procedure that was followed in collecting data.

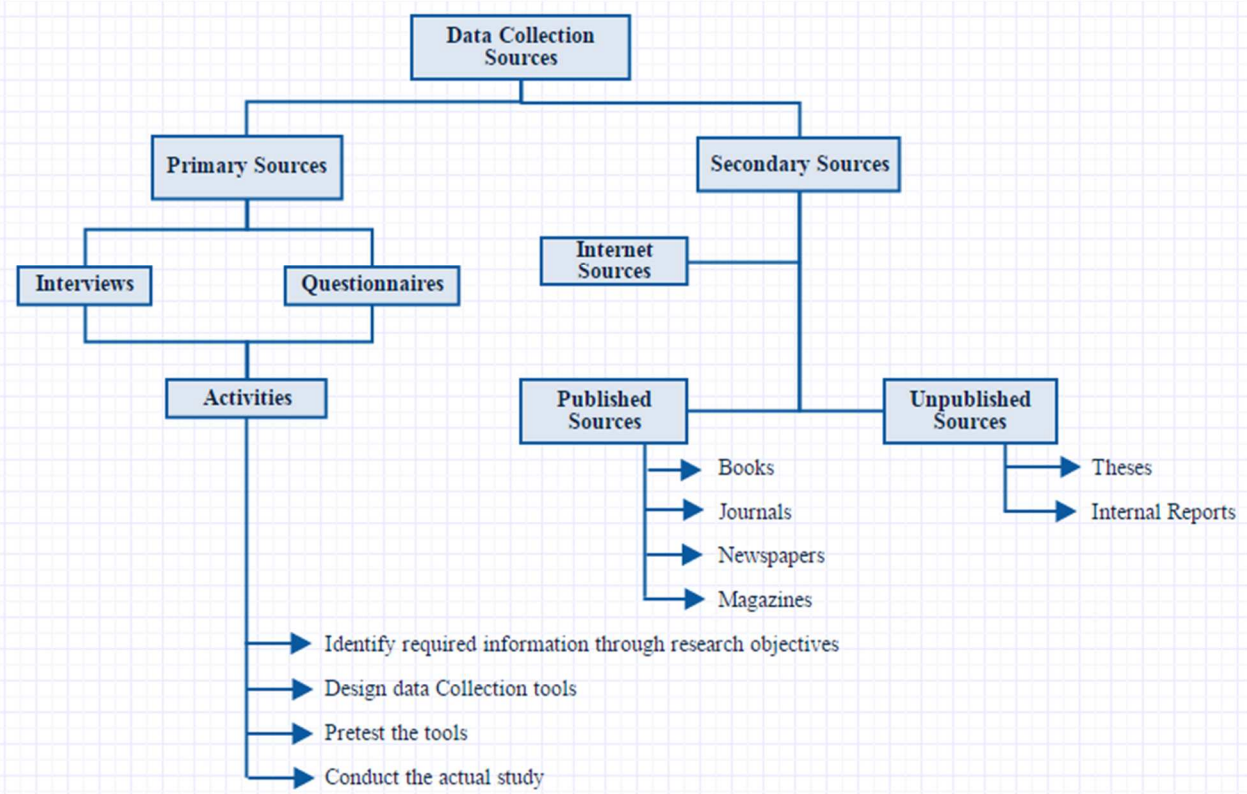

Figure 3.1: Sources of data collection

3.6 Data Analysis

According to Shuttleworth (2008), data collection procedures facilitate systematic collection of information on the objects of the study and the settings in which they occur. Qualitative data that was collected through interviews was coded and grouped according to the order of themes on the interview guide. For quantitative data, MS Office Excel was used whereby descriptive statistical techniques were employed to analyze and represent quantitative data, which include tabulation, frequencies, percentages, charts and graphs**.** These techniques were used due their ability for visual data representation and ease of interpretation as well as comparison of results while observing

noticeable trends of the phenomena under study. Statistics also help the researcher to identify underlying patterns in the data to be used as evidence for his or her arguments about the research topic under study.

3.7 Research quality

According to Miller (2012), reliability is defined as “the degree to which tools of measurement remain consistent to provide same results when the same procedure is repeated”. The quality of the research was enhanced through the adoption of triangulation method where both interviews and used to collect primary data. Construction of data collection tools was guided by observable concepts in the literature review. This was to ensure that reliable data is collected for purposes of informing the study accordingly. In order to increase the credibility of data obtained from the study, secondary sources were used as well as other relevant articles from published academic journals on existing models and frameworks. A pilot survey was carried out to test the validity of the research tools before the main survey was conducted.

The proposed model was validated using the AMS, which was in use at SU. In order to enhance the research, only IT students from the Faculty of Information Technology (FIT) participated in the study. This was due to the researcher’s assumption that IT student had a better understanding of technical terms used in the survey tools. In order to confirm the applicability of the new model in the proposed research context, face validity was used whereby core departments/offices and professional users of AMS who participated in the initial study were engaged through a survey to validate the accuracy of measures proposed in the research model (Phelan & Wren, 2005).

3.8 Ethical considerations

The researcher ensured to meet the requirements of the institution's code of ethics to avoid breaching the ethical guidelines. He first identified himself with a letter of introduction which clearly stated the purpose of the research to the authorities before he was authorized to conduct the study. With his foreknowledge of the ethical rights of research subjects, the researcher was able to observe his primary responsibility to protect the respondents from possible harm during and after the study. He sought the consent of the respondents, who participated in the study voluntarily. The researcher assured them confidentiality in the handling of the information provided and that it was to be only used for research purposes (Kumar, 2005).

Chapter 4: Data Analysis and Representation

4.1 Introduction

This chapter presents and analyzes data collected from the study with a sample population comprising 3 senior management staff, 17 lecturers, 16 administrators and 202 students. Both qualitative and quantitative methods were used to analyze data collected. A summary discussion and conclusion is also included at the end of the chapter.

Qualitative data from interviews was coded, grouped and analyzed according to the order of questions on the interview guide. Analysis of quantitative data was presented and analyzed using descriptive statistics including tables comprising of the response items, the corresponding frequencies as well as percentages. These were further summarized in form of charts and graphs for easier visualization and interpretation. These statistical techniques were considered ideal in presenting the contribution of each surveyed view(s) towards forming an opinion on each surveyed item. The aim of this analysis was to establish challenges that were experienced regarding the evaluation of AMS in SU, as well as challenges faced by the users of the system from the sample population.

Therefore, the study was conducted in two levels which involved interviews with the senior staff and conducting user surveys for administrators, lecturers and students.

4.2 Interviews

Interviews were used explore the research phenomena in order to get a deeper insight of the areas that were of interest to the study to unearth issues that would otherwise not be discovered through surveys (Gray, 2006). This method was used to collect data from the senior staff category of

participants because it was considered to be more enjoyable to them as opposed to filling in questionnaires, considering the nature of their tight schedule(s). Also interviews would allow the participants an opportunity to reflect on events and share their experiences. Apparently, this category of participants was involved decision and policy making in the organization and therefore, were in a position to explain the current state of affairs better regarding the discussion topic. Three (3) participants were interviewed, whose divisions (departments) were either directly or indirectly concerned with matters to do with evaluation of AMS.

Five questions were designed and organized into themes, according to the interview guide which included challenges associated with IT audit approach in evaluating AMS, measures taken to address the challenges, the possibility of the University adopting alternative approach, challenges that hindered use of AMS and participant opinion on the effectiveness of internal audits in SU context.

The topic attracted the attention of the participants and was willing to participate in the study. The names of the participants have been withheld while coding was used for purposes of anonymity and confidentiality. The first, second and third participants are identified as respondent X, Y and Z respectively.

The interviews were recorded and later transcribed, then read and systematically coded according to the themes. This was done by going through the lines of each theme as well as the sentences related to each theme to code and group related responses together. Interview Data analysis.

4.2.2.1 Interviewees profiles

Respondent X was my first participant, who was stationed at the University's Strategy and Quality Assurance Office. He had a background in IT hence was familiar enough with the topic of

discussion. He had served in various managerial positions in the University for a reasonable period of time hence well experienced in strategy matters of the organization and therefore, the reason he was selected to participate in this study.

Respondent Y was my second participant, a senior member of staff stationed at the University's Internal Audit Office. Had an IT background with good experience on issues to do with internal audits in the University, hence the reason selected to participate in the study?

Respondent Z was my third and last participant, a senior manager at the IT department of the University. He had a background in IT and well experienced in matters to do with operations of AMS operations in the University and therefore the reason he was selected to participate in the study.

4.2.2.2 Interviews Findings

The findings from the interviews are discussed in this section.

Q1. What challenges does the University experience in using risk-based internal IT audits to evaluate AMS?

The results in Table 4.1 is a summary on the challenges associated with the use of risk-based internal IT audits in SU.

Table 4.1: Challenges associated with internal audit approach in evaluating AMS in SU

Challenge/Limitation		Exhibited problem(s)
1	**Non-proactive**	The approach is lagging hence deviations/risks associated with the AMS cannot be detected early for corrective action
2	**Limited scope**	The approach covers only two areas i.e. System security & functionality hence not comprehensive enough to effectively measure all success dimensions of AMS
3	**Plays a partial role**	The approach is selective i.e. only addresses specific areas considered to have high potential to risk thus selective
4	**Risk-based/ focused**	The audit approach is designed/meant for risk management hence areas not considered to be at risk are ignored hence could not adequately measure the effectiveness of AMS
5	**Non-objective**	The approach is dependent on informal policy /internal controls which were themselves not necessarily objective. This fact therefore showed that this method was not sufficient in measuring the effectiveness of AMS
6	**Internal conflict**	The audit approach is vulnerable to internal conflict thus the tendency to compromise independence and

		objectivity of internal auditors to report errors thus impacting negatively on the transparency of the audit process.
7	**No stakeholders involvement**	The audit approach does not recognize stakeholders' participation, which was considered critical for purposes of continuous improvement of the system.

In order to capture the proceedings of the interviews as they actually were, direct quotes from interviewees were used in various parts of this section.

The researcher sought to understand the challenges the University experienced in using risk-based internal IT audits to assess the effectiveness of AMS. Apparently, all participants agreed that this approach was faced with several limitations as highlighted in Table 4.1 above.

***Non-proactive*:** The audit approach is not proactive in order to detect risks early enough. Respondent X in particular said: "*the audit approach is lagging and therefore it cannot facilitate proactive action on AMS"*. This was observed to be one of the major limitations of this method since the University had encountered situations whereby fraud was committed without being detected hence incurred losses. Therefore this finding confirmed the fact that the audit approach alone was not adequate to meet the University requirements in terms of assessing AMS effectiveness.

Limited scope: A concern raised by the participants particularly Respondent X, who said that internal audits only focused on system security and functionality. Therefore, this approach could not measure critical dimensions of AMS such as usability and productivity levels

among other dimensions; yet they were critical in determining the effectiveness of the system. Both respondents Y and Z acknowledged the same fact saying that audits only played a partial role hence did not cover everything. It was observed that auditors only looked at the system within the confines of specific, agreed upon areas. This therefore, confirmed the fact that the internal audit was not appropriate in evaluating the effectiveness of AMS given its limited scope.

Risk-based: It was observed that the audit approach was basically designed to manage IT risks in organizations. Respondent Y said: "*IT audits are not meant for evaluating success of information systems like AMS but, only for purposes of checking on assurance and compliance with internal controls on the security aspects of the system"*. In essence, IS success does not necessarily check on risks but it's meant for continuous improvement and to determine success of a system such as AMS to facilitate corrective action, which audits cannot fully support given their nature and design. These findings therefore justify the proposed study's aim to provide a comprehensive model to improve the effectiveness of AMS towards realizing organizational goals.

Non-objective: Respondent X pointed out the fact that the internal audit approach was not objective since it were driven by internal control systems, derived from informal policies and procedures. that were not necessarily formal. For instance, respondent Z said *"internal audits are highly dependent on organizational culture of which systems are deliberately designed to preserve and protect*". It was observed therefore, that the manner in which the audit approach was executed in SU may not have been necessarily objective since the audit procedures were informal hence highly subjective.

Internal conflict: Another challenge observed was that the internal audit approach was vulnerable to internal conflicts. Respondent Y said "*the problem with this approach is that it prompts suspicion and fear among staff. People may sometimes fail to cooperate with auditors in order to protect personal interests*". It was observed that this approach threatened the independence and objectivity of both the auditor for fear of victimization and the audit process as a whole thus compromising transparency.

No stakeholders' involvement: It was observed that the audit approach did not involve stakeholders in evaluating AMS, which was a critical requirement in determining the effectiveness of AMS. It was therefore impossible to identify deviations in the system exhaustively hence a major limitation of the approach. It was therefore necessary to adopt a separate approach to include stakeholders' participation in evaluating AMS.

Q2. What measures has the University taken to address the shortcomings of the audit approach?

Given the observable challenges experienced in SU regarding shortcomings of internal audit approach in evaluating AMS, the researcher sought to know what the University management was doing to mitigate the challenges. Apparently, all participants said that the university had engaged an external auditor, who could put in place checks and balances in order to assist management to verify the findings from internal audits. However, there were concerns that external audit approach was also inadequate in determining AMS effectiveness given the fact that the approach also had limitations. For instance, Respondent X said:

"*A major limitation of external audit is that we have to trust reports presented to us since we have no alternative for now"* whereas respondent Y said: "*External auditors only look at AMS from a financial perspective and not the system's security or functionality"*. This observation revealed the

fact that the measures employed by management to counter limitations of internal audits were not appropriate as far as the effectiveness of AMS was concerned, since the work of internal auditors is not fully cross-examined. This paves way for loopholes which may compromise the security of the system.

Q3. What is the possibility of the University adopting a separate approach to supplement internal audits in determining the effectiveness AMS?

The researcher sort participants' opinion on the possibility of adopting a separate approach to evaluate the AMS. Apparently all the participants were in agreement that adoption of a supplementary approach to evaluate AMS was a noble idea; given the weaknesses of the two approaches currently used in SU i.e. both internal and external audits. Respondent X warmly welcomed the idea saying**:** *"…Yes**!** An alternative, proactive approach is necessary to help check on weaknesses of internal audits which can also measure the productivity and usability levels of the system. However, I would recommend that we continue using audits since they have helped us improve the system*". Respondent Y and Z said that besides the audit approach, there was need for a separate approach, to be guided by organizational objectives and organize forums to engage stakeholders in order to find a better solution towards improving the effectiveness of AMS. From these findings, it was observed that the proposed AMS evaluation framework would go a long way to address existing challenges once implemented.

Q4. What are the underlying challenges associated with the use of AMS towards realizing organizational goals?

Despite the system having been implemented several years ago, there were still challenges hindering use of the AMS in SU towards realizing organizational goals, contrary to both

management and users expectations. Table 4.2 contains a summary of challenges associated with the use of AMS towards realizing organizational goals.

Table 4.2: Underlying challenges associated with use of AMS in SU

Challenge/Limitation		Exhibited problem(s)
1	**Rigid policy framework**	The University management demand that that AMS be aligned to meet organizational requirements hence prompting the need for extensive customization of the system
2	**Evolving organizational requirements**	There was constant change of requirements as a result of change of organizational policy/objectives by management and technological influence thus affecting operations of AMS
3	**Staff turnover**	System developers (Programmers) keep changing, which has negatively impacted the operations of the AMS including users
4	**Lack of users commitment to use AMS**	System use was still low since users opted for alternatives such as excel and manual methods to maintain records, which led to operational inefficiency since some of the records were kept outside AMS
5	**Inadequate user training and support**	Users especially new staff and students don't receive adequate user training and support on AMS due to constrained manpower

6	**High maintenance costs**	Huge costs are incurred in maintaining the system thus a major hindrance towards successful implementation and delivery of AMS services to ultimate users
7	**System customization**	There is constant demand for customization of AMS due to growing demands of the University as a result of new departments, projects etc. thus leading to system and data integration issues
8	**Incomplete data**	Data is not complete since old records are not fully updated in the AMS as the system was implemented in phases. Therefore some of the critical data is still missing including student admissions, exam results, financial data etc.
9	**System Security**	Due to security threats, there is no remote access to AMS since the system handles sensitive data hence limiting system access to which negatively impact on productivity of staff

The researcher sought to understand the underlying challenges associated with the use of AMS in University. Apparently, participants were able to point out a number of challenges as summarized in Table 4.2 above.

Rigid organization policy framework: It was observed that the organizational policy framework was not flexible enough to accommodate AMS requirements but, it was rather being done the other way round. This was a big challenge since the situation prompted the need for extensive

customization of the system to accommodate the University requirements. Respondent X, for instance said "*Another challenge is customization of the system to suit the University's requirements, having come from a different ecosystem and therefore rigidity of the University policy framework".* This prompted policy implications on customization of the system either to tailor existing system functionality or develop new functionality e.g. admissions and mentoring modules in order to meet university requirements. Respondent Y said "*customization of both academic and administrative data is still a challenge. Some users' requirements are not well met such as Financial Aid Office who can't access full information on student scholarships and sponsors in AMS"*. This confirmed that there were issues of incomplete data and system integration, which affected end users.

Evolving requirements: The ever changing requirements was a challenge particularly to both the system developers and users, which affected the manner in which AMS worked. This was occasioned by change of organizational requirements/objectives by management decisions as well as change in technology. Areas observed to experience challenges include handling of student retake and repeat units, exempt units, fees payment plan/mode, course transfer/change, mode of study, financial statements, semesterization, modularization etc. thus affecting end users in various ways.

Staff turnover: It was observed that staff turnover was a big challenge to the University. Programmers kept moving out in search of green pastures while finding suitable replacements was a problem. Respondent X said: *"This problem of staff turnover has also kept ….evolving and so discouraging users. Well, getting a new staff who understands the architecture of the system to readily provide support takes a long period as they have to learn the system first*

in order to code". This was therefore a serious challenge leading to inadequate training and support services to end users of AMS.

High maintenance costs: It was observed that maintenance costs on the system were high hence a challenge towards the effort to provide adequate service delivery. For instance, respondent Z said *"I think cost was a big driver towards adapting the current open source system. However, maintenance of the system is so costly in terms of both operational and fixed expenses because, as the University expands we need more resources*". Apparently, availability of resources determines service quality of the system. It was observed that more resources were needed including manpower in order for the AMS to provide adequate and quality service delivery to users.

Lack of user commitment to use AMS: It was observed that system use was still low since users opted for alternatives such as excel and manual especially maintenance of records. Such records including class lists, class attendance records, and coursework & examination grades, student fees payment/commitment plans were maintained outside the system thus leading to operational inefficiency.

System Security: It was observed that security threats from hackers compromised provision of adequate accessibility of the system by users. Respondent X said: *"we don't have a strong secure network yet in order to provide remote access to AMS by staff"*. It was observed that unavailability of off campus access to the system by users affected both the usability and productivity of staff.

Q5. In your own opinion, how would you rate the effectiveness of the internal audit approach in evaluating AMS system? Check the appropriate option.

- A-Excellent
- B-Very good
- C-Acceptable

- D-Poor
- E-Fail

Respondents X and Y rated the system as acceptable while respondent Z rated it as very good.

Considering the responses provided regarding effectiveness of the audit approach, it was observed and concluded that this method, was not adequate in addressing SU needs. Therefore there was need for a more comprehensive approach to address existing gaps.

4.3 Surveys

Online questionnaires were distributed to users in order to establish the demographics characteristics of different groups of respondents, challenges associated with the use of the AMS and also to test the applicability of D& M model in SU context. The user population comprised of three main categories namely: administrators, lecturers and students. The target study population comprised of 100 administrators, 150 lecturers and 1,162 students respectively; whose sample size was 311.A total of 235 valid responses were returned hence the overall response rate was 75.56%.

4.3.1 Surveys Data Analysis

In order to present results clearly, the researcher analyzed the study findings using tables, frequencies, charts and graphs to present various themes. This subsection contains the findings of the online which were distributed to the respondents.

The main themes covered in the surveys include:

(i) Demographic characteristics of the respondent groups
(ii) Challenges of using AMS
(iii)Testing applicability of the D&M success model in SU context

4.3.1.1 Administrator Demographics

This section presents the demographics of administrator participants including their departments, experience in using the AMS and the kind(s) of administrative and academic data they used in performing their daily and routine tasks. A total of 22 questionnaires were distributed via email, according to the predetermined sample size. A total of 18 responses were filled in and submitted but, after removing incomplete questionnaires, the number of responses reduced to 16 which translate to a response rate of 72.22%.

(i) Distribution of administrators across departments

Table 4.3 represents the distribution of administrator participants across different departments at SU.

Table 4.3: Distribution of Administrators across various departments

Department	**No. of Respondents**	**Percentage (%)**
Faculty of Information Technology (FIT)	5	31
School of Management and Commerce (SMC)	3	19
School of Finance and Applied Economics (SFAE)	2	13
Finance	1	6
Admissions	1	6
Exam Office	1	6
School of Accountancy (SOA)	2	13
School of Humanities and Social Sciences (SHSS)	0	0
Strathmore Law School (SLS)	1	6
TOTAL	**16**	**100**

The summary in Table 4.3 shows that 31 % of administrator respondents were from FIT, 19% from SMC, 13% from SFAE, 6% from Finance, 6% from Admissions, 6 % from Exams, 13% from SOA, 6% from SLS while there was none from SHSS. At least 8 out of 9 targeted departments participated in the study, which means that 88% of the departments responded hence an indication that feedback received from across the various departments was valid.

(ii) Administrators' experience of AMS

Figure 4.1 below is a representation of administrators experience on system use whereby the respondents had been using the system as follows: between 6 months-1 year (19%), followed by 1-2 years (6%), followed by 2-3 years (25%), and followed by 3-4 years (6%) and over 4 years (44%) years. The results show that approximately 81% of the respondents had an experience of over 2 years; which means that the data collected was valid for purposes of informing this study.

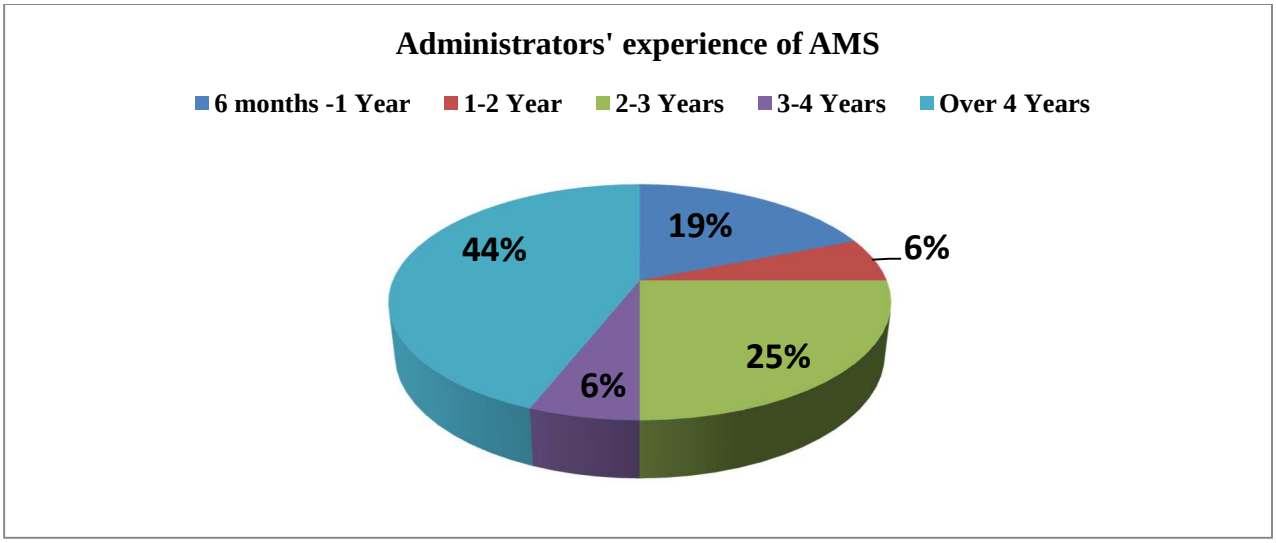

Figure 4.1: Distribution Administrators' experience of AMS

(iii) Kinds of Data used by Administrators from AMS

Figure 4.2 represents a frequency distribution of results on kinds of data used by administrators in daily and routine tasks which were as follows: admissions data 44% (8), course enrollment data 33% (6), finance data 67% (12), contacts data 61% (11), course syllabus data 61% (11), Lecturers data 33% (6), academic progress data 67% (12), examination data 72% (13), mentoring data 38% (5) and class attendance data 72% (13).

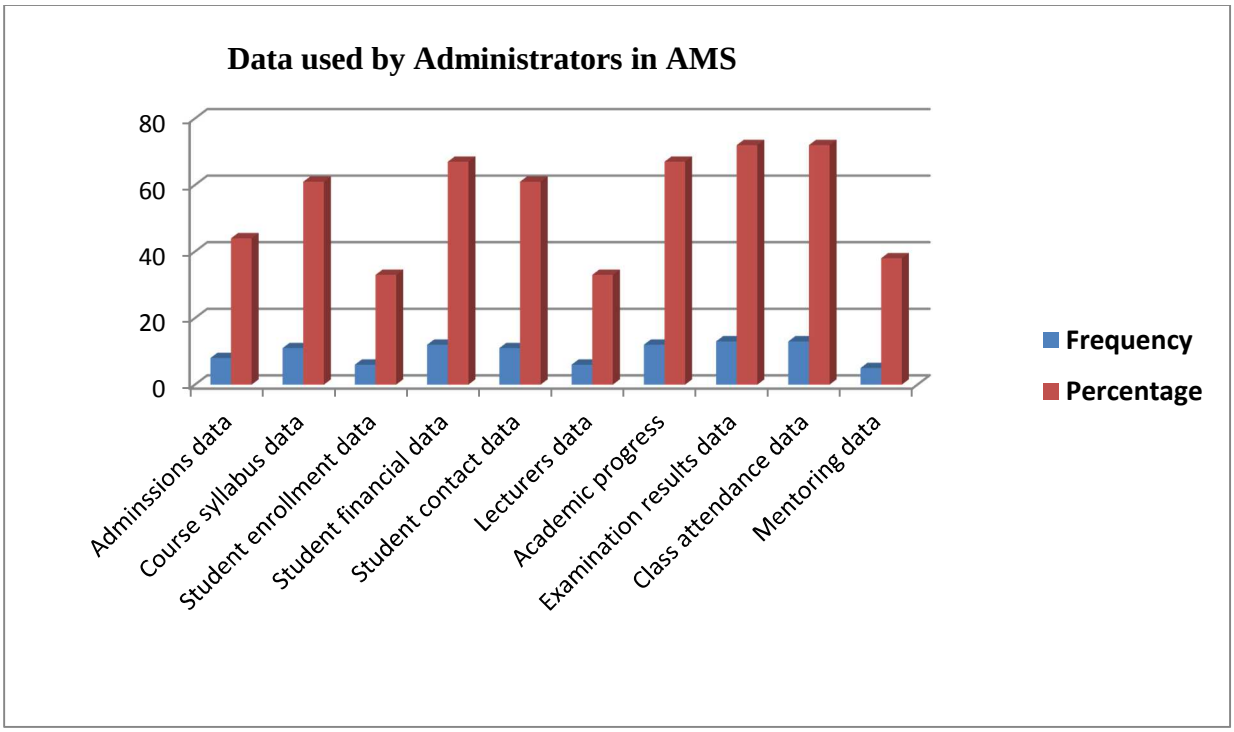

Figure 4.2: Kinds of data used by administrators from AMS

The results revealed that examinations, class attendance, academic progress and finance data were the most frequently used data; followed by contacts, course syllabus, admissions, student enrollment, lecturers and lastly mentoring services data.

4.3.1.2 Lecturer Demographics

This section presents the demographics of lecturer participants including their departments, experience in using the AMS and the kind(s) of academic and administrative data they used in performing their daily and routine tasks. A total of 33 questionnaires were distributed via email, according to the predetermined sample size. A total of 18 responses were filled in and submitted but, after removing incomplete questionnaires, the number of responses reduced to 17whichtranslate to a response rate of 51.51%.

(i) Distribution of participant lecturers across departments

The summary in Table 4.4 presents the distribution of lecturer participants across different faculties/schools at SU.

Table 4.4: Distribution of lecturers across various schools/faculty

Department	**No. of Respondents**	**Percentage (%)**
Faculty of Information Technology (FIT)	6	35
School of Management and Commerce (SMC)	5	29
School of Finance and Applied Economics (SFAE)	2	12
School of Accountancy (SOA)	1	6
Strathmore Law School (SLS)	1	6
School of Humanities and Social Sciences (SHSS)	1	6
Center for Applied Research and Mathematical Sciences (SHSS)	1	6
TOTAL	**17**	**100**

Results in Table 4.4 shows that 35 % of the respondents were from FIT, 29% from SMC, 12% from SFAE, 6% from SOA, 6% from SLS, 6 % from SHSS and another 6% from CARMS. At least all of the 7 schools/faculties selected participated in the study, which means 100% representation. Therefore the assumption made from these findings is that feedback received from the schools was valid.

(ii) Lecturers' experience on AMS

Lecturers are among the main users hence they interacted with the system on a daily basis in executing their tasks which included updating class attendance records, coursework grades, checking class enrollment as well as mentees' data.

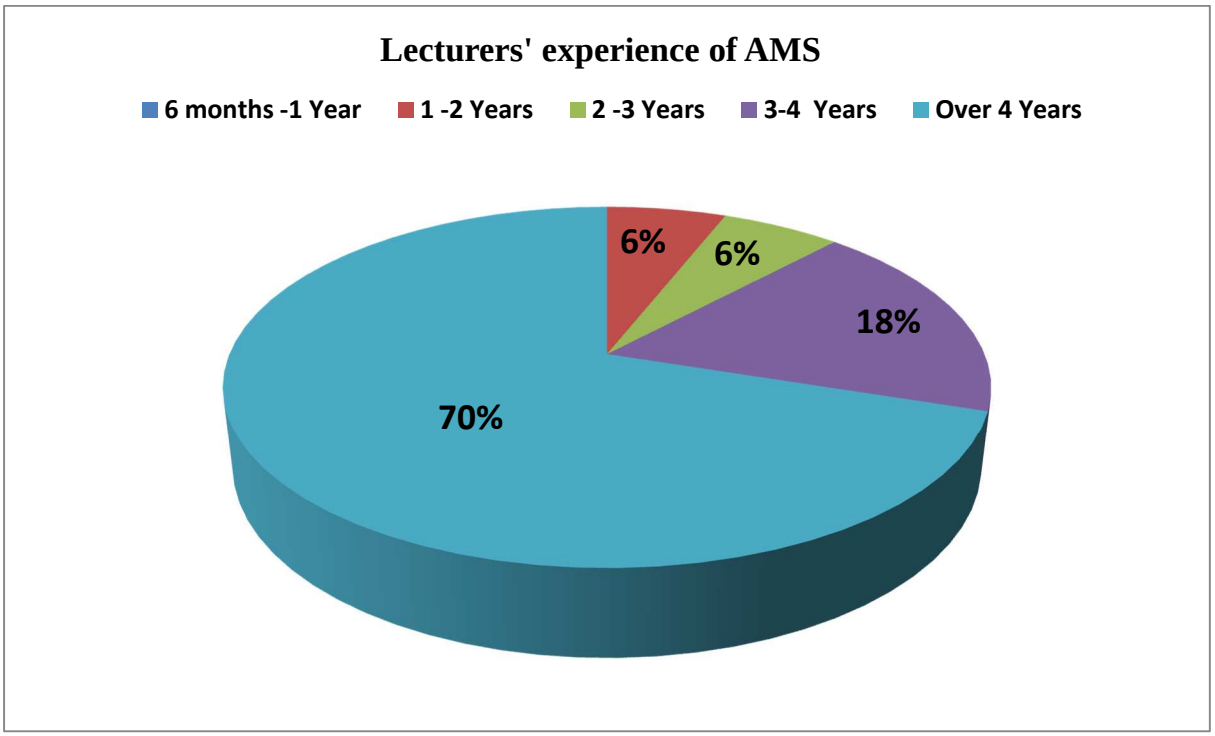

Figure 4.3: Distribution of Lecturers' experience of AMS

Results in Figure 4.3 is a representation of lecturers' experience in using the system whereby the of respondents had been using the system as follows: between 6months-1 year 0%, followed by 1-2 and 2-3 years 6%, followed by 3-4 years 18% and over 4 years 70%. The results show that approximately 94% of the respondents had an experience of over 2 years; which means that e data collected was valid for purposes of informing this study.

(iii) Kinds of data used by lecturers from AMS

According to the results presented in Figure 4.4, lecturers used the following kinds of data to execute their daily and routine tasks in percentage: class enrollment data 65% (11), class attendance data 100% (17), course work data 82% (14), examinations results data 88% (15) and mentee `data 53% (9).

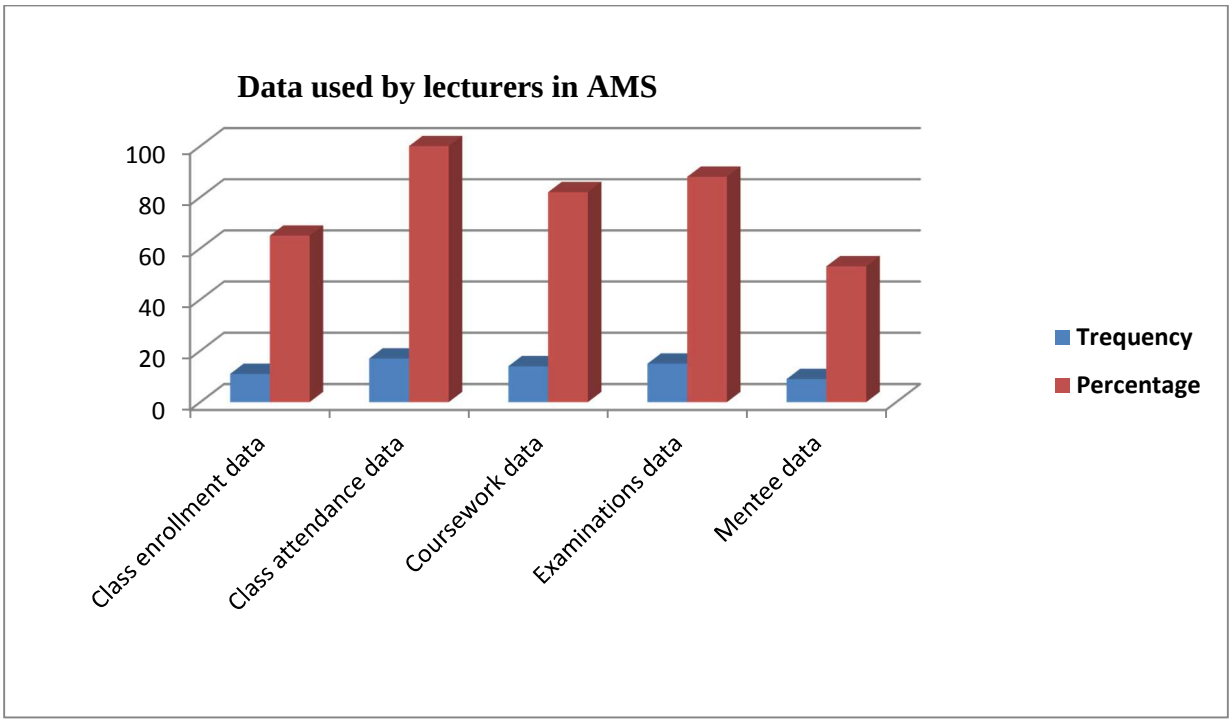

Figure 4.4: Kinds of data used by lecturers from AMS

The results reveal that class attendance; examinations and coursework data are the most frequently used; followed by class enrollment and lastly mentee data. This means that class attendance was among priorities of lecturers' tasks in managing classes since it were recorded on a daily basis. Examinations and coursework data was found to be equally important, being among the core tasks in determining students' performance and academic progress while mentoring came last since lecturers met their mentees occasionally.

4.3.1.3 Student Demographics

This section presents the demographics of student participants including the program(s) in which they were enrolled, year of study, and experience of using the AMS as well as the kind of academic and administrative data they normally use from the system in performing their daily and routine tasks. A total of 256 questionnaires were distributed via email whereby 202 completed questionnaires, the number of responses reduced to 202 which translate to a response rate of 78.9%.

(i) A Distribution of student participants across various programs

The summary in Table 4.5 present results on student participants' distribution across different programs at the faculty in the faculty of Information Technology.

Table 4.5: Distribution of student across various programs

Program	**No. of Respondents**	**Percentage (%)**
Bachelor of Business Information Technology (BBIT)	78	39
Bachelor of Science in Informatics (BIF)	66	33
Bachelor of Science in Telecommunications (BTC)	37	18
Master of Science in Information Technology (MSc.IT)	12	6
Master of Science in Computer-Based Information Systems (MSc.IS)	7	3
Master of Science in Mobile Technology and Innovation (MSc.MTI)	2	1
TOTAL	**202**	**100**

Figure 4.5 is a representation of the students' distribution across different programs which show that: 39% of the students were from BBIT, 33% from BIF, 18% were from BTC, 6% from MSc.IT, 3% from MSc.IS and 1% from MSc.MTI. From the statistics, it was observed, undergraduate students comprise the largest population whereby BBIT students were the largest group at the faculty, followed by BIF, followed by BTC and then postgraduate students i.e. MSc.IT, MSc.IS and MSc.MTI in that order respectively. The representation of all the six programs selected therefore enhances the validity of results.

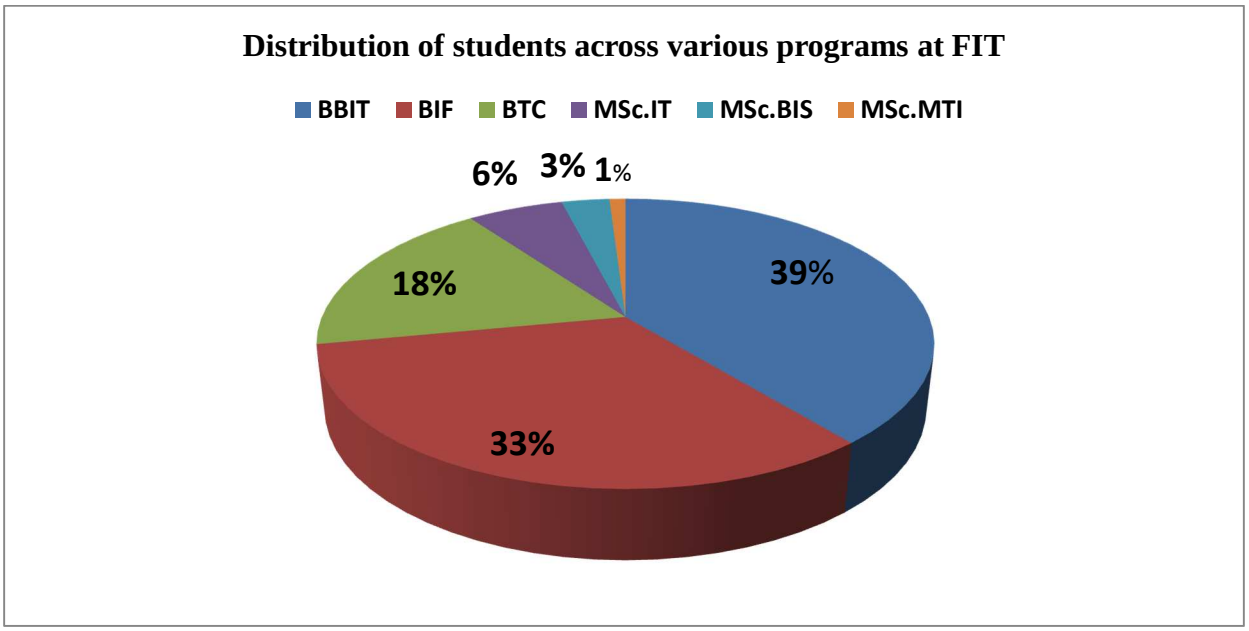

Figure 4.5: Student distribution across different programs in FIT

(ii) Distribution of undergraduate students according to year of study

Figure 4.7 is a representation of the distribution of undergraduate participant i.e. BBIT, BIF and BTC students according to the year of study which was as follows: 1st Year of study 0%, 2nd Year of study 25% (45), 3rd Year of study 27% (49) and 4th Year 48% (87). The results show that students in 4thyearwere the majority, followed by 3rd years and then 2nd years respectively; which

means that data collected was valid since participants had had a substantial user experience of the system.

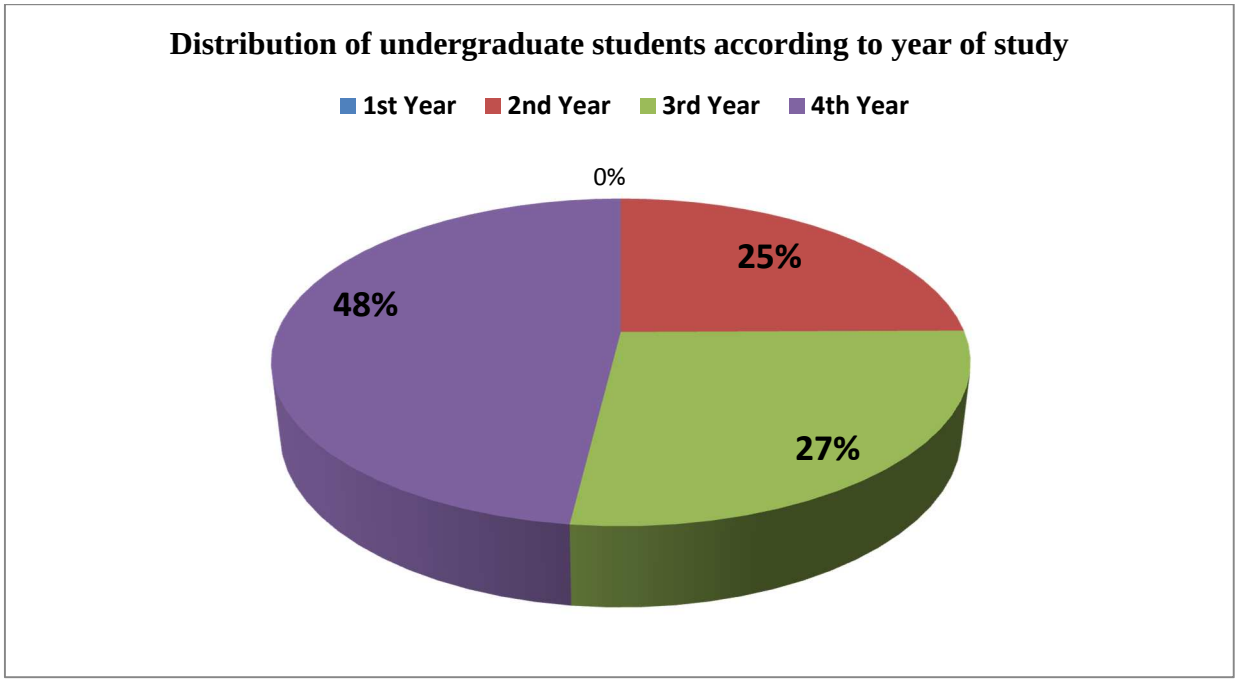

Figure 4.6: Undergraduate students' distribution according to year of study

(iii) Distribution of postgraduate students according to year of study

Figure 4.7 is a representation of the distribution of postgraduate students' participants i.e. MSc.IT, MSc.BIS and MSc.MTI according to the year of study which showed that: 29% were in 1st year while 71% were in 2nd year of study. This means that the results obtained from this category of participants were valid as majority of them were final year students with reasonable experience of AMS.

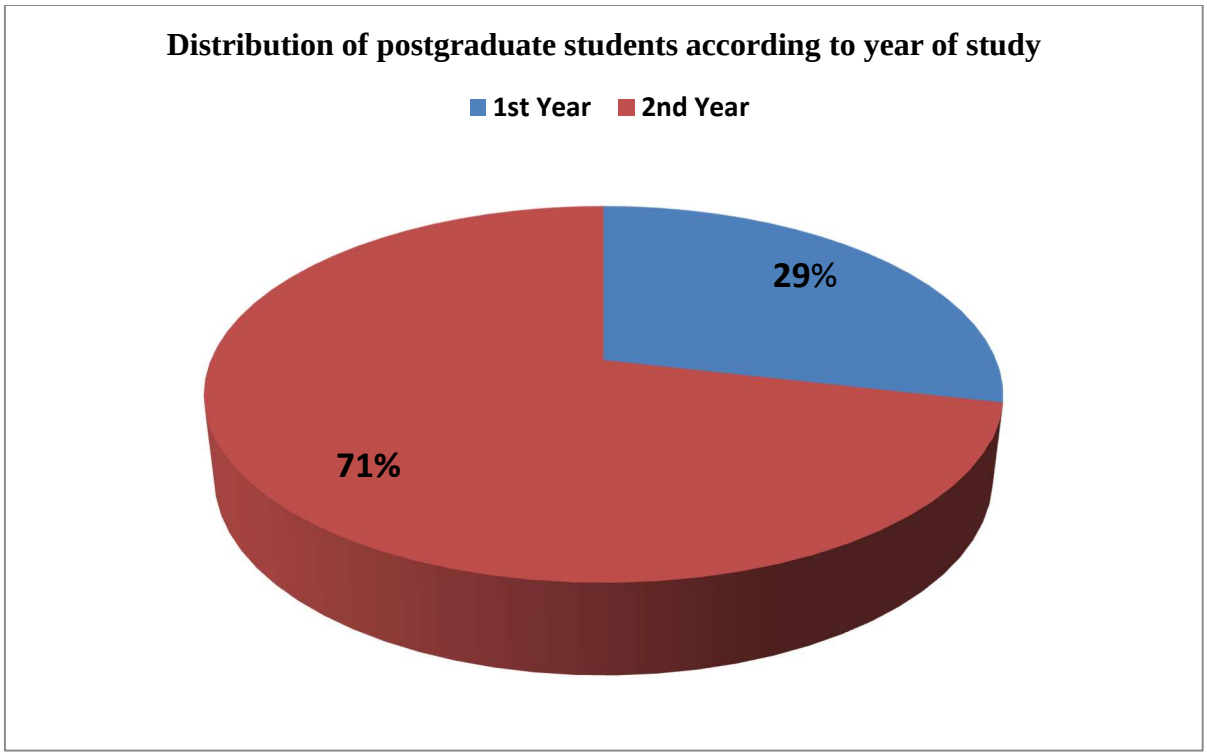

Figure 4.7: Postgraduate students' distribution according to year of study

(iv) Students' experience on AMS

Figure 4.8 below is a representation on student participants' experience in using the system whereby they had been using the system as follows: between 6 months-1 year (2%), followed by 1 year (3%), followed by 2 years (19%), followed by 3 years (24%), and followed by 4 years (12%) and over 4 years (40%). The results show that approximately 95% of the respondents had an experience of more than 2 years; which means that the responses given were valid for purposes of informing this study.

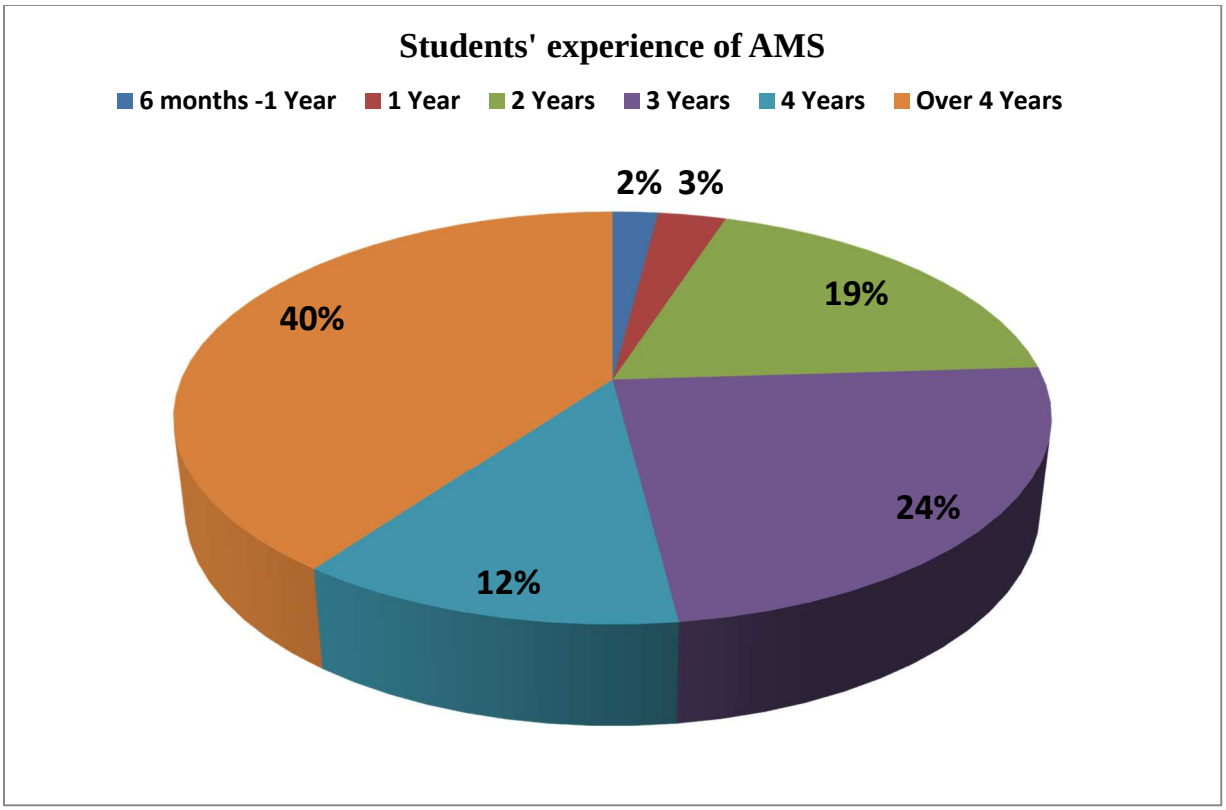

Figure 4.8: Distributed Students' experience of AMS

(v) Kinds of data used by students from AMS

Results represented in Figure 4.9 shows that students used the following kinds of data in their daily tasks: course units data 57% (115), course registration 84% (169), class attendance data 88% (177), academic progress 91% (183), examinations results 88% (177), financial data 86% (174) and mentoring services 23%(46).

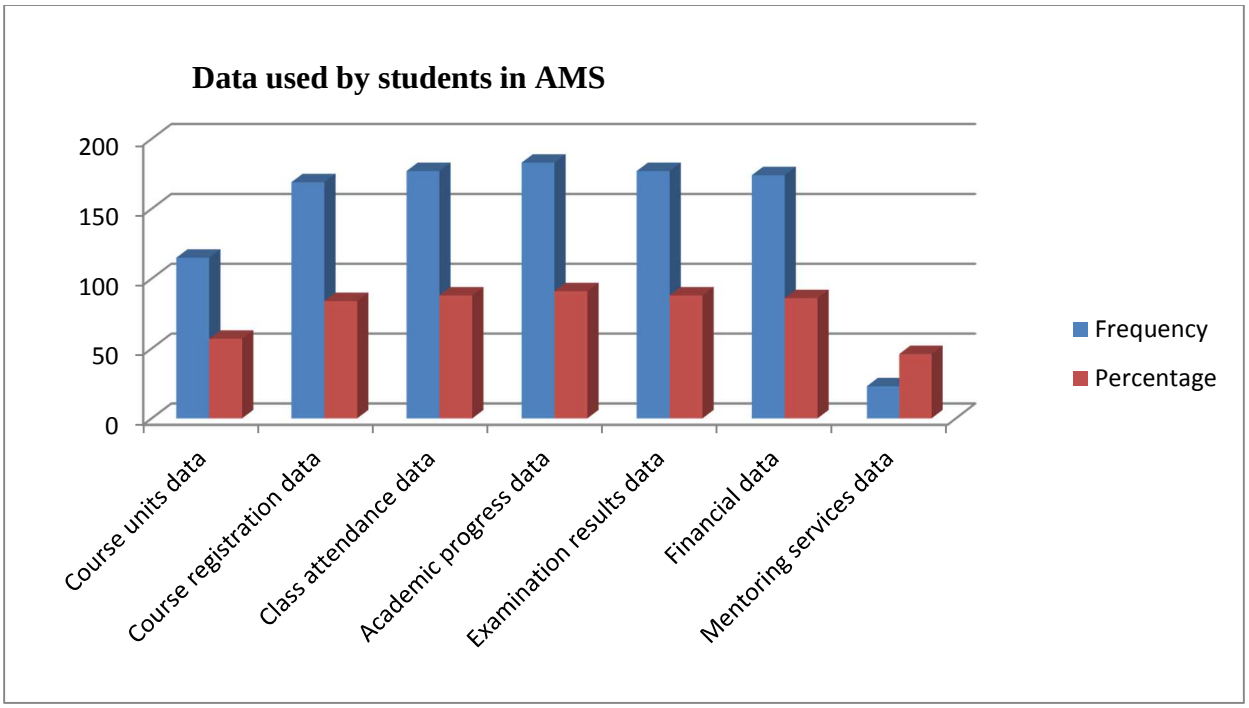

Figure 4.9: Kinds of data used by students from AMS

The results in Figure 4.9 show that students used different kinds of data, both academic and administrative from the system to execute their daily tasks. These included examinations, class attendance, academic progress and financial data which were the most frequently used; followed by enrollment and course syllabus data while mentee data was rated least. This meant that students relied on the system to inspect class attendance records more regularly since classes were attended on a daily basis. It was also observed that examinations data was used frequently since it showed students' academic performance. Financial data was also used regularly for purposes of information and accountability, followed by course syllabus data while mentoring data was rated least it not being among a core tasks of teaching and learning activities.

4.3.1.4 Challenges facing AMS users

This section uses 5 levels of measurement in each survey statement whereby:

1=Strongly Agree while 5=Strongly Disagree

(i) There is adequate accessibility to the system

The summary in Table 4.6 below presents results on the levels of agreement on respondents' perception concerning accessibility of the system.

Table 4.6: Respondents' perception regarding accessibility of AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	14	6
Agree	94	40
Not Certain	38	16
Disagree	71	30
Strongly Disagree	18	8

The results in Figure 4.10 shows that 46% of the respondents agreed that there was adequate access to the system.16% of respondents were uncertain while approximately 38% of respondents said accessibility to the system was not adequate. Part-time lecturers in particular argued that lack of remote access to the system was a major hindrance to completing their tasks. Most of the student respondents also argued that the system did not allow access through mobile platforms whereas it did not run on certain browsers. From the findings therefore, it was observed that lack of remote access to system by part-time lecturers in particular was a major hindrance to executing their tasks.

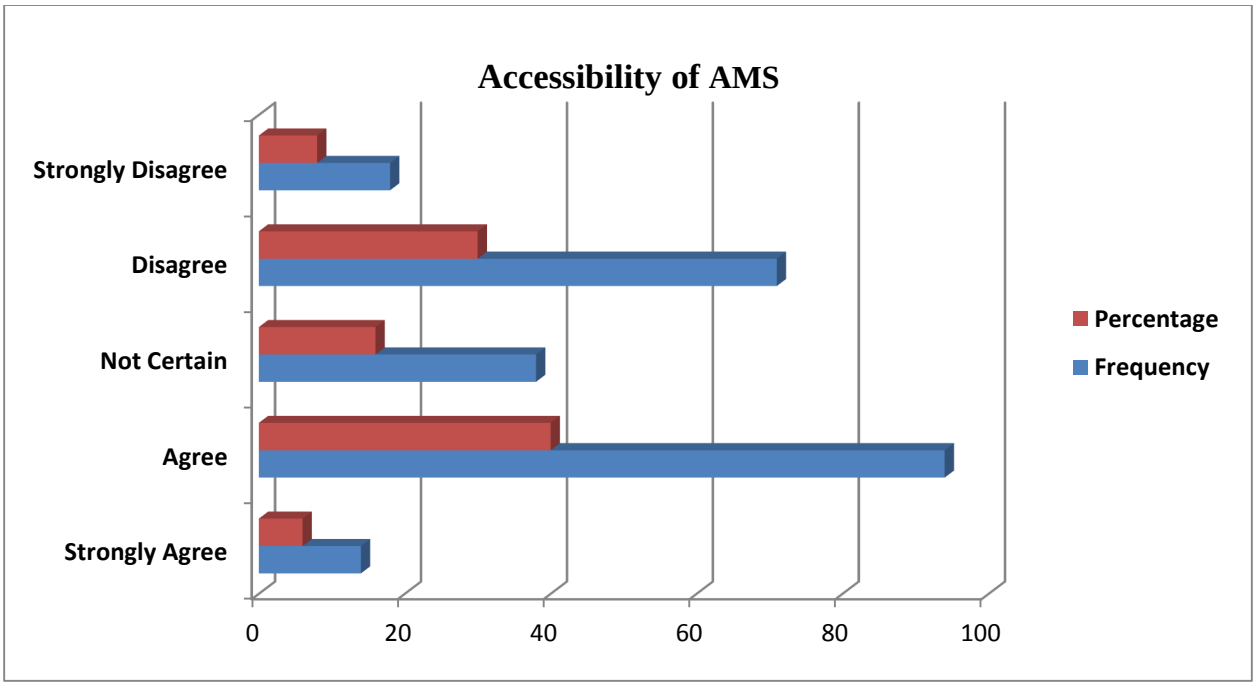

Figure 4.10: Distribution of respondents' perception on accessibility of AMS

(ii) The system is easy to use

The summary in Table 4.7 below shows the results on the levels of agreement on respondents' perception on ease of use of the system.

Table 4.7: Response Frequency Distribution on ease of use of AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	60	25
Agree	154	66
Not certain	9	4
Disagree	4	4
Strongly Disagree	2	1

The results in Figure 4.11 show that 91 % of respondents agreed that the system is easy to use. This therefore means that there is a positive attitude on the usability of the system, which enhances it utilization to enhance productivity of users. However, 4% of respondents were uncertain while 5% of them disagreed that the system was easy to use whereby student respondents argued that self-registration of units at the beginning of each new semester was a problem. Lecturers said that the exam mark entry interface was somewhat unfriendly thus not intuitive. However, in general the results showed that majority of users were satisfied that the system was easy to use.

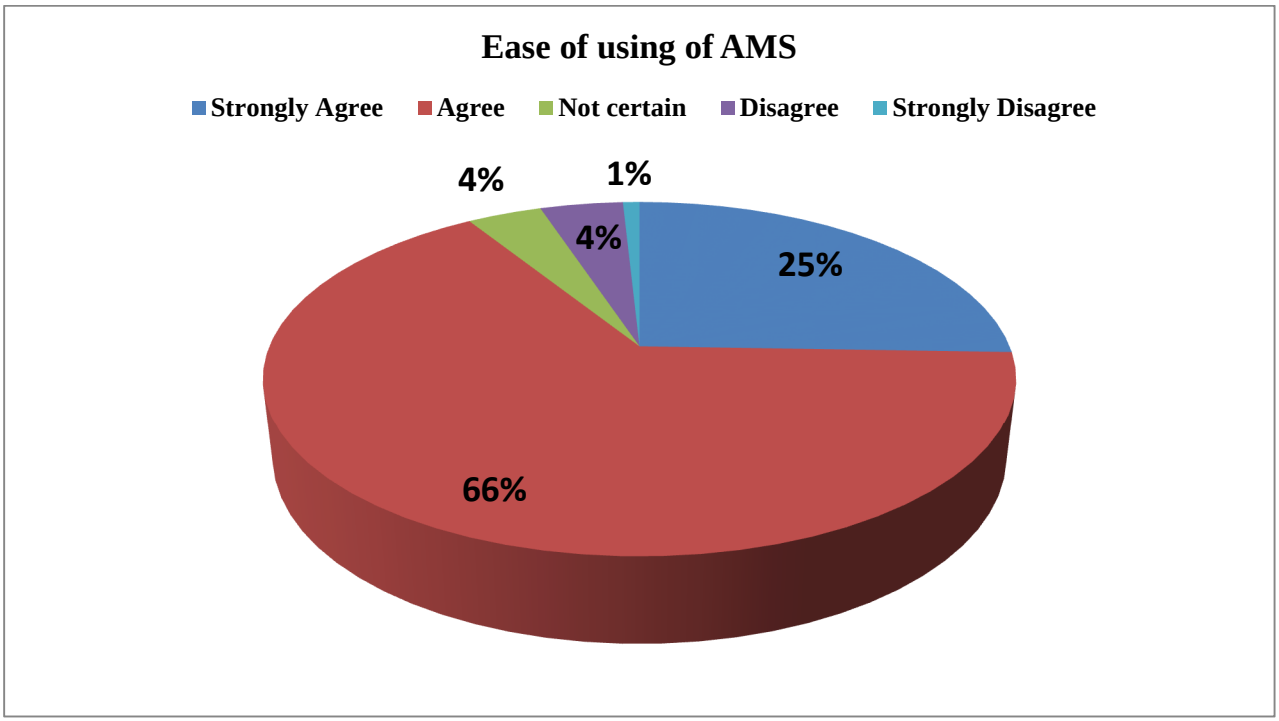

Figure 4.11: Distribution of respondents' perception on ease of using AMS

(iii) The system provides timely response to queries

The summary in Table 4.8 below shows the results on levels of agreement on respondents' perception on system timeliness in responding to queries posed by users.

Table 4.8: Response Frequency Distribution on timeliness of AMS response

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	29	12
Agree	105	45
Not certain	79	34
Disagree	17	7
Strongly Disagree	5	2

The results in Figure 4.12 show that about 67 % of respondents were in agreement that the system response to queries was timely. 34% were uncertain while 9 % of respondents disagreed arguing that the system was not giving timely responses adequately especially in downloading reports thus wasting time. Sometimes, it was argued the system hangs forcing users to re-enter the work done hence delay in processing information.

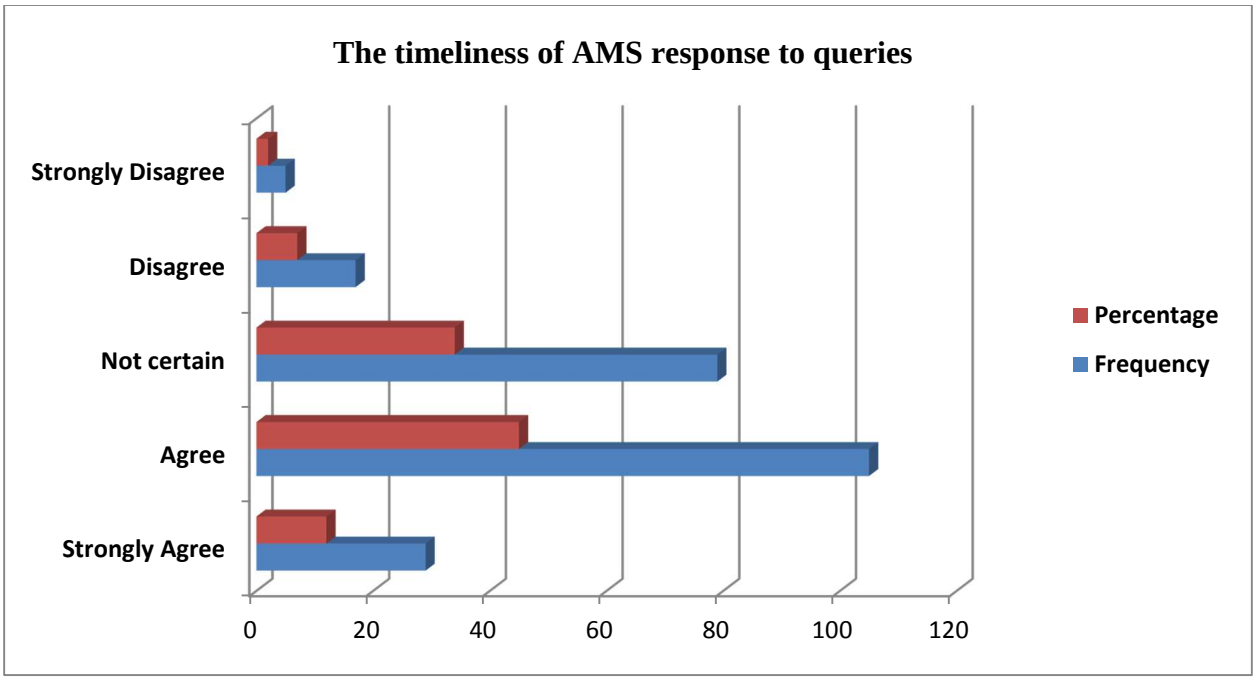

Figure 4.12: Distribution of respondents' perception on timeliness of AMS response

(iv) The system is easy to learn

The summary in Table 4.9 below shows the results on the levels of agreement on respondents' perception concerning ease of learning the system.

Table 4.9: Response Frequency Distribution on ease of learning AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	35	15
Agree	141	60
Not certain	17	7
Disagree	40	17
Strongly Disagree	2	1

The results in Figure 4.13 show that 75% of respondents agreed that the system was easy to learn. 7% were uncertain while 18% disagreed that the AMS was easy to learn especially new administrative staff users arguing that the system was complex to navigate through. It was observed that new staff sought assistance from colleagues and sometimes used trial and error method, which was not ideal hence risky.

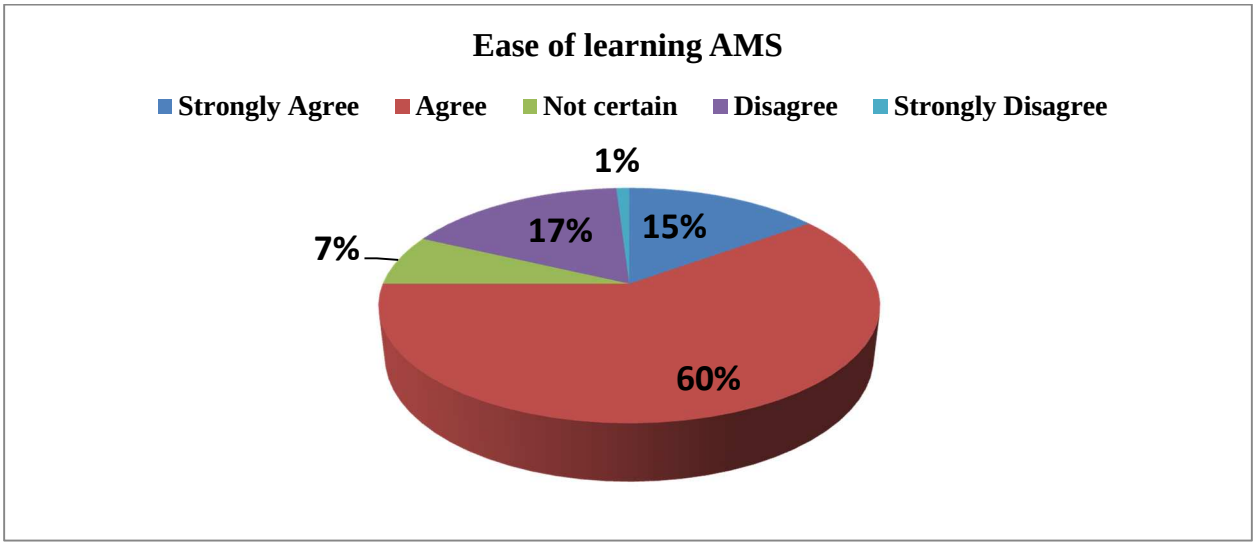

Figure 4.13: Distribution of respondents' perception on the ease of learning AMS

(v) The system is flexible in accommodating my needs

The summary in Table 4.10 shows the results on levels of agreement on respondents' perception concerning the flexibility of the system in accommodating their needs.

Table 4.10: Response Frequency Distribution on flexibility of AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	29	8
Agree	75	32

Not certain	101	43
Disagree	33	14
Strongly Disagree	7	3

The results in figure 4.14 show that approximately 40% of the respondents were in agreement that the system was flexible in accommodating their needs, 43% were uncertain while approximately 17% of the respondents particularly student users disagreed arguing that the system was not flexible. It was argued that the system did not allow users to reset their log in passwords from outside campus. It was also observed that the system lacked features of interactivity such as alerts on expiry of passwords, direct uploading of student profile photos and update contacts in the system. Administrators in particular argued that the system did not have features for downloading student contacts i.e. email and phone contacts to ease communication.

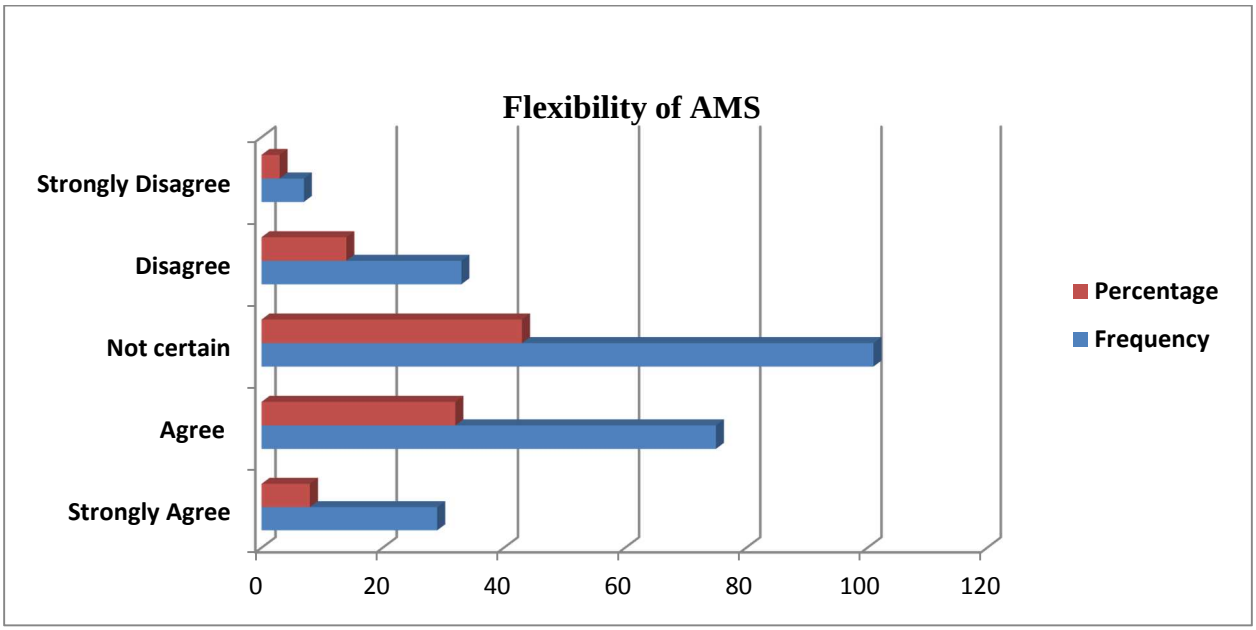

Figure 4.14: Distribution of respondents' perception on flexibility of AMS

(vi) The system is reliable

The summary in Table 4.11 below shows the results on levels of agreement on respondents' perception concerning reliability of the system

Table 4.11: Response Frequency on reliability of AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	14	6
Agree	141	60
Not certain	27	11
Disagree	47	20
Strongly Disagree	6	3

The results in Figure 4.15 show that 66% of the respondents were in agreement that the system was reliable, 11% were uncertain while approximately 23% disagreed that the system was reliable, especially student respondents arguing that in some cases, it was not possible for students to view all previously attempted units since data in the system sometimes kept changing from time to time. For instance, it was observed that at times exam results would be available while at some point they were not i.e. status kept changing. Also the system did not display failed retake exam results but, only showed the affected units as "pending" hence students could be able to view their score. Some students' academic progress reports and marks were jumbled in more than one account especially for exempt students as well as those who had transferred to different mode of study i.e. full time to evening and vice versa, even within the same course/program. Exempt students'

records were not well merged since the lists of completed units were incoherent hence data lacked consistency. Financial data displayed were ambiguous hence student statements were not quite true especially in situations where the balances accumulated interest. Administrator respondents also argued that past graduation lists and financial statements were not very accurate as the data kept changing. These issues were attributed to system integration problems.

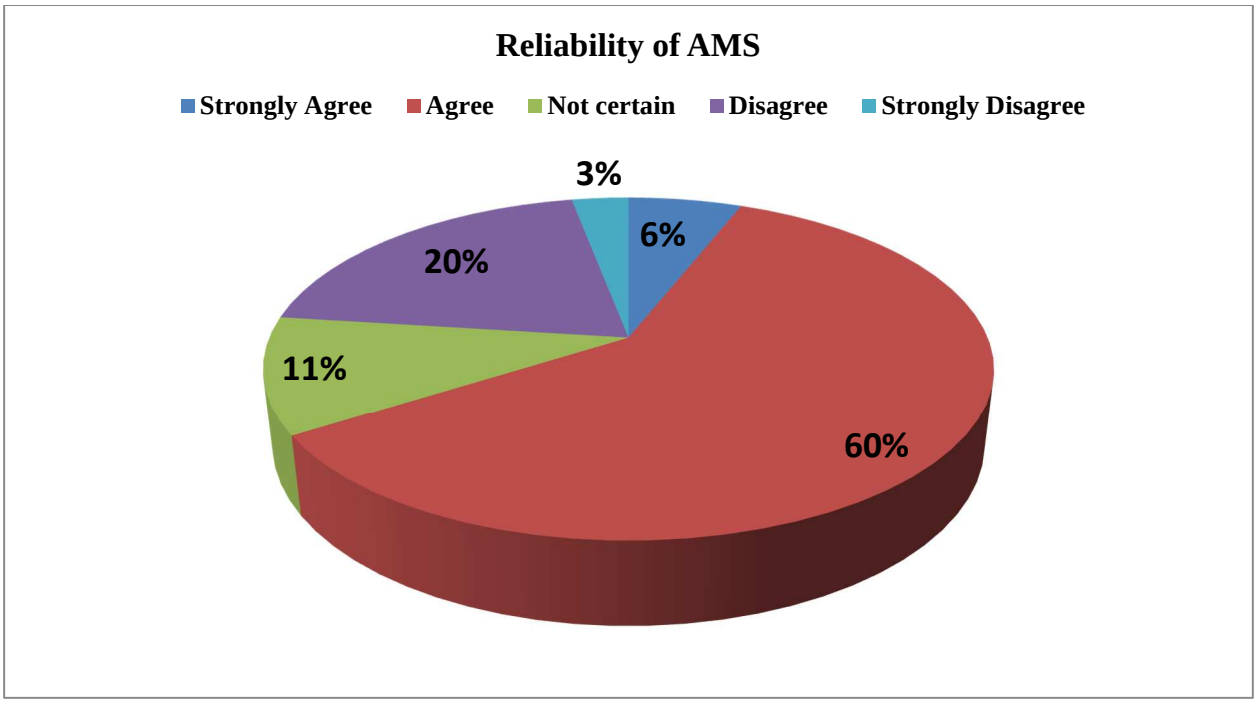

Figure 4.15: Distribution of respondents' perception on reliability of AMS

(vii) Security measures taken regarding use of the system are adequate?

The summary in Table 4.12 shows the results on the levels of agreement on respondents' perception concerning adequacy of security measures taken concerning the use of the system.

Table 4.12: Response Frequency Distribution on security of AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	29	12
Agree	129	55
Not certain	65	28
Disagree	8	3
Strongly Disagree	4	2

The results Figure. 4.16 show that 67% of the respondents were in agreement that security measures taken regarding system use were adequate. 29% of respondents were uncertain while 5% of respondents disagreed arguing that users used the same password to log into the network as well as the AMS, which was not a good practice regarding password policy as this posed the risk of unauthorized access. It was also reported that senior staff shared passwords with personal assistants to update records in the system hence user impersonation.

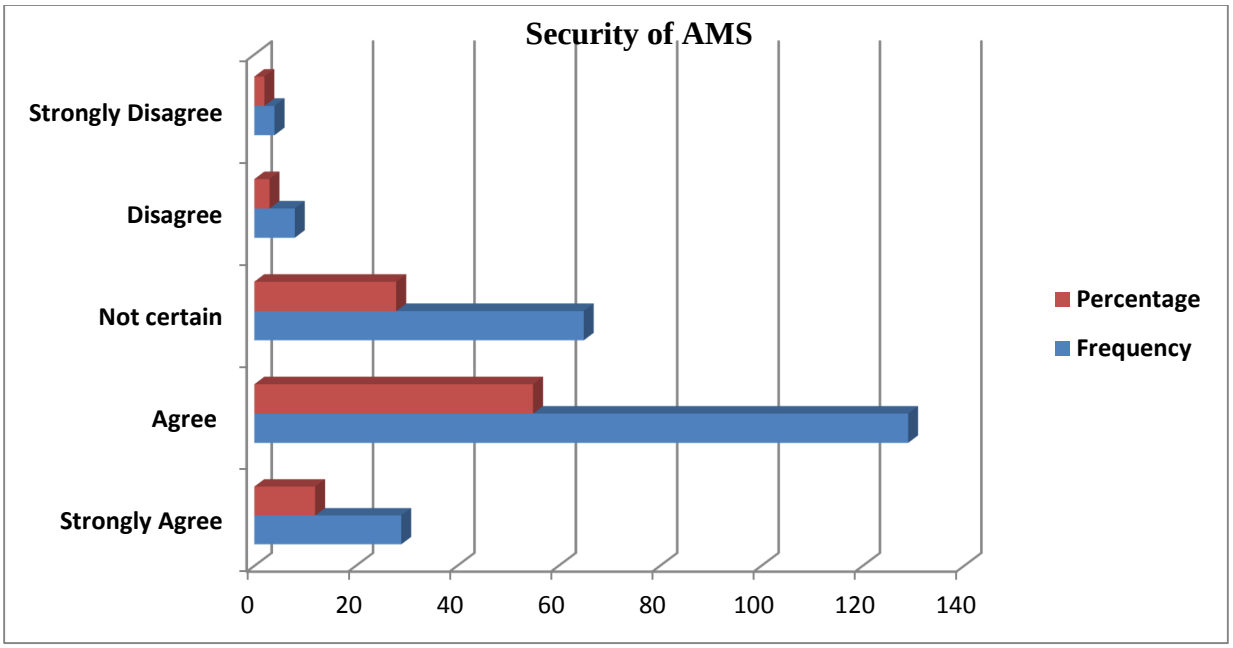

Figure 4.16: Distribution of respondents' perception on security of AMS

(viii) The data generated in the system is well formatted

The summary in Table 4.13 below shows the results on levels of agreement on respondents' perception concerning the format of data generated in the system.

Table 4.13: Response Frequency Distribution on data format in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	44	19
Agree	155	66
Not certain	19	8
Disagree	13	5
Strongly Disagree	4	2

The results in Figure 4.17 show that 85 % of the respondents were in agreement that data generated in the system was well formatted especially administrators, saying that reports downloaded from the system could be printed in either pdf or excel format. However, 8% of respondents especially students were uncertain, while 7% disagreed arguing that the data should also be presented in form of visual representation using graphs including pie-charts and bar-graphs. In particular, the coursework data layout just looked like an excel sheet hence needed to be improved. But, in general according to the survey findings the data format seemed satisfactory which means reports generated were presentable thus motivating especially for staff users.

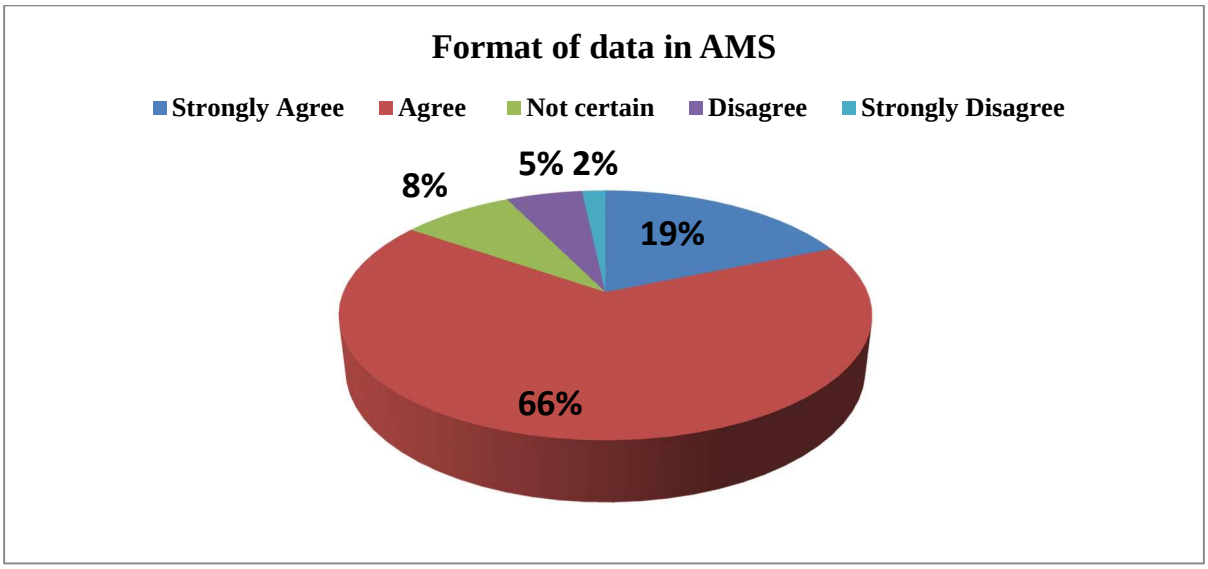

Figure 4.17: Distribution of respondents' perception on data format in AMS

(ix) The data generated in the system is timely

The summary in Table 4.14 shows results on the levels of agreement on respondents' perception concerning the timeliness of data in the system.

Table 4.14: Response Frequency Distribution on timeliness of data in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	30	13
Agree	146	62
Not certain	34	14
Disagree	21	9
Strongly Disagree	4	2

The results in Figure 4.18 show that that 75% of the respondents were in agreement that data generated in the system was timely. 14% were uncertain while 11% disagreed particularly student respondents arguing that financial data, coursework grades and class attendance records were not updated in the system promptly.

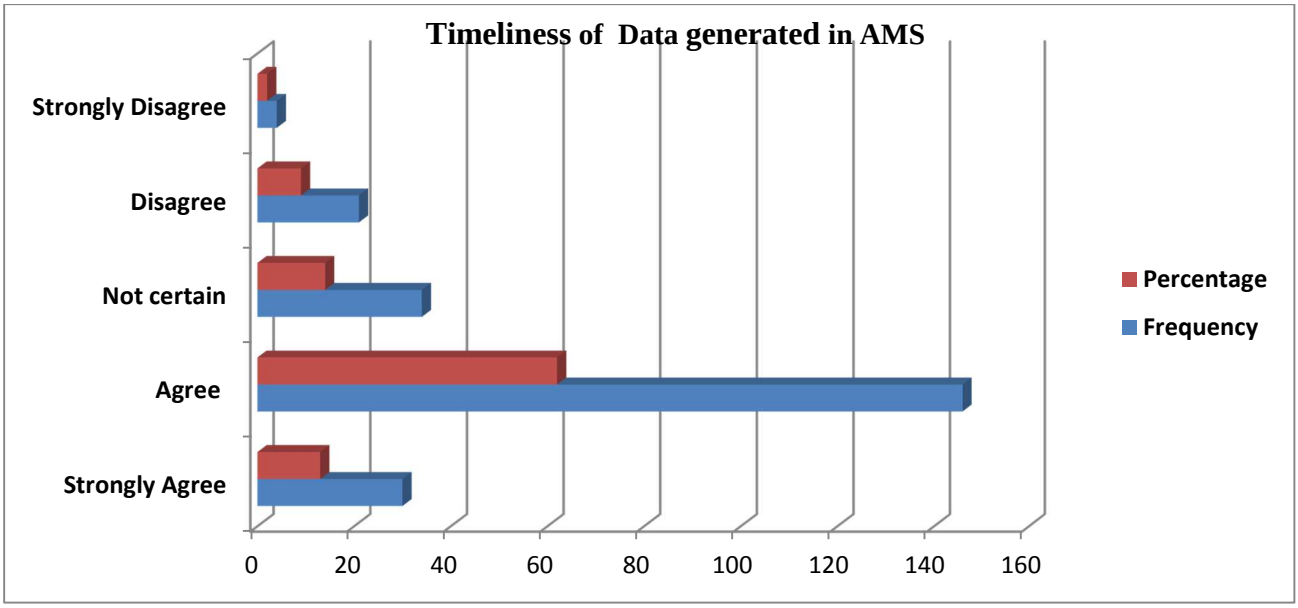

Figure 4.18: Distribution of respondents' perception on timeliness of data in AMS

(x) The data generated in the system is accurate

The summary in Table 4.15 below shows results on the levels of agreement on respondents' perception concerning the accuracy of the data in the system.

Table 4.15: Response Frequency Distribution on accuracy of data in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	21	9
Agree	120	51
Not certain	16	7
Disagree	73	31
Strongly Disagree	5	2

The results in Figure 4.19show that 60% of the respondents were in agreement that the data generated in the system was accurate, 7% were not certain while about33% of the respondents disagreed that data in AMS was accurate especially student respondents who argued that financial data and academic progress reports/records were not accurate enough as most of the data had errors. As it may be observed from the results, approximately 40% of the respondents

were not satisfied with the accuracy of data in the system thus compromising users satisfaction.

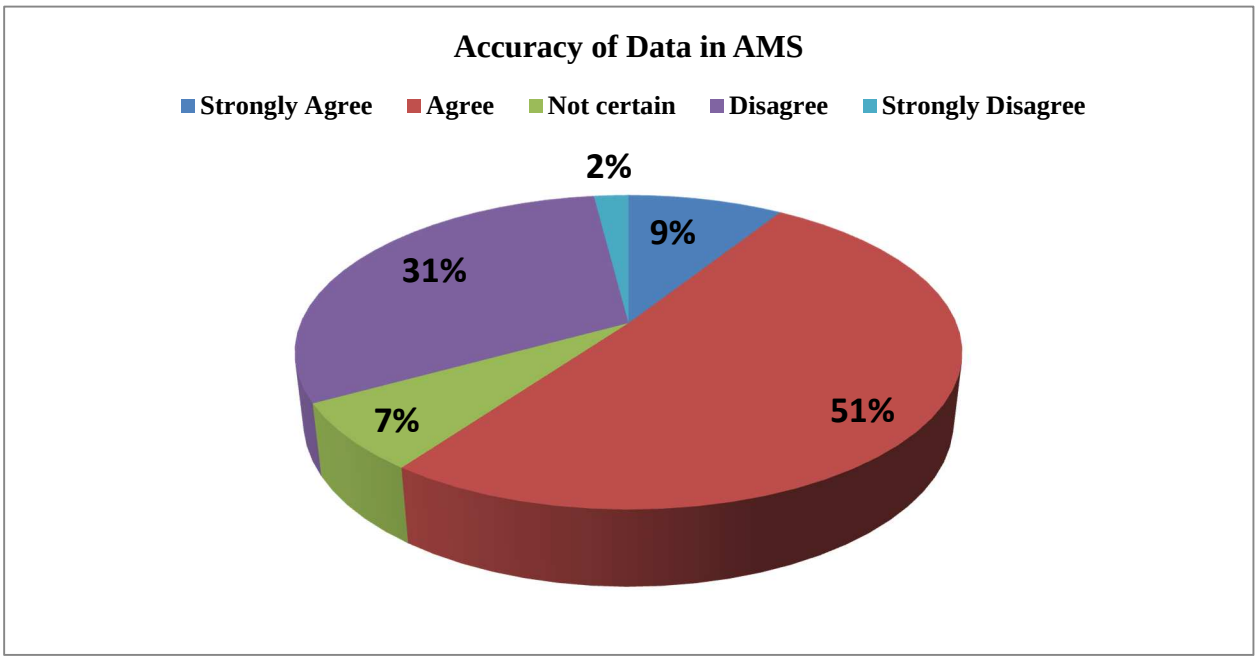

Figure 4.19: Distribution of respondents' perception on accuracy of data in AMS

(xi) The data generated in the system is relevant to my needs

The summary in Table 4.16 shows results on the levels of agreement on respondents' perception on the relevancy of data generated in the system to users' needs.

Table 4.16: Response Frequency Distribution on the relevancy of data in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	49	21
Agree	172	73
Not certain	10	4
Disagree	4	2

Strongly Disagree	0	0

The results in Figure 4.20 show that94% of respondents were in agreement that data generated in the system was relevant to their needs. 4% were uncertain while 2 % disagreed arguing that sometimes data was not up to date especially class attendance records, coursework grades and financial records as it took so long to be updated in the system.

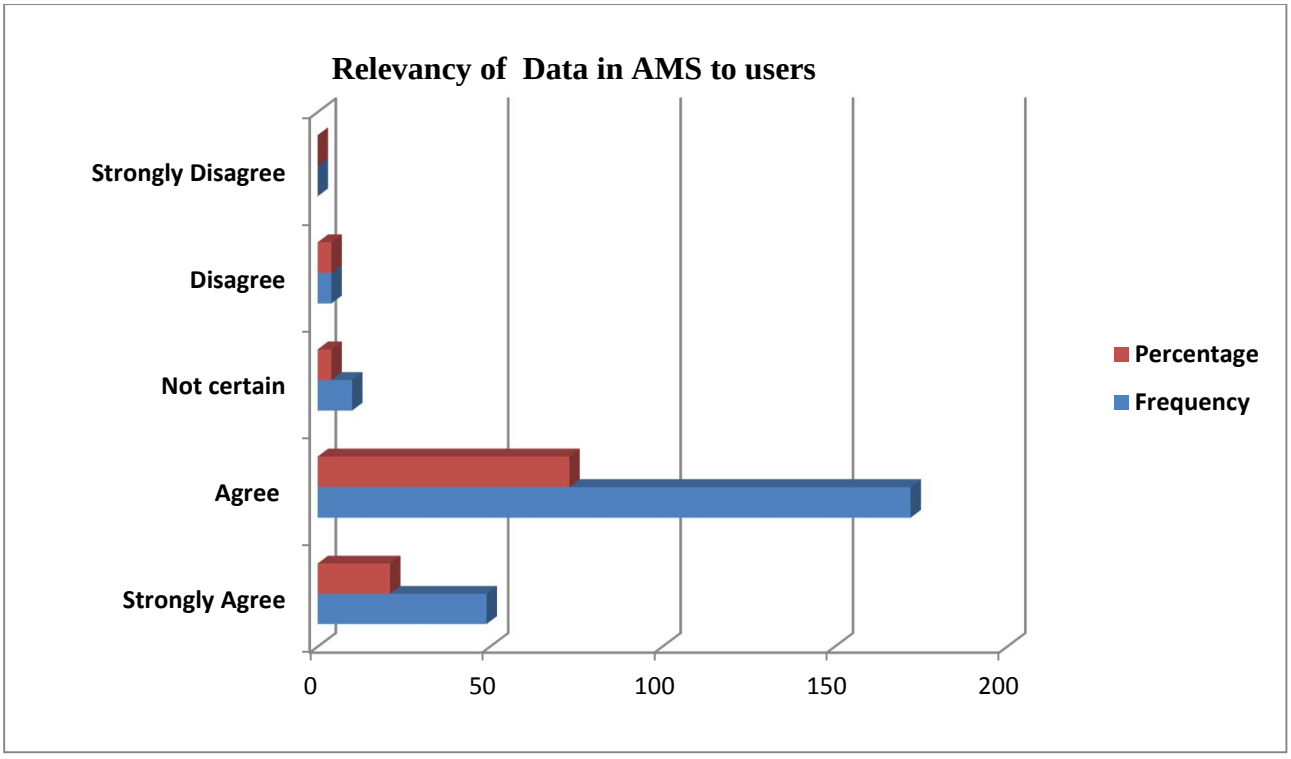

Figure 4.20: Distribution of respondents' perception on relevance of data in AMS

(xii) The data generated from the system is complete

The summary in Table 4.17 below show on levels of agreement on respondents' perception concerning the completeness of data generated in the system.

Table 4.17: Response Frequency Distribution on completeness of data in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	9	4
Agree	129	55
Not certain	49	21
Disagree	41	17
Strongly Disagree	7	3

The results in Figure 4.21 show that approximately 59% of the respondents agreed that data generated in the system was complete, 21% were uncertain while 20% disagreed that the data was complete. Administrators and student respondents in particular argued that there was no complete financial breakdown on each individual credit/debit on their statement to show how much was charged and for which expense, except cumulative blanket figures indicated on the statement hence no accountability. Also it was observed that the system did not display details of deregistration of a unit(s) i.e. who made the change and the date a unit was de-registered for purposes of reference. Students were unable to view results (scores) on failed retake exams but, affected units only appeared as pending.

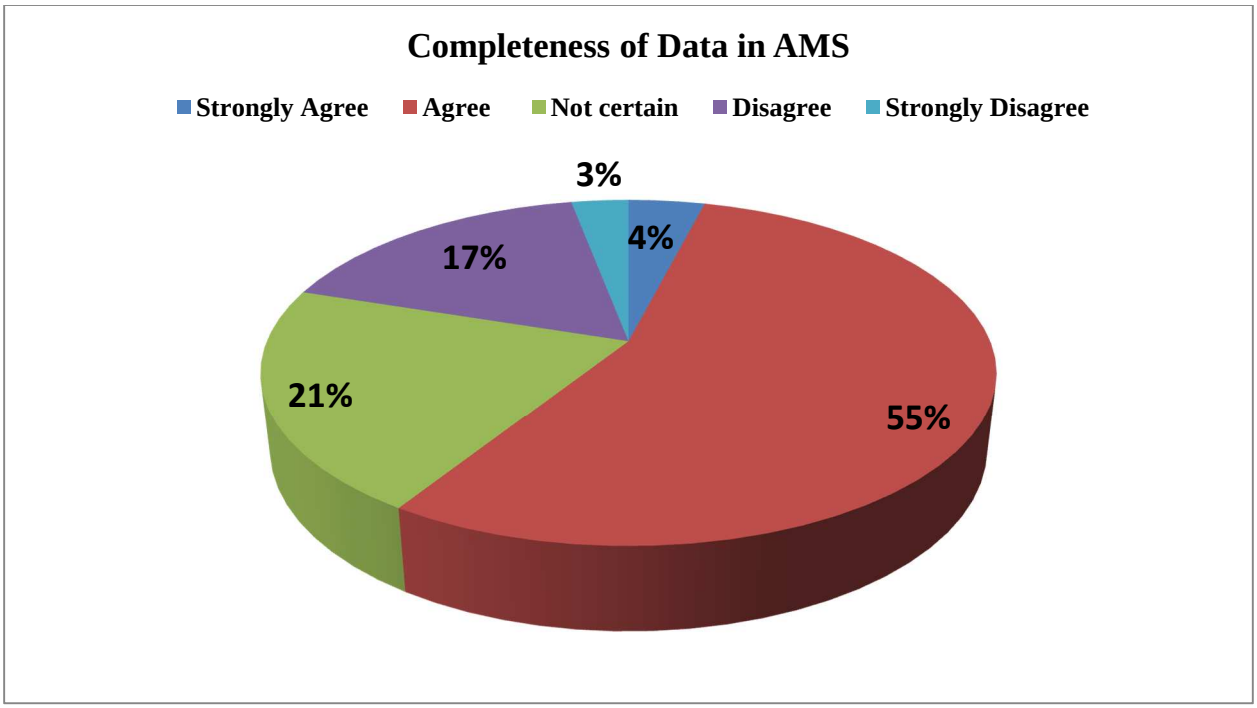

Figure 4.21: Distribution of respondents' perception on completeness of data in AMS

(xiii) The data generated in the system is well integrated

The summary in Table 4.18 show the levels of agreement on respondents' perception concerning integration of data in the system.

Table 4.18: Response Frequency Distribution on data integration in AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	8	3
Agree	116	49
Not certain	35	15
Disagree	72	30
Strongly Disagree	8	3

The results in Figure 4.22 show that approximately 52% of the respondents agreed that data in the system was well integrated, 15% were uncertain while 33% of the respondents disagreed arguing that the inaccuracy of financial records and academic records in the system was an indication of poor system integration of data especially with the financial module. There was an overwhelming concern by student respondents about inconsistencies of data in the system, which was sometimes misleading and confusing particularly on fees balances as well as on the pending units. It was reported that some of the units already passed were still appearing as pending in the system; particularly for students who transferred across programs or mode of study hence, an indication of integration problems. Administrators who argued that errors on student invoices in the system were corrected manually, which was complex thus compromising operational efficiency.

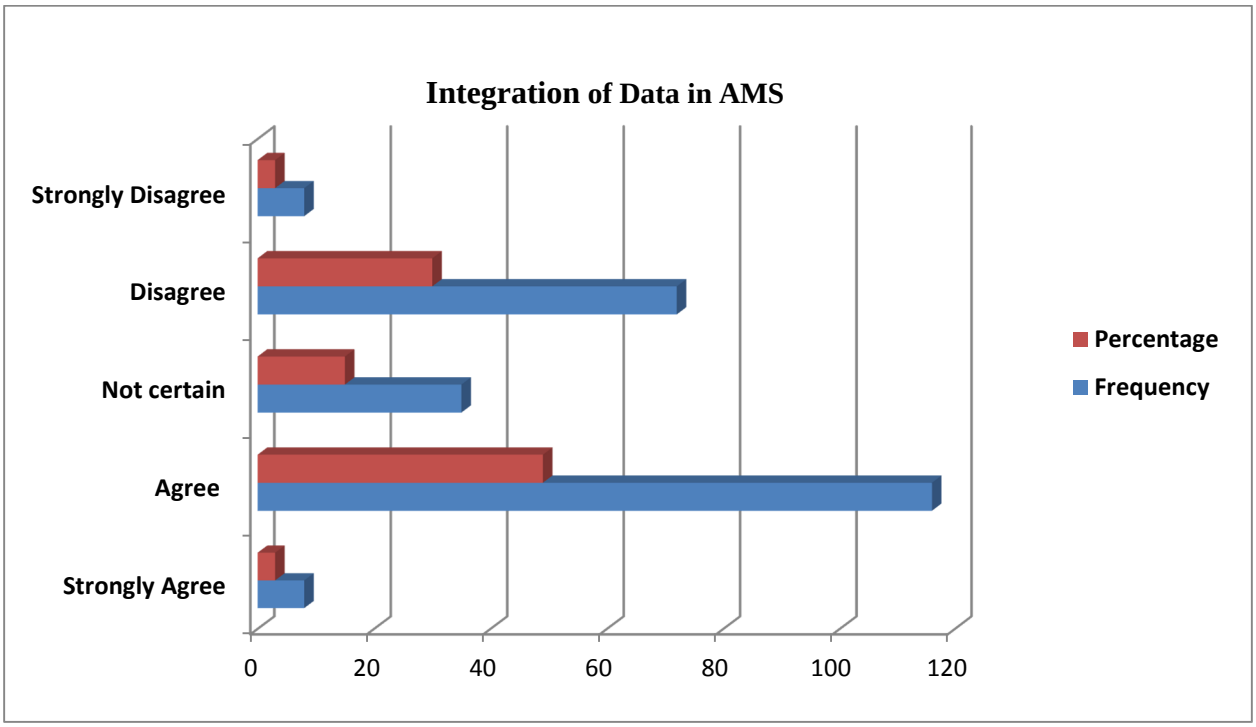

Figure 4.22: Distribution of respondents' perception on data integration in AMS

(xiv) Induction and refresher training(s) on the system are provided to users promptly

The summary in Table 4.19 shows results on the levels of agreement on respondents' perception concerning provision of induction and refresher trainings on the system by the IT support team.

Table 4.19: Response Frequency Distribution on induction and refresher training

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	24	10
Agree	96	41
Not Certain	47	20
Disagree	54	23
Strongly Disagree	14	6

According to the results in Figure 4.23, approximately 51% of the respondents agreed that trainings on system use were offered, 20% were uncertain while 29% disagreed that training was offered promptly; arguing that users, especially new staff and students were not offered adequate induction and or refresher trainings. It was argued that changes were implemented in the system but users were not aware hence this resulted to underutilization of the system. It was observed that some of the users were using trial and error method to navigate through since they were not familiar with the system.

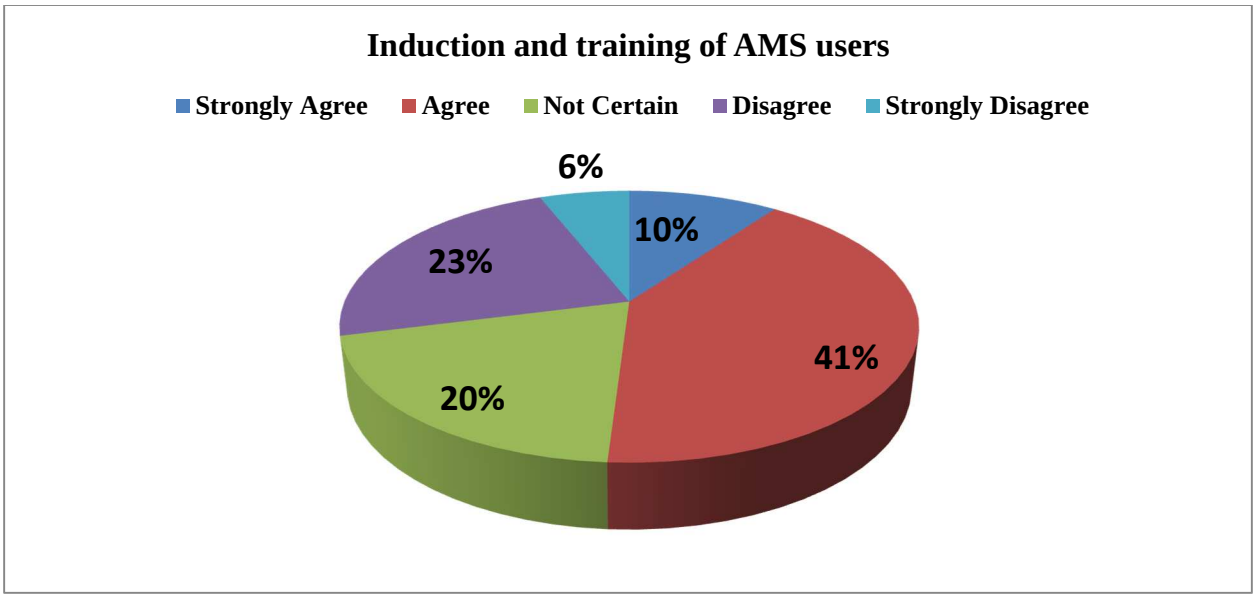

Figure 4.23: Distribution of respondents' perception on induction and training on AMS

(xv) I normally receive adequate support in using AMS to fulfill my tasks

The summary in Table 4.20 shows results on levels of agreement on respondents' perception concerning the adequacy of the support provided by AMS support team in fulfilling users' tasks.

Table 4.20: Respondents' Frequency Distribution on user support by AMS team

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	24	6
Agree	153	55
Not certain	34	13
Disagree	20	25
Strongly Disagree	4	1

The results in Figure 4.24 show that approximately 61% of the respondents agreed that they received adequate support in fulfilling their tasks, 13% of respondents were uncertain while 26% disagreed arguing that system support services provided were not adequate. It was observed that users' requests, especially from administrators in most cases took several days and sometimes weeks to be attended to. This prompted delays in executing certain tasks thus compromising operational efficiency as quality of service to customers. Students also argued that errors reported in the system took so long to be fixed.

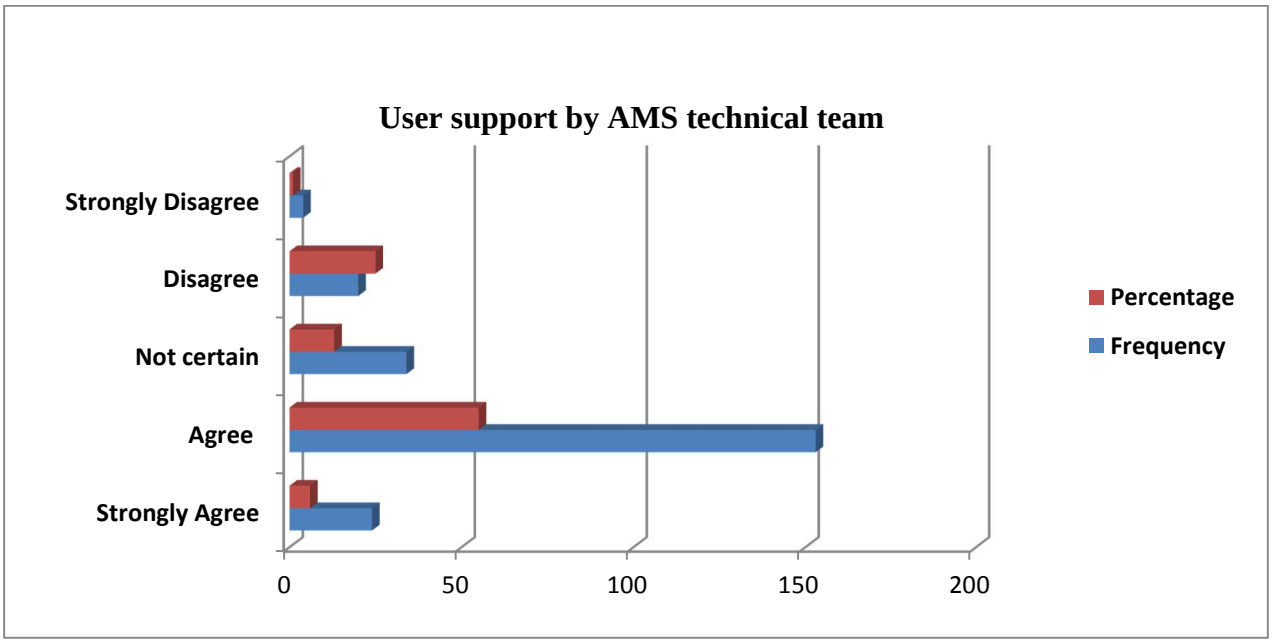

Figure 4.24: Distribution of respondents' perception on AMS team support

(xvi) I use the system frequently in executing my tasks

The summary in Table 4.21 shows results of the levels of agreement on respondents' perception concerning their frequency of using of AMS.

Table 4.21: Respondents' Frequency Distribution on the frequency of AMS use

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	71	30
Agree	106	45
Not certain	0	0
Disagree	54	23
Strongly Disagree	4	2

The results in Figure 4.25 show that approximately 75% of the respondents used the system frequently to execute their tasks especially administrators, full-time lecturers and students. However, 25% of respondents disagreed especially part-time lecturers, arguing that they were off campus most of the time while there was no remote access to the system. It was observed that the degree of system use by part-time lecturers was lower as compared to the rest of the users.

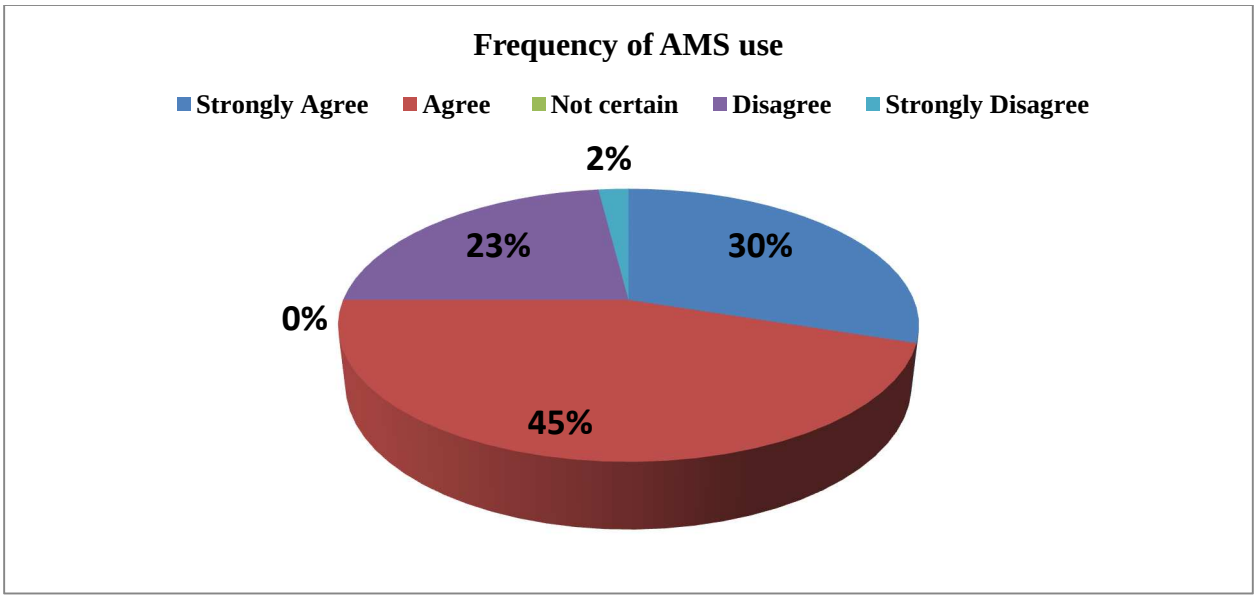

Figure 4.25: Distribution of responses on frequency of AMS use

(xvii) I am satisfied with the service(s)provided by the system

The summary in Table 4.22 shows results of the levels of agreement on respondents' responses concerning users' satisfaction with AMS.

Table 4.22: Respondents' Frequency Distribution on users' satisfaction with AMS

Response item	**Frequency**	**Percentage (%)**
Strongly Agree	24	10
Agree	117	50
Not certain	47	20
Disagree	47	20
Strongly Disagree	0	0

The results in Figure 4.26 show that approximately 60% of the respondents were satisfied with the system especially staff users saying the system greatly helped them in executing their daily tasks,20% were uncertain while another20% of the respondents particularly students disagreed arguing that a lot more needed to be done to improve the system.

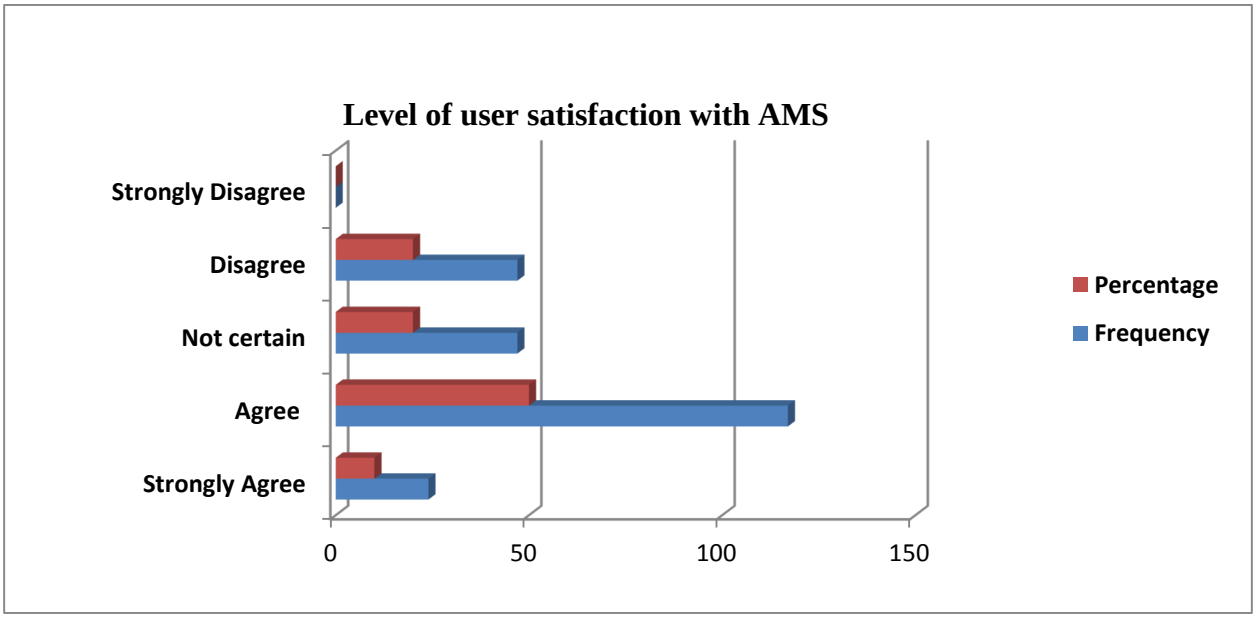

Figure 4.26: Distribution of response on the frequency of AMS use

4.3.1.5 Frequency test results on variables of the Research Model

The summary in Table 4.23 presents results of the frequency and scores in percentage and average (%) of the various categories of variables of the research model (n=235):

Table 4.23: Response Frequency Distribution on the variables of the Research Model

Dependent Variables	Individual Variables	Frequency	Percentage (%)	Individual measure contribution (%)	Average score (%)
System Quality	Accessibility	189	80	8.92	**58**
	Ease of learning	90	38	4.23	
	Ease of use	150	64	7.13	
	Flexibility	99	42	4.68	
	Integration	95	40	4.46	
	Reliability	171	73	8.15	
	Response time	148	63	7.02	
	Navigation	109	46	5.13	
	Security	175	74	8.25	
Information Quality	Availability	158	67	7.42	**53**
	Accuracy	185	79	8.75	
	Usability	91	39	4.32	
	Understandability	130	55	6.09	
	Relevance	127	54	5.98	
	Format	53	23	2.55	
	Completeness	124	53	5.87	
	Reliability	130	55	6.09	
	Timeliness	124	53	5.87	
Service Quality	Assurance	116	49	7.02	**50**
	Tangibles	49	21	3	
	Competence	87	37	5.3	
	Responsiveness	119	51	7.3	
	Accuracy	147	63	9.02	
	Reliability	139	59	8.45	
	Training	140	69	9.88	
System use	Frequency of use	127	54	6.06	**43**
	Degree of use	122	52	5.83	
	Usage pattern	77	33	3.7	
	Time of use	87	37	4.15	
	Number of accesses	100	43	4.82	
	Number of queries	78	33	3.7	
	Purpose of use	129	55	6.17	
	Number of reports generated	80	34	3.81	

Dependent Variables	Individual Variables	Frequency	Percentage (%)	Individual measure contribution (%)	Average score (%)
Users satisfaction	Adequacy	95	40	6.7	**53**
	Effectiveness	154	66	11.06	
	Efficiency	168	71	11.9	
	Information satisfaction	138	59	9.89	
	System satisfaction	83	35	5.87	
	Overall satisfaction	106	45	7.54	
AMS success	Quality decision making	145	61	8.78	**51**
	Timely decision making	153	65	9.36	
	Decision effectiveness	119	51	7.34	
	Improved employee productivity	83	35	5.04	
	Improved organization performance	117	50	7.2	
	Increased cost reduction	77	33	4.75	
	Improved customer satisfaction	136	59	8.5	

(i) System Quality

The results presented in Table 4-23 shows specific measures of the system quality category, whose frequency and percentage scores were as follows: accessibility 80% (189), ease of learning 38% (90),ease of use 64% (150), flexibility 42% (99), integration 40% (95),reliability 73% (171), response time 63% (148), Navigation 46% (109) and security 74% (175). As it may be observed from the results, 5 out of 9 measures scored above 50%, which confirmed that the system quality category/variable was relevant in the SU context; whereby individual metric contributions are shown with an average score of 58%.

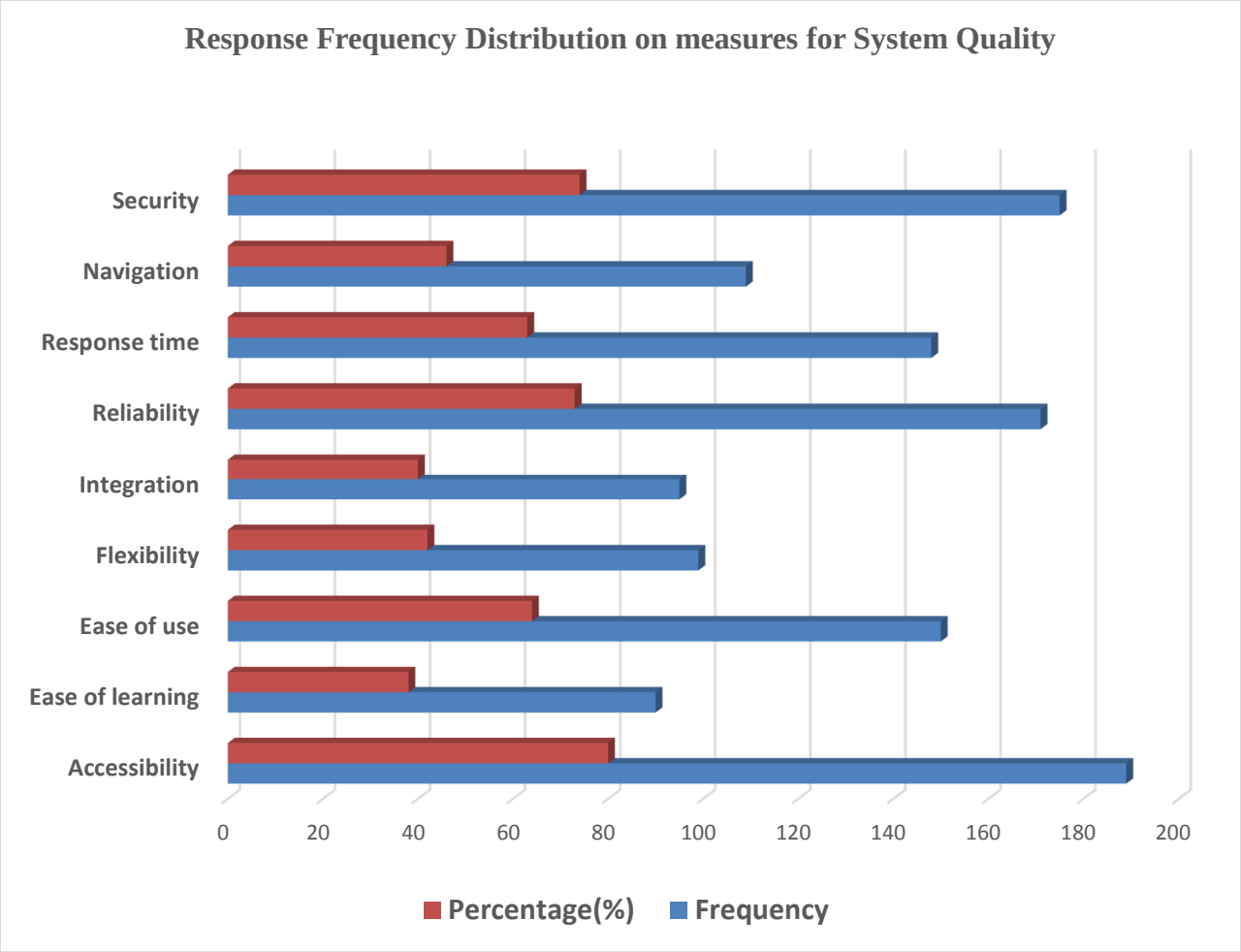

Figure 4.27: Frequency Distribution of responses on metrics of System Quality

(ii) Information Quality

The results presented in Table 4.23 shows specific measures of the information quality category, whose frequency and percentage scores were as follows: availability 67% (158), accuracy 79% (185),usability 39% (91), understandability 55% (130), relevance 54% (127), format 23% (53), completeness 53% (124), reliability 55% (130) and timeliness 53% (124). As it may be observed from the results, 7 out of 9 measures scored above 50%, which confirmed that the information

quality category of variables was relevant in the SU context; whereby individual metric contributions are shown with an average score of 53%.

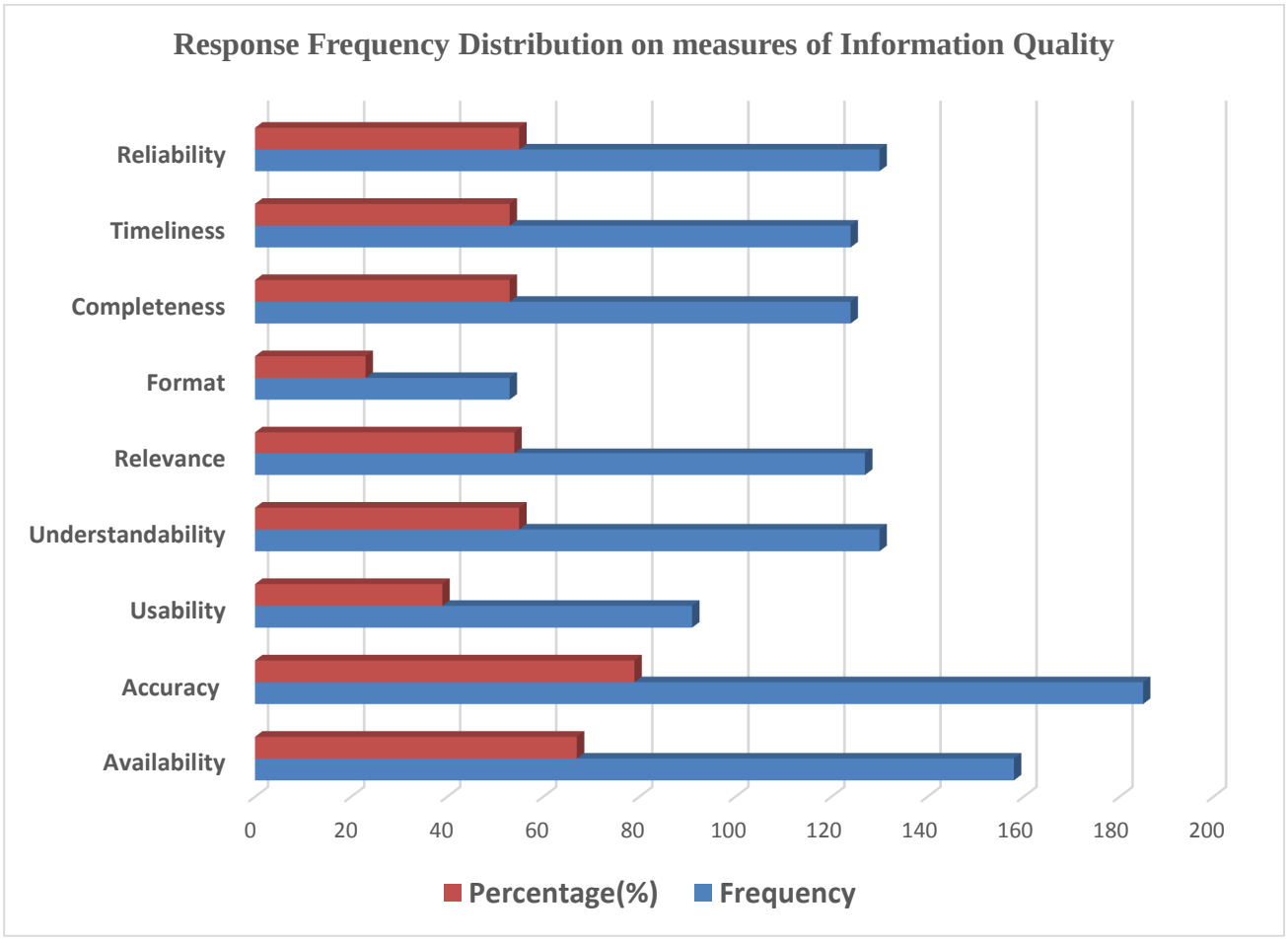

Figure 4.28: Frequency Distribution of responses on metrics of Information Quality

(iii) Service quality

The results presented in Table 4.23 shows specific measures of the service quality category, whose frequency and percentage scores were as follows: assurance 49% (116), tangibles 21% (49),competence 37% (87), responsiveness 51% (119), accuracy 63% (147), reliability 59% (139), training 69% (140). As it may be observed from the results, 4 out of 7 measures scored above

50% i.e. assurance, responsiveness and training. This confirmed that the service quality category of variables was relevant in the SU context; whereby individual metric contributions are shown with an average score of 50%.

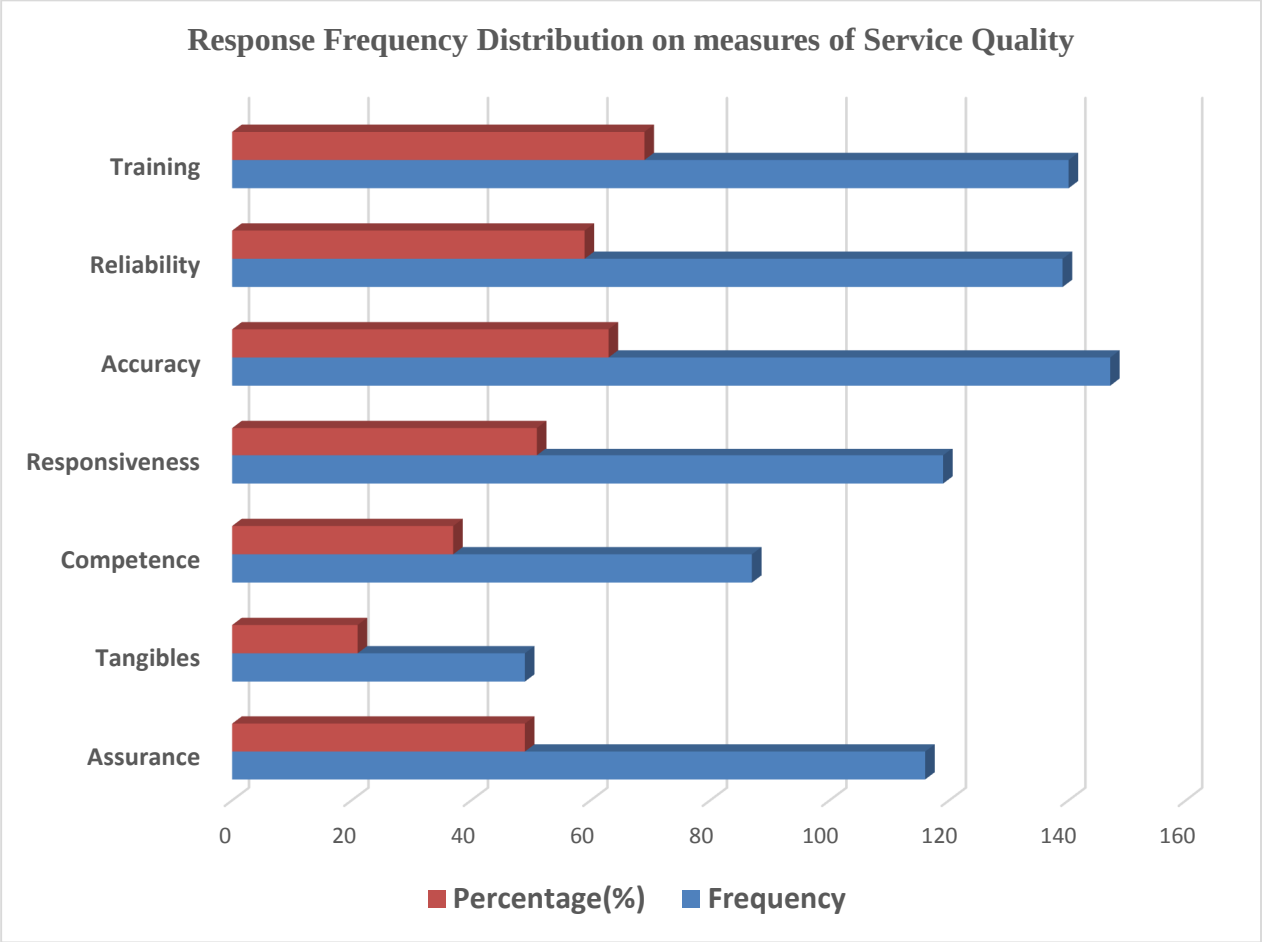

Figure 4.29: Frequency Distribution of responses on metrics of Service Quality

(iv) System use

The results presented in Table 4.23 shows specific measures of the system use category, whose frequency and percentage scores were as follows: frequency of use54% (127), degree of use52% (122), usage pattern 33% (77), time of use 37% (87), number of accesses 43% (100), number of queries 33% (78), purpose of use 55% (129), number of reports generated 34%(80) and degree of

dependency 42% (98). As it may be observed from the results, 3 out of 9 constructs scored above 50% i.e. frequency of use, degree of use and purpose of use; which was an indication that the system use category of variables had a relatively low degree of relevance in the SU context; whereby individual metric contributions are shown with an average score of 43%.

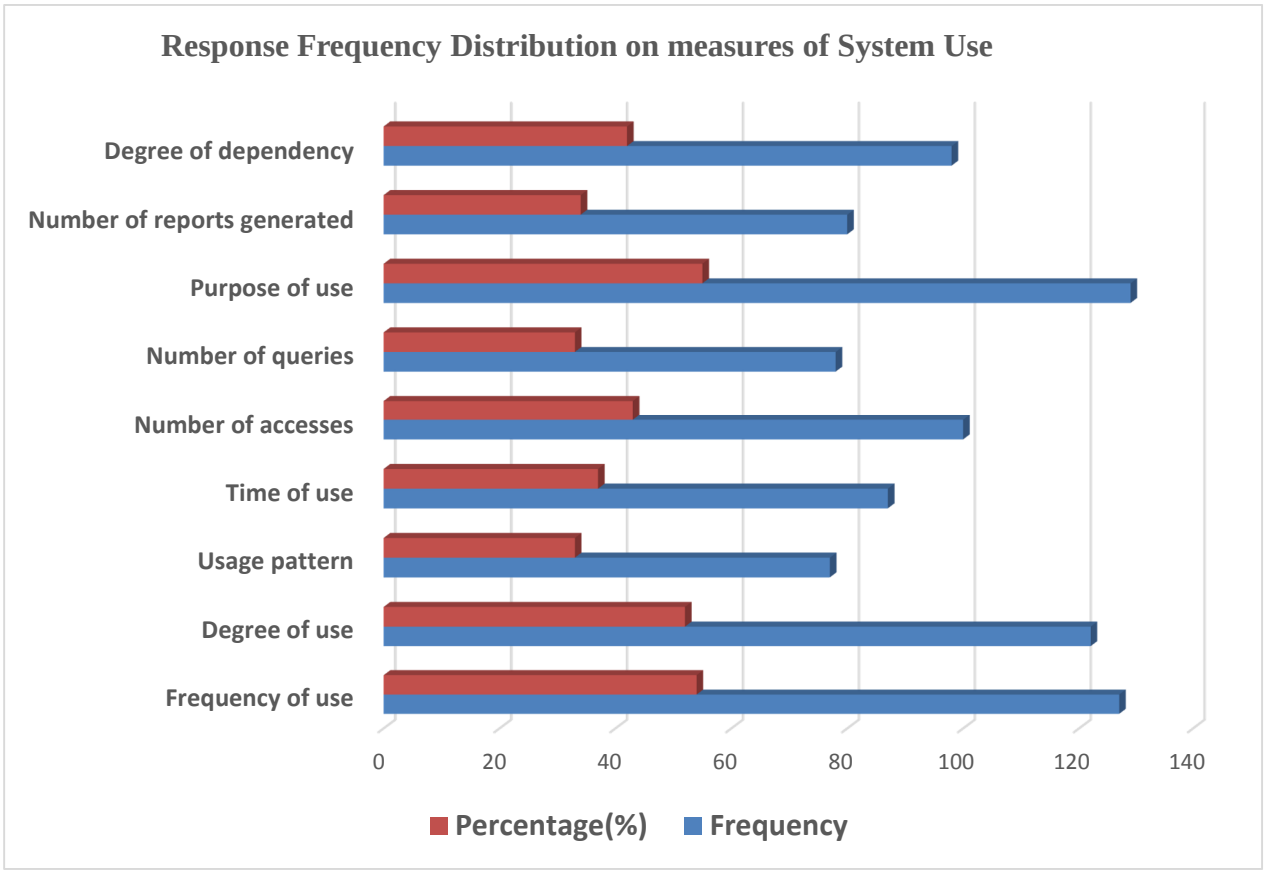

Figure 4.30: Frequency Distribution of responses on metrics of System Use

(v) User satisfaction

The results presented in Table 4.23 shows specific measures of the system quality category, whose frequency and percentage scores were as follows: adequacy 40% (95), effectiveness 66% (154), efficiency 71% (168), information satisfaction 59% (138), system satisfaction 35% (83) and overall satisfaction 45% (106). As it can be observed from the results, 3 out of 6 measures

scored above 50%, which confirmed that the relevancy of the user satisfaction category of variables in the SU context; whereby individual metric contributions are shown with an average score of 53%.

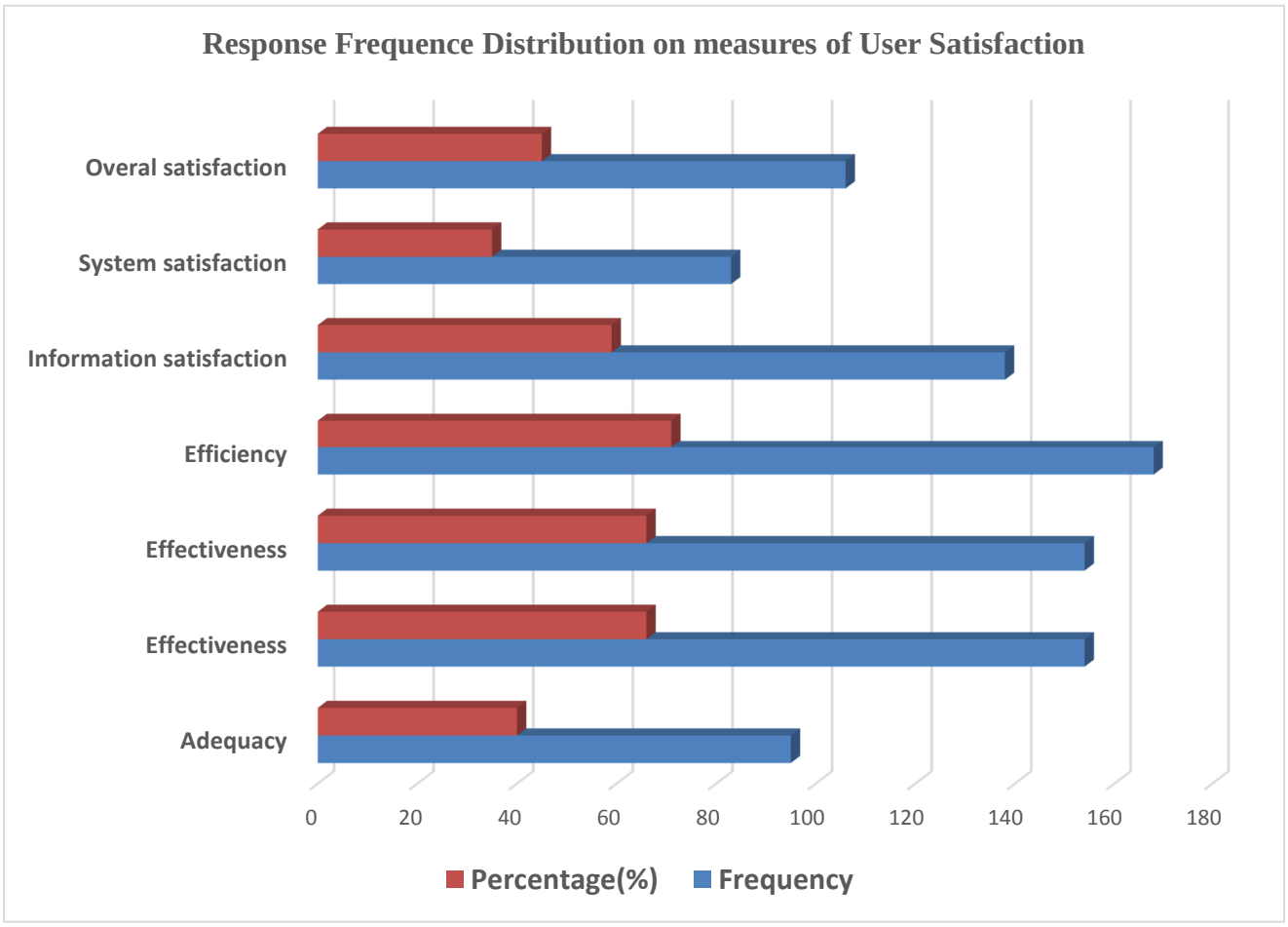

Figure 4.31: Frequency Distribution of responses on metrics of User Satisfaction

(vi) AMS success

The results presented in Table 4.23 shows specific measures of the system quality category, whose frequency and percentage scores were as follows: quality decision making 65%(145), timely decision making 65%(153), decision effectiveness 51% (119), improved employee productivity 35% (83), improved organization performance 50% (117), increased cost reduction 38% (77) and

improved customer satisfaction 59% (135). As it can be observed from the results, 5 out of 7 measures scored above 50%, which confirmed that the AMS success variable was relevant in the SU context; whereby individual metric contributions are shown with an average score of 51%.

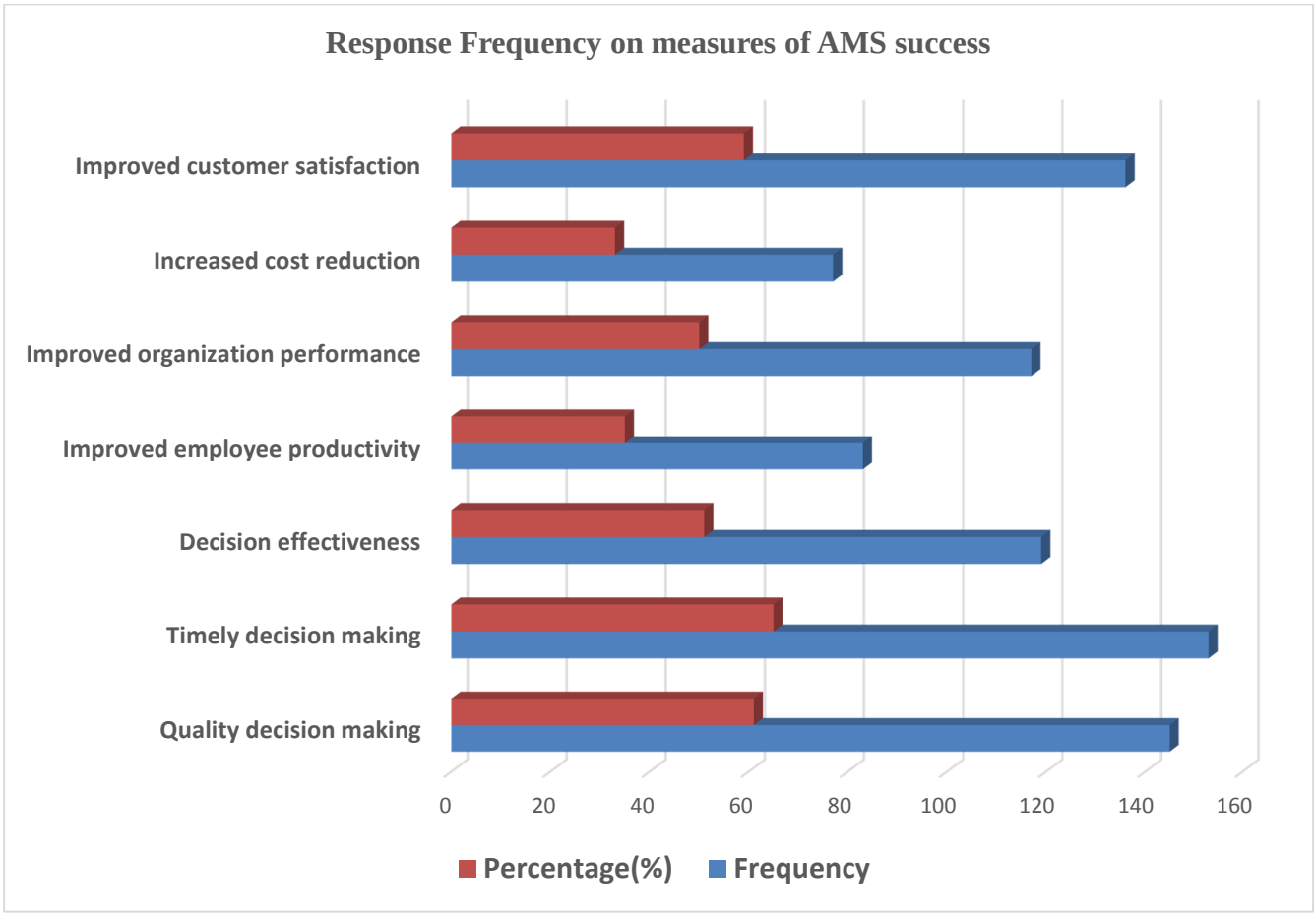

Figure 4.32: Frequency Distribution of responses on measures of AMS success

4.4 Summary discussion

This subsection gives an overall summary of the findings from both interviews and survey analysis. The interviews focused on both the challenges associated with use of risk-based internal IT audit approach in evaluating AMS as well as underlying challenges facing the use of the system in SU.

On the other hand, the survey method focused on challenges that faced users of AMS, both organizational and technical as well testing the applicability of D&M model in SU context.

According to the study's findings, challenges of using IT audits in evaluating AMS in SU showed that this approach was inadequate in the sense that it was: non-proactive, limited in scope, played a partial role, risk-based (focused), non-objective, vulnerable to internal conflicts and did not recognize stakeholder participation. Underlying challenges of using AMS that were observed include: a rigid organizational policy framework, evolving organizational requirements occasioned by management decisions and policy change, lack of users' commitment to use the system, staff turnover hence inadequate manpower, inadequate training & support and high maintenance costs. Technical challenges observed include system security, customization, integration, inflexibility and inadequate accessibility, inaccuracy and incompleteness of data. It was observed that these challenges did compromise the quality of AMS service delivery, given the fact that the evaluation approach used was inappropriate.

4.5 Conclusion

This section covered the analysis of data collected from both interviews and surveys, which focuses on challenges of using internal IT audits in evaluating AMS and challenges facing users of AMS both organizational and technical. According to observations made regarding challenges surrounding the effectiveness of AMS, it was apparent that the University needs a comprehensive separate approach to help mitigate these challenges in order to improve the effectiveness of AMS.

The data collected from the surveys showed that D&M model was applicable in SU context whereby all the success dimensions of the model attained an average score above 50% except the "system use" category which score 43% (see Table 4.21). Therefore, considering the overall result,

it was observed that D&M model was capable of providing an application for AMS in SU context to address the challenges currently experienced in evaluating the system.

Chapter 5: Proposed Model and Validation

5.1 Introduction

This chapter will focus on the proposed model, which will help to address the challenges facing the effectiveness of AMS in SU as observed from the study findings. Despite having been implemented about 10 years ago, this study established that the University did not have a comprehensive framework to evaluate the system's effectiveness apart from the risk-based internal IT approach. It was observed that the current audit approach used in the organization was faced by several limitations, which hindered the effectiveness of AMS due to lack of a comprehensive evaluation criteria. AMS having been identified among pillars to strengthen institutional capacity to implement the University strategic plan 2015/2015, this study sought to provide an appropriate solution towards realizing this goal. It's therefore against this background this study came up with the proposed model to help improve the effectiveness of AMS in order to facilitate the realization of the University's goals.

The proposed model is founded against a background of extensive analysis and cross examination of IS evaluation literature, analysis of the study findings as well as the University's requirements. In order to provide an appropriate solution for the University, this study proposes a

Hybrid model of D&M IS success model (see Figure 2.4) and Formative CPE framework (see section 2.5).

A review was done on the previous studies which guided the identification of appropriate methodology and criteria to be employed in order to improve the effectiveness of AMS in SU context (DeLone and McLean, 1992, 2003; Remenyi & Sherwood, 1999).

5.2 Enhanced Research Model

Based on the study findings, the research model in Figure 2.4 was enhanced to an AMS Adoption and Evaluation Model (AMSAEM) in Figure 5.1 below. In order to enhance the system's effectiveness, the continuous evaluation factor has been added to enhance the D&M model to facilitate continuous improvement of the system of AMS.

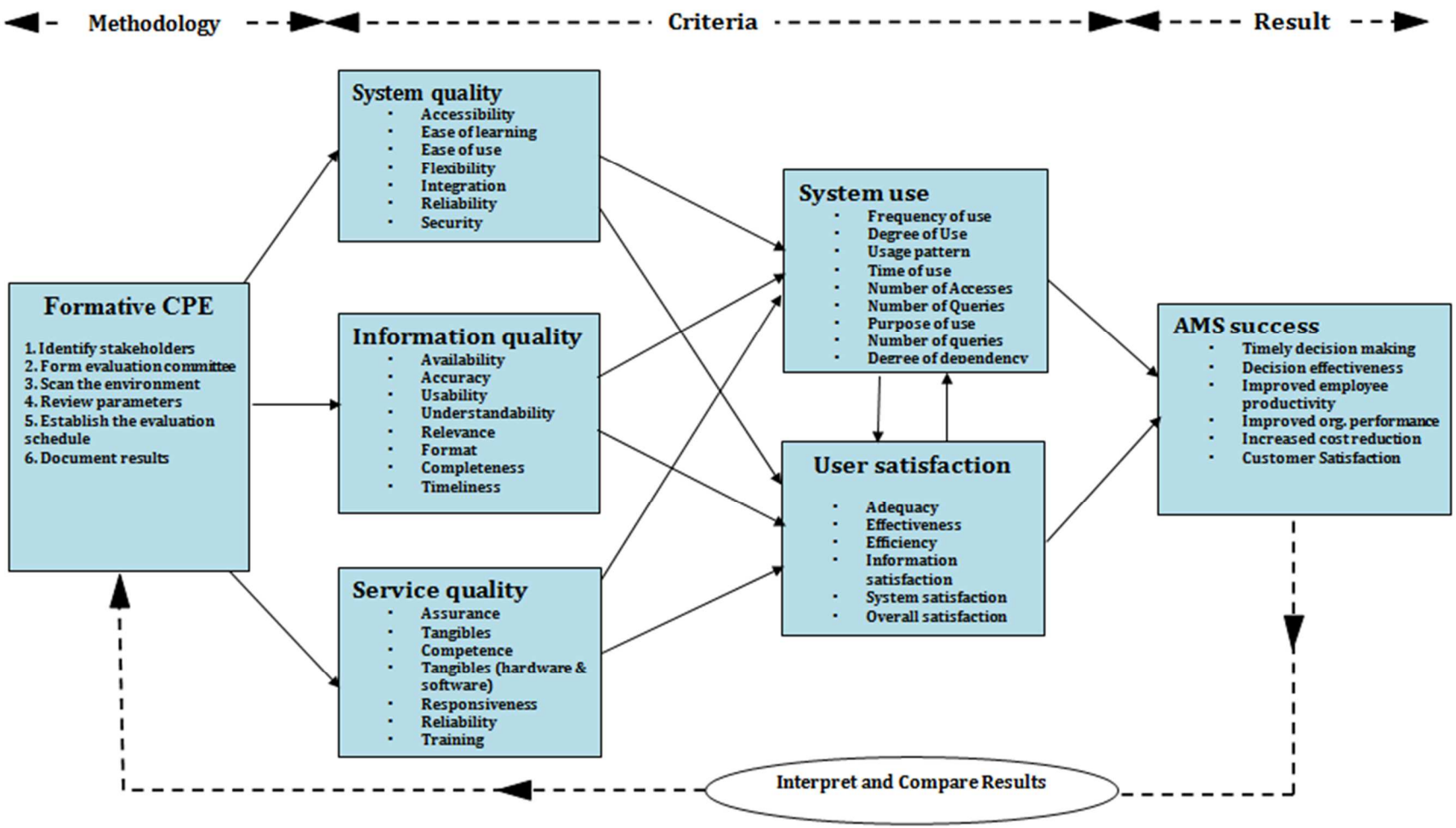

Figure 5.1: AMS Adoption and Evaluation Model (AMSAEM)

5.3 Proposed Model Architecture

In order to deliver an appropriate solution to address the current situation in the research context (SU), the study proposes three major components for AMS evaluation which include methodology, criteria and success respectively.

5.3.1 Methodology

The methodology component of the implementation process shall be the input stage whereby planning and all relevant requirements shall be determined; including nominating members to the evaluation team to execute the evaluation process. Therefore, controls shall be put in place to ensure objectivity and facilitate the process to ensure desired results are obtained. This stage shall be implemented through the following seven steps (Remenyi & Sherwood, 1999):

(i) Identify stakeholders

In the proposed research context, stakeholders shall be members of SU community, who interact with AMS regularly in executing their daily tasks. In this context, stakeholders shall include top management, AMS specialists& support team and ultimate users i.e. staff and students. The staff category shall include the top management, lecturers and administrators, who use the system to execute their daily job tasks in various departments such as admissions, faculty/schools, finance, examinations and mentoring services departments. These are the people who shall give feedback from their user experience of the system in order to facilitate continuous improvement of the system (Lagsten, 2011; Remenyi & Sherwood, 1999).

(ii) Establish an evaluation committee

Departments using AMS shall nominate a representative to the evaluation committee, including the top management in order to execute this mandate. Those to be nominated shall represent various stakeholders groups, whom they shall represent. Needs shall be identified during meetings (discussion forums) as well as brainstorming of ideas on how to improve the system. The selection criteria to guide the appointment of nominees to the evaluation committee shall be established based on an individual's level of education, Job position and related tasks, user experience& education and teamwork skills. This is to ensure competence among nominees for purposes of objectivity as well as ensuring quality contribution of ideas by committee members to enhance continuous improvement of the system. The team shall be chaired by a user who is neutral to avoid politics and personal interests, which might compromise the credibility of the process if allowed (Remenyi & Sherwood, 1999).

(iii) Scan the evaluation environment

The evaluation team shall constantly assess and analyze the environment to find out what has changed and is likely to affect the system's operations so as to adjust accordingly. This includes such factors like organizational, technical, individual, social, cultural and political factors (Kalema *et al.*, 2014).This is because requirements keep evolving, occasioned by changes from both organizational and technical perspectives, particularly on policy change on such issues like the handling of repeat/retake units, fees payment plan, course/unit exemptions, system upgrade and opportunities among others (Carcary, 2010). Such changes will definitely affect the way the system operates hence the need to monitor them in order to take proactive measures to ensure continuous improvement of the system.

(iv) Review evaluation metrics

Due to constantly changing environment in terms of organizational and technical aspects, the evaluation team shall regularly review the evaluation metrics in order to establish appropriate key performance indicators (KPIs) for the system (Remenyi & Sherwood, 1999). This is to ensure that the proposed measures are up to date and commensurate with organizational requirements to ensure valid feedback from users. This process also provides checks and balances to confirm whether both user and system requirements have changed or not so as to take corrective action. The evaluation committee must ensure that users and all stakeholders have understood the requirements and are in agreement with parameters used as opposed to the evaluation context.

(v) Establish an evaluation schedule

Formative CPE methodology being a continuous process, the evaluation activities shall be conducted periodically depending on the agreed frequency as may be considered appropriate by member's evaluation committee. This will depend on the current stage of the system's implementation and the degree success achieved so far. It will also depend on such factors like the numbers and frequency of users' complaints received.

(vi) Document the evaluation results

In order to determine the progress on improvement of the system over time, all results including initial and the subsequent evaluation sessions shall be documented and compared with previous results. Therefore, the initial evaluation results shall be the baseline for determining the system's improvement over time in order to guide the decision making towards achieving organizational goals.

5.3.2 Evaluation criteria

The evaluation criteria shall be guided by the aforementioned D&M framework, which comprises of system quality, information quality, service quality; system use, user satisfaction and net benefits i.e. AMS success (see Table 2.2). However, only those measures/metrics that are relevant shall be selected from literature as well as those emanating from within the SU context (DeLone & McLean 1992, 2003).These metrics shall be reviewed by the evaluation community from time to time to ensure validity of the evaluation results for appropriate decision making.

5.3.3 Results (AMS Success)

This is the last phase of the evaluation process i.e. the output, which determines the success rate in terms of the net benefits realized from using AMS. The benefits of the system shall be measured against organizational goals i.e. in terms of investment objectives. The metrics to be applied shall include the quality of decision making, timeliness of decision making, decision effectiveness, improved employee productivity, improved organization performance, increased cost reduction, and customer satisfaction among other factors based on the context (Petter *et al*, 2008; Urbach, 2012).

5.4 Validation of the Research Model

The strength of the proposed model is that it recognizes stakeholders who play a central role in the development and consequent improvement of the system, hence would increase chances of AMS success. According to Remenyi & Sherwood (1999), stakeholders (users) are the ones charged with the responsibility to deliver system benefits through their daily and routine operations hence understand needs better. According to the study findings, there exists several challenges facing the effectiveness of AMS in SU as highlighted in chapter 4 however, the most important aspect of a

model is the potential to provide solution. At the same time, the input and output of the model should be realistic and measurable in order to determine and quantify organizational success. Table 5.1 uses components of the proposed model, which include the methodology (activities), metrics to be used and the output that the SU can use to measure and maximize the value of investment. The various components are ranked on a scale of 1 to 5 whereby **1** is the least score while **5** is the highest possible score. The participants of this study included 3 senior staff from 3departments in SU that are either directly or indirectly associated with AMS issues, the system developer and 3 professional users of the system. Table 5.1 contains the components and measurement metrics of the model:

Table 5.1: Components and parameters of AMS Adoption Model (AMSAEM)

Model component	**Parameters**	**Score/Ranking**				
		1	**2**	**3**	**4**	**5**
Continuous participation (Methodology)	• Identify stakeholders • Form an evaluation board • Scan the environment • Review parameters • Establish an evaluation schedule • Compare results					
System quality	• Accessibility • Ease of learning • Ease of use • Flexibility • Integration • Reliability • Response time • Navigation • Security					

Information quality	• Availability • Accuracy • Usability • Understandability • Relevance • Format • Reliability • Completeness • Timeliness					
Service quality	• Assurance • Tangibles • Competence • Responsiveness • Accuracy • Reliability • Training					
System use	• Assurance • Tangibles • Competency • Responsiveness • Accuracy • Reliability • Training					
User satisfaction	• Adequacy • Effectiveness • Efficiency • Information satisfaction • System satisfaction • Overall satisfaction					
AMS success	• Quality decision making • Timely decision making • Decision effectiveness • Improved employee productivity • Improved organization performance • Increased cost reduction • Customer satisfaction					
Total Ranking score/35						

5.4.1 Model validation results

Despite the model requiring a longitudinal validation, the proposed research on the other hand was cross sectional and with strict deadlines. Therefore, in order to complete the proposed study, the researcher validated the model using the System (AMS) Developer, 3 departments and 3 professional users of the system (AMS), who were participants in the initial study. The participants were selected for purposes of ensuring a fair representation and they included the Strategy and Quality Assurance Office, IT Department and Internal audit Office while professional users Nos. 1-3were mainly IT lecturers from the faculty of IT.

Table 5.2: Validation Results

Participant		**Score/35**
1	System Developer	23
2	Strategy & Quality Assurance Office	23
3	IT Department	27
4	Internal Audit Office	21
5	Professionals user 1	31
6	Professional user 2	26
7	Professional user 3	28
	Total Average Score =35	**25.57**

The names of individual participants or titles have not been used for purposes of confidentiality. The maximum possible total average score was 35, given the fact that the highest possible score for each component was 5. On the other hand, the minimum possible average score was7 since the

lowest score for each component was 1. Table 5.3 is a scorecard to help interpret the overall results on the validation of the model:

Table 5.3: Interpretation of Validation results

Range of overall score	**Interpretation**	**Meaning of the results**
31-35	Exceeds Expectations	Demonstrates potential to perform beyond expectations
26-30	Meets Expectations	Demonstrates potential for sustained performance to meet the organization's goals
21-25	Satisfactory	Demonstrates potential to meet most of the requirements while missing a few by a small margin
20 and below	Unsatisfactory	Demonstrates a performance below the standard in meeting the requirements

As it may be observed from the validation results in Table 5.2, the model scored an average score of 25.57 out of 35, which falls within the range of 21-25. According to the interpretation score card, the model is satisfactory and therefore can be applied in SU context.

Chapter 6: Discussion

6.1 Introduction

This chapter will discuss the research findings while comparing the same with available literature. The various sections of this chapter will be addressing specific themes based on the research objectives. We shall discuss through each of these sections, ways in which the proposed Model (AMSEAM) will address issues arising from the research findings in SU context. A brief critical look on the study findings is made in order to enable us understand the challenges experienced in evaluating AMS, challenges faced by users of the system and the current state of affairs regarding the system as a whole in SU. However, it should be noted that challenges experienced in evaluating AMS consequently led to challenges were facing users as we shall see in subsequent sections of this chapter.

6.2 Challenges faced in evaluating AMS in SU

According to the research findings i.e. challenges presented in 4.2, it was evident that the current approach used in evaluating AMS in SU was not adequate to fully meet the University's requirements, following its several limitations. Apparently, it was observed that it was not possible to determine the effectiveness of AMS exhaustively hence management was unable to identify deviations in the system to facilitate corrective action thus creating loopholes. The following were among limitations observed during the study:

First, the audit approach was not proactive in detecting deviations but rather reactive, a situation which derailed the effort towards continuous improvement of AMS. Given the nature and design of the audit approach, errors and risks were discovered too late to take action thus leading to

organizational loss. This finding agrees with facts in IBM Systems (2015) concerning limitations of IT audits hence the need for organizations to employ proactive approaches in order to mitigate risks on IT systems. Apparently, AMS handles sensitive information including examinations and financial records of the University. It was therefore noted that the current approach used in the University was not sufficient and therefore the need to adopt a separate approach.

Secondly, it was observed that the audit approach was limited in scope hence could not measure the success of AMS effectively. It was observed that the audits played a partial role since it only covered security and functionality aspects of AMS, which included availability, confidentiality and integrity of information. This approach ignored other critical factors of AMS success including usability and user satisfaction levels. Fatshul and Namroush (2006) confirm this observation whereby they argue that the audit approach only focuses on security aspects of information system. Management was unable to quantify the success rate of the system in order to justify investment. Being a critical system to the University, there was need for a comprehensive approach to effectively evaluate all the necessary success dimensions of AMS. The IS success factors include system quality, information quality, service quality, system use, user satisfaction and benefits so as to facilitate critical decision making (DeLone & McLean, 1992,2003).

Thirdly, it was observed that the approach used in SU was not objective since it was driven by informal policies. This allowed manipulation to accommodate personal interests thus rendering the approach subjective since there was no standardized way to guide formulation of organizational policies. This finding was in agreement with facts stated regarding limitations of IT audits by Management Development Corporation (2011) that audit approach is non-objective hence compromises transparency.

Fourthly, it was observed that the audit approach was risk-based hence it was basically designed to manage organizational risks. Given its design, this approach was meant to check on potential risks facing information system in organizations. Therefore the audit approach was not appropriate to measure AMS success give the fact that it could not assess areas of the system that were not considered to have a potential for risk. This finding therefore necessitated the need for an appropriate approach to assess the effectiveness of AMS.

Fifth, the study found that the audit approach was prone to internal conflicts. This was due to the fact that internal auditors were employees of the organization hence fear and suspicion among staff thus compromising independence and objectivity of internal auditors. This observation was in agreement with the study by Stewart & Subramaniam (2010) that found out that the major challenge of internal audits was internal conflicts within an organization. There is need therefore to adopt a method that is free from internal conflicts.

Lastly, the study found out that internal audits did not recognize stakeholders' involvement. This was noted to be a major weakness of this approach, given the fact that stakeholders played a critical role in evaluation of information systems according to Remenyi and Sherwood-Smith (1999) and Lagsten (2011. Apparently, it was observed that most of the challenges that faced AMS users were due to lack of stakeholders' participation, who would have identified weak areas of the system to facilitate corrective action. There is need therefore to adopt a framework that involves stakeholder participation to improve effectiveness of AMS in SU.

6.3 Challenges faced by AMS users in SU

As it was mentioned earlier in this chapter, this study observed through the surveys that there were a number of challenges that faced users of AMS. This was as a result of the limitations of the

current approach used in SU, which was incapable of exhaustively addressing issues concerning the effectiveness of AMS in order to take proactive action and therefore creating loopholes that compromised service delivery. The study identified the following areas as the most affected as far as the users of AMS were concerned: system accessibility, data accuracy, reliability, integration of data, completeness of data, user training and support, system use and users satisfaction levels. According to survey results presented in chapter 4, the study established that only 46% of respondents were satisfied with the accessibility of the AMS, 16% were uncertain while approximately 38% of respondents said there wasn't adequate access to the system, especially students and part-time lecturers. This situation inconvenienced users while at the same time it compromised operational efficiency as well as employee productivity. Approximately 34% of the respondents said the system was not reliable while 40% said data in AMS was not accurate, especially financial and academic records which influenced a negative attitude by users towards the system. Approximately 41% of the respondents said the data in the system was incomplete hence users did not have confidence in the system. It was also observed that data integration in the system was not satisfactory whereby about 48% of respondents particularly students expressed dissatisfaction arguing that there were numerous inconsistencies on financial statements as well as academic progress reports. User training and support was found unsatisfactory whereby approximately 49% of respondents said the training and support provided was not adequate. While checking on usability and satisfaction levels of AMS, the study established that 25% of respondents did not use the system on a regular basis while approximately 40% of respondents said they were not satisfied with the system. From the study's findings therefore, it is evident that there were serious challenges that faced the users hence the need for a comprehensive evaluation

framework and stakeholders involvement in order to address these problems so as improve effectiveness of AMS.

6.4 Discussion summary of the Proposed Model

As indicated in the research model (AMSAEM) in chapter five (5), three issues must be looked into, which are based on SU context in order to provide an amicable solution. These include a methodology, criteria and results. The proposed model recommends adoption of formative CPE framework which highlights critical steps to be followed in implementing the model while emphasizing continuous system evaluation and stakeholders' participation, which was not considered by the current evaluation approach used in SU (Remenyi & Sherwood, 1999). The methodology part will be used to improve system quality, information quality and service quality through continuous evaluation. Stake holders especially ultimate users of the system including administrators, lecturers and students will help identify issues that need to be addressed in the system to enhance continuous improvement.

The criteria part of the proposed model is an important component too since it provides a comprehensive framework comprising of critical factors (parameters) and metrics to assess AMS effectiveness. These include system quality, information quality, service quality, system use, user satisfaction and benefits i.e. system success (DeLone & McLean, 2003). This will go a long way in addressing the limitations of the current approach in terms of scope thus improving the effectiveness of AMS.

Benefits (system success) are basically the results obtained from using the system, which shall be determined or measured according to organizational goals to be achieved. Given the benefits realized, The University management should be able to take critical decisions regarding AMS for

purposes of continuous improvement. The model provides key metrics including quality of decision making and effectiveness, employee productivity, organizational performance, cost reduction and customer satisfaction; which can be used to measure success to determine the level of organizational goals towards achieving organizational goals.

Chapter 7: Conclusion and Recommendations

7.1 Conclusions

According to the study's findings, it was evident that the University was faced with challenges of evaluating AMS, given the fact that the audit approach currently used had several limitations hence insufficient. Among the limitations/challenges include the fact that the audit approach was: non-proactive, limited in scope, played a partial role, risk-based (focused), non- objective, vulnerable to internal conflicts and non-involvement of stakeholders. It was observed that the challenges of system evaluation also led to the existence of some of the technical problems that faced users which included inadequate access, inaccuracy of data, incomplete data and poor integration of data in AMS. A major organizational problem observed was inadequate user training and support services whereby new users in particular did not receive training on using the system. The study established that the existence of these problems negatively impacted usability and user satisfaction levels, which key critical factors in achieving success. AMS being a critical system to the University, there was need for a comprehensive and appropriate solution to address these challenges hence the proposed model (AMSAEM).

7.2 Recommendations

Considering the findings of the study, appropriate mechanism need to be put in place to improve effectiveness of AMS towards achieving the University goals. Therefore, study proposes the following recommendations from both organizational and technical perspectives:

From an Organizational perspective

(a) Management to formulate a policy to include and guide operationalization of the evaluation process.. This will provide a framework within which the AMS evaluation process shall be conducted including allocation of resources as well as those to be held responsible and accountable.

(b) Establish AMS evaluation division under the office of the Deputy Vice Chancellor, Academic Affairs (DVC Academic).This is will make it easy to address policy matters regarding this process, the DVC being a senior member of the management board where such matters shall be discussed.

(c) Management should employ more staff (programmers) and give incentives and privileges to retain staff to meet the growing demands of the university i.e. AMS user training and support services.

From a Technical perspective

(d) In order to ensure the security of the system, set up a private virtual network (PVN) to enable lecturers access the system remotely. This will enable lecturers to be able to work even from remote locations since they won't necessarily need to come to campus to update records in AMS. This will improve on convenience, efficiency and staff productivity.

(e) Make the system (AMS) responsive to user agents including tablets, smart phones, iPads etc. to enable users especially students who are on mobile platforms to be able to access the system comfortably to improve system usability and user satisfaction levels.

7.3 Contribution of the study

This study is significant to the academic literature and the industry.

Contribution in academia: While using DeLone & McLean Model and the Formative CPE Framework, the research has established the significance of these two studies as theories informing the evaluation of information system in terms of methodology and criteria. The research model (AMSAEM) has been obtained from both studies hence a hybrid model.

Contribution in industry: For the industry, managers in the HE sector need to take into consideration the critical success factors determining effectiveness of Academic Management Systems in terms of implementation methodology and criteria for evaluation of (AMS). While considering the aspect of continuous participative evaluation, stakeholders must be involved in all stages to facilitate continuous improvement of the system towards achieving organizational goals.

7.4 Limitations of the study

This study was a case of a single institution i.e. (SU). Therefore the findings of the study may not necessarily be similar to other research contexts hence the need to extend the research to other institutions in order to compare and contrast the results.

7.5 Further research

Given the scope covered by this study, there would be need for further research to verify the following:

(i) The applicability of AMSAEM in different applications/contexts apart from AMS

(ii) Applicability of the model in different computing environments a part from academia

(iii) The possibility of a formula to test the model in various contexts

References

Avison, D., Curthbertson, C., & Powell, P. (1999). The paradox of information systems:strategic value and low status. *Journal of Strategic Information Systems, 8*, 419-445.

Carcary, M. (2008). *The Evaluation of ICT Investment Performance in terms of its Functional Deployment-A study of Organizational Ability to Leverage Advantage from the Banner MIS Institutes of Technology.* Limerick, Ireland.

Carcary, M. (2009). MICT Evaluation in the Irish Higher Institution Sector. *The Electronic Journal of Information Systems Evaluation, 12*(2), 129-140.

Carcary, M. (2010). Evaluating a Student MIS in the Tertiary in the Education Sector:Addressing Functional-Operational Misalignment through continuous Participative. *J.Service & Management, 3*, 31-44.

Carcary, M., Long, G., & Remenyi, D. (2007). The Implementation of a new Student Management System (MIS) at an Irish Institute of Technology-An Ex Post Evaluation of its Success. *Electronic Journal of Information Systems Evaluation, 10*(1), 31-44.

Chartered Institute of Internal Auditors. (2014). Retrieved January 22, 2014, from Chartered Institute of Internal Auditors Web site: http://www.iia.org.uk/about-us/waht-is-internal-audit/

Day, J., & Bobeva, M. (2006). Using a balanced scorecard approach for evaluating an integrated learning environment for undergraduate dissertations. *Proceedings of the 13th European Cnference on Information Technology Evaluation*, (pp. 198-207). Genoa, Italy.

DeLone, W. H., & McLean, E. (2003). The DeLone and McLean Model of Information Systems Success. A Ten- Year Update. *Jounal of Mangement Information Systems, 19*(4), 9-30.

DeLone, W., & McLean, E. (1992). Information Systems Success:the quest for the dependent variable. *Information Systems Research, 3*(1), 60-95.

Fatshoul, A., & Namroush, S. (2006). Security issue, attack Trends related to the confidentiality, integrity and availability of information assets on an organization's computer system. *Proceedings of the Postgraduate annual Research Seminar*. Kuala Lumpur, Malaysia.

Gray, E. (2009). *Doing Research in the Real World* (2nd Edition ed.). New Delhi, India: Sage Publications.

Gregor, S., Martin, M., Fernandez, W., Stern, S., & Vitale, M. (2006). The Transformational dimension in the realization of business value from Information Technology. *Journal of Strategic Information Systems, 15*, 249-270.

Grover, G., Jeong, S., & Segars, A. (1996). Information Systems Effectiveness:The Construct Space and paterns of application. *Information & Management, 31*(4), 177-191.

Hassan, W. A., Teridi, N. A., Abdullah, K., Hamid, A., & Zainuddin, N. (2010). An Assessment Study on Usabilility of Academic Management System. *International Conference on user Science and Engineering.* Selangor, Malaysia.

IBM. (2015, January 5). *A Proactive, Preventive Approach to Compliance and Security*. Retrieved January 25, 2015, from IBM Web sitr:

http://www.ibmsystemsmag.com/mainframe/trends/security/A-Proactive,-Preventative-Approach-to-Compliance-a/

Kalema, B., Olugbara, O., & Kekwaletswe, R. (2014). Identifying Critical Susccess Factors:The case of ERP Systems in Higher Education. *The Africa Journal of nformation Systems, 6*(3), 64-84.

Kanaracus, C. (2008, April 3). Gartner:global IT spending growth stable. *InfoWorld*.

Kaplan Financial. (2012). *Audit and Assurance*. Retrieved January 27, 2015, from Kaplan Financial Website: http://www.kfknowledgebank.kaplan.co.uk/KFKB/Wiki%20Pages/Internal%20Audit.asp

Karande, H., & Ghatule, A. (2013). Examination of Accountable Critical Success Factors and Impact of ERP over Higher Education Institutions. *Sinhgad Institute of Management and Computer Applications*, 125-127.

Kothari, C. (2004). *Research Methodology-Methods and Techniques* (2 ed.). New Delhi: New Age International (P) Limited.

KPMG. (2014). *Phase II Internal Audit Report-Strathmore University.* Nairobi, Kenya.

Kumar, R. (2005). *Research Methodology: A step by step guide for beginners.* London: Sage Publications.

Lagsten, J. (2011). Evaluating Information Systems According to Stakeholders. A pragmatic Perspective and Method. *The Electronic Journal Information System Evaluation, 14*(1), 73-88.

Lin, H., Hsu, P., & Ting, P. (2006). ERP Systems Success:An integration of IS Success Model and Balanced Scorecard. *Journal of Research and Practice in Information Technology, 14*(1), 215-228.

Makokha, A., Musiega, D., & Juma, S. (2013). Implementation of Enterprise Resource Planning Systems in Kenyan Public Universities: A Case of Masinde Muliro University of Science and Technology. *Research Journal of Finance and Accounting, 4*(6), 26-34.

Management Development Corporation. (2011). *Consulting Services:Impact of Informal Policies*. Retrieved January 27, 2015, from Management Development Corporation Web site: http://www.mgtdev.com/consulting_impactpolicies.html

Miller, M. (2012). *michaeljmillerphd.com*. Retrieved March 7, 2015, from Western International University Web site: http://michaeljmillerphd.com/res500_lecturenote/reliability_andvalidity.pdf

Mugenda, O., & Mugenda, G. (2003). *Research Methods:Quantitative and Qualitative Approaches.* Nairobi, Kenya: African Center for Technology Studies (ACTS) Press.

Nizaman, S., Khoumbati, K., Ismaili, I., & Nizamani, S. (2013). A Conceptual Framework for Evaluating ERP in Universities on Pakistan. *Sindh University Research Journal, 45*(3), 461-475.

Nyandiere, C., Kamuzora, F., Ateya, I., & Omwenga, V. (2012). Implementing Enterprise Systems for Management: A case of Kenyan Universities. *Computer Technology and Application Journal, 3*, 558-563.

Pan, C., & Tan, S. (2002). ERP SUCCESS:The Search for a comprehensive Framework. *Proceedings of the 8th Americas Conference on Information Systems (AMCIS),* (pp. 925-933).

Petter, S., & McLean, E. (20008). Measuring Information Systems Success:models,dimensions measures, and Interrelationships. *European Journal of Information Systems, 17*, 236-263.

Petter, S., DeLone, W., & McLean, E. (2012). The Pas,Present and Future of "IS Success". *Journal of Association for Information Systems, 13,* 341-362.

Phahlane, C., & Kekwaletswe, R. (2014). Management Information Systems Use in Higher Education Environments. *Proceedings of the Southern Association for Information Systems Conference.* Macon,USA.

Phelan, C., & Wren, J. (2005). *Exploring reliability in academic assessment-UN Office of Academic Assessment.* Retrieved December 29, 2014, from Google Website: http://www.google.com/?gws_rd=sslq=research+reliability

Piccoli, G., & Ives, B. (2005). IT-dependent strategic initiatives and sustained competitive advantage: a review and synthesis of literature. *MIS Quartely, 29*(4), 747-776.

Rai, A., Lang, S., & Walker, R. (2002). Assessing the validity of IS Successmodels:An emprical test and theoretical analysis. *Information Systems Research, 13*(1), 50-69.

Remenyi, D., & Sherwood-Smith, M. (1999). Maximize Information Systems by continuous participative evaluation. *Logistic Information Management, 12*(1/2), 14-31.

Seddon, P. (1997). A re-specification and extension of DeLone and McLean Model of IS Success. *Information Systems Research, 8*(3), 240-253.

Seddon, P., & Kiew, M. (1996). A partial test and development of DeLone and McLean's model of IS Success. *Australian Journal of Information Systems, 4*(1), 90-109.

Sevilla, J., & Shabaya, P. (2007). Change and Innovation in Higher Education:Implememnting An Academic Management System-The Case of Strathmore University. *Proceedings of REAL 2007 Conference.* Blantyle, Malawi.

Sharkey, U., Scott, M., & Action, T. (2010). The influence of quality on e-commerce success-an emperical application of the DeLone and McLean IS Success Model. *International Journal of E-business Research, 6*(1).

Shuttleworth, M. (2008). *Case Study Research Design.* Retrieved August 27, 2014, from Explorable Web site: https://www.explorable.com/case-study-reserach-design

Smithson, S., & Hirschheim, R. (1998). Analyzing Information System Evaluation. *European Journal of Information Systems, 7*(3), 158-174.

Stat Trek. (n.d.). *Sample Size:Stratified Random Samples*. Retrieved August 20, 2014, from Stat Trek Web site: http://www.stattrek.com/sample-size/stratified-sample.aspx

Stewart, J., & Subramanian, N. (2010). Internal Audit Independence and Objectivity:Emerging Research Opportunities. *Managerial Auditing Journal, 25*(4), 328-360.

Strathmore University. (2004). *Strathmore University Monitoring and Management System-Academic Management Requirements Specification.* Nairobi,Kenya.

Strathmore University. (2011). *Academic Management System(AMS) Overview- Main Module.* Nairobi.

Strathmore University. (2014). *UNiversity Strategic Plan 2015/ 2025.* Nairobi.

Survey Monkey. (n.d.). *How many respondents do i need?* Retrieved August 25, 2014, from Surveymonkey Web site: http\www.help.surveymonkey.com/articles/en_US/kb/How-many-respondents-do-I-need.

Ujunju, M., Wanyembi, G., & Wabwoba, F. (2012). Evaluating the Role of Information and Communication Technology (ICT) Support towards Processes of Management in Institutions of Higher Learning. *International Journal of Advanced Compueter Science and Applications, 3*(2), 55-85.

Urbach, N., & Muller, B. (2012). The updated DeLone and McLone Model of Information Systems Success.Information Systems Theory:Explaining and Predicting Our Digital Society. *Integrated Series in Information System, 1*, 1-18.

Urbach, N., Smolnik, S., & Riempp, G. (2009). A Conceptual Model for Measuring the Effectiveness of employee portals.Proceedings of the 15th Americas Conference on Information Systems (AMCIS). San Francisco, USA.

Xia, L., Yu, W., & Hock, L. (2010). A methodology for Successful implementation of ERP in smaller companies. *Service Operations, Logistics and Informatics (SOLI)*, 380-385.

Appendices

Appendix I –Introductory letter

Appendix II-Senior Staff Interview Guide

Appendix III-Survey Questionnaire

Appendix IV-Turn tin Report