Factors Affecting Information Systems user Satisfaction in Kenyan Universities

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ABSTRACT

The role of information systems in providing business a competitive edge has recently been the subject of much debate. However, it has been argued that not the information system solution but their utilization is what provides the competitive advantages. For these information systems to be well utilized and provide the competitive edge for an institution, its users need to be satisfied with systems as satisfaction determines continued use of the system. Satisfaction is the extent to which users believe the information system available to them meets their information requirements. The study sought to understand the relationship between the value users attribute to information systems and the satisfaction users experience with these systems. This study analyzed information systems in two Kenyan universities to find out factors that influence information system user satisfaction. The sample was selected using both purposive sampling and simple random sampling techniques. The main instruments for data collection that were used are content analysis and questionnaires. Data was analyzed using both descriptive and inferential statistics. This study evaluated satisfaction on software quality attributes basing on the ISO/IEC 9126 software quality model. The findings show that there are a number of factors affecting satisfaction of information systems ranging from institutional factors, individual factors, system factors and infrastructural factors. Information system satisfaction differed significantly across demographic factors like age, gender, mode of study and level of study for students. There was no significant difference in satisfaction between the two universities.

Keywords: *Information system, user satisfaction, information system satisfaction*

1. INTRODUCTION

Organizations of all types are seeking to improve their effectiveness and efficiency by using information systems [1] and Kenyan universities are not exempted.

Although the issue of satisfaction has been greatly discussed in the literatures of information systems, enough attention has not been paid to the identification of the factors affecting user satisfaction [2]. Therefore it is important to find out factors that determine information system user satisfaction and determine information systems' user satisfaction for a particular organization. As [3] asserts, organizations strive to improve their competitiveness by enhancing productivity, innovation, quality and flexibility of services at the individual and organizational levels using information systems.

However, investigations are required to identify problem and weaknesses of the information system for better understanding of the requirements for different types of the users and hence determine user satisfaction and information system success. This is because information system users are heterogeneous and the system itself operates in a dynamic environment.

Information system is an integrated software package that maintains, supports, and provides inquiry, analysis, and communication tools that organize student accountability data into information to support the educational process [4]. End user satisfaction is the extent to which users believe the information system available to them meets their information requirements [5].

Determining end user satisfaction is important since it has been widely cited as measure for success and effectiveness of an information system [6]. As noted by [7], the success of information system is important to organizations because they are making huge investment in these systems.

Organizations of all types are seeking to improve their effectiveness, efficiency [1] and competitiveness by enhancing productivity, innovation, quality and flexibility of services at the individual and organizational levels using information systems [3]. However, as [2] assert, although the issue of satisfaction has been greatly discussed in the literatures of information systems, enough attention has not been paid to the identification of the factors affecting user satisfaction in education systems. Therefore it is important to find out factors that determine information system user satisfaction for a particular organization.

2. RELATED STUDIES

Many higher education institutions have taken advantage of information systems in the direction of support for key administrative and academic services [8].

Information system is an aggregate of acquisition links, transmission channels, and technical means for information collection, processing and information carriers [9]. As noted by [10], information system of university management is an organizational and technical system where information technologies are realized and hardware and software are used for collection, processing, acquisition, storage, search and dissemination of information that is geographically distributed on computer

systems located in separate buildings but connected with each other.

Information systems for university management have a number of peculiarities distinguishing them from the information systems of other institutions, organizations and enterprises [10]. The university information system is intended to support information resource and flows and to provide users opportunities to work in data computing environment as well as other services necessary to perform their functions of teacher, researcher and administrator [11]

As [10] further assert, these systems serve to control the entire educational process, including the activities of deans offices and departments, compilation of time tables, introduction of changes into the list of staff and students of the university among other functionalities.

Introduction of information systems into the management of higher educational institutions aims at the increase of productivity of daily activities, elimination of duplication and at the improvement of management efficiency. The main advantages of information systems for higher education institutions are improved information access for planning and managing the institution; improved services for the faculty, students and employees; lower business risks and increased income and decreased expenses due to improved efficiency [8].

2.1 Information Systems and Management Information System

MIS is an integrated, user machine system providing the necessary information to support core functions of a firm such as operations, management, and decision making [12]. These systems typically utilize computer software and hardware, manual procedures, models for analysis, planning control, decision making and a database [13].

Management information system (MIS) is one of the major computer based information systems. Its purpose is to meet the general information needs of all the stakeholders in the organization or in some organizational sub unit of the organization [14]. In this turbulent era, organizations strive to improve their competitiveness by enhancing productivity, innovation, quality and flexibility of services at the individual and organizational levels [15]. Under this pressure, the organization's information processing capabilities are challenged by additional and diverse demands, such as speed and reliability [13]. In order to address this strategic challenge, organizations develop and apply more sophisticated and comprehensive MISs [16], [17].

2.2 Components of Information Systems

There are five components that make up an information system. These components are hardware, software, data, procedures, and people [18].

Hardware is made up of the electronic components and related gadgetry that input, process, output, store, and communicate data according to the instructions encoded in the software while data are recorded facts or figures. Procedures are the instructions for humans to follow when working within an information system. The last components are the people that use information system. This includes those who operate and service the computers, those who maintain the data, those who support the networks, and those who use the system [18].

2.3 Factors that Influence user Satisfaction

Although the issue of satisfaction has been greatly discussed in the literature of Information Systems, enough attention has not been paid to the identification of the factors affecting user satisfaction [2]. In the study of characters existing in the Internet, [19] introduced the factors determining e-satisfaction as: information accessibility level, communication structure, individualization, integrated information and transactions.

In a recent study of satisfaction in e-commerce, [20] found that ease of information downloading, ease of payment, website structure and alike, all influence e-satisfaction.

There is much empirical evidence that technology acceptance factors are able to explain the users' tendency towards technology acceptance. There exist a strong relationship between technology acceptance factors in accepting these information technologies and user satisfaction of these technologies [2]. They further argue that, users' experience of technology application might be the major criteria for evaluation of customer's satisfaction of the services provided by a website. The rest of this section presents factors that affect information systems' user satisfaction.

2.4 Perceived Ease of Use

Ease of use refers to the extent to which it is easy for citizens to interact with a website [21]. An individual's perception of ease of use refers to the degree to which they believe that little mental effort is needed in order to learn how to use and work with a specific system.

Perceived ease of use can be defined as the degree to which an individual believes that learning to adopt a technology requires little effort [22]. Elements that determine perceived ease of use of information systems include; Ease to learn; Ease to manage; Self efficacy; Simplicity; and Compatibility. Usability can be defined as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241−11, 1998).

Perceived ease of use influences users' attitude towards using information system which sequentially has influence over behavior intention to use, which is a key

factor for determining actual conditions of system use [22]. Ease of use is recognized as a factor affecting user satisfaction [2], service quality assessment and technology acceptance [23]. Ease of use appears frequently in studies examining the key dimensions of web quality or the factors influencing customer satisfaction. Among others.

Thus, it might be said that ease of use is an effective factor in user satisfaction of information systems.

2.5 Content and Appearance of Information
This dimension refers to the quality of information and its display such as proper use of colors, graphics and web page size [24]. The features of applied systems and the information contained therein are among the factors affecting IS acceptance. Effective communication, website design and its content are known as key factors determining the perceived quality of e-services. Some websites are not fully used because of improper customization and user support [2]. They further argue that, in the same way that aspects such as completeness, accuracy, brevity and relevance are considered as positive features of information, excess or scarcity are negative ones.

Correct links are complementary to the information provided by the website and therefore proper links should be selected and maintained. Also these links should be routinely monitored for solving any potential problem. Easy perception of documents or information provided in the website is essential particularly in the case of formal documents which contain specialized terminology and are formulated in an official jargon.

Another required characteristic is the aesthetic one recognized with features such as colors used, graphics, animation, and size of web pages [2].

2.6 User Support
Supporting the users refers to the assistance provided by organizations to users towards browsing required information or during interaction with the information system. This assistance may include user guide, existence of help pages in the website and presenting the frequently asked questions with their answers within the website. Provision of supportive mechanisms and systems support capabilities is another important factor of technology acceptance. Such mechanisms can help users in the case of their unawareness of employed technology or unforeseen events [25]. User support services refer to the ability to respond to the potential problems in services accessibility and the ability to solve user concerns and difficulties.

2.7 Reliability
Reliability refers to the degree to which citizens rely upon government's websites in terms of appropriate and timely provision of services. This includes proper technical functioning (accessibility and usability), and

fulfillment of promises. Accessibility is a general term which mostly refers to the extent to which a system is usable for most users without need for modification.

Usability refers to the extent to which a system is affected by problems or interference in providing service to citizens as a result of failures in one or more of its sections.

Reliability of services refers to the capability of providing promised services in a correct, timely and reliable manner. Reliability means the ability to provide the promised services in a correct, reliable and continuous fashion. For instance, users visiting a government website expect to be provided with appropriate, timely and high-quality services. Reliability is measure of a website's ability to meet such expectations. If there is an unreliable information system, numerous problems arise in service providing which may influence customer satisfaction [26].

2.8 Perceived Usefulness
An individual's perceptions on usefulness of an informative technology depend on the extent to which they believe that using a specific technology leads to the improvement of their professional performance within an organization or helps better performance of tasks [2].

Such a help may be realized through reducing task performance time or timely provision of information [27]. In learning institutions terms, this performance refers to the usefulness of user's interaction with the information system and benefits they achieve through this interaction.

Usefulness and design are important in human-computer interaction because they influence user's satisfaction and task performance when using computers.

The good design of information system leads to increased profitability and may influence the information systems' success [2]. Examining 18 government-owned websites in South Korea, [28] identified usefulness and perceived usability, website's proper design and ease of e-service use as the most important measures of customer satisfaction of e-government services.

[29] Identified the implications of satisfaction and presented usability, ease of use, time, cost efficiency and reliability as factors affecting satisfaction. Perceived usefulness improves user's satisfaction with information system [30]. Research also indicates that perceived usefulness, perceived ease of use and compatibility improves user satisfaction [31]. Compatibility is the degree to which the system in use fits user's current needs, values and past experiences [32].

3. RESEARCH METHODOLOGY

3.1 Research Design

According to [33], research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. Research design links the data to be collected and conclusions to be drawn to the initial questions of the study – it provides a conceptual framework and an action plan for getting from questions to set of conclusions [34].

This study used a multi-case study approach. Case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used [34]. Case study involves a careful and complete observation of a social unit that places more emphasis on the full analysis of a limited number of events or conditions and their interrelations [33]. He further asserts that, case study is essentially an intensive investigation of the particular unit under consideration.

3.2 Target Population

This research targeted staff and students who use information system at Masinde Muliro University of Science and Technology (Main campus) and Mount Kenya University (Kakamega campus). These two universities were chosen one to represent public universities and other private universities.

3.3 Sampling Techniques

Sampling techniques is a process of selecting a number of individuals from a population such that the selected group contains elements representative of the characteristics found in the entire target population [35].

[36] Assert that a sample is a small group obtained from the accessible population as a representative of the whole population. A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample [33].

The study sample was derived using both purposive sampling and simple random sampling techniques where each respondent had equal probability to be chosen from their respective category. Purposive sampling is a non-probability sampling procedure which does not afford any basis for estimating the probability that each item in the population has of being included in the sample [33]. Purposive sampling is a sampling technique that allows a researcher to select and use cases that have the required information with respect to the objective of the study [36]. Purposive sampling technique was used to select system developers and ICT support staff. The criterion that was used in purposive sampling

was based on the experience in usage and non-usage of information systems.

Simple random sampling is a probabilistic sampling technique where each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected [33].

According to [36], this technique gives every sample in a given accessible population equal chance of being selected. This technique was used to select the sample of students and staff who use the information system in the universities. Students and staff were the main respondents in this study. Random sampling provides an efficient system of capturing, in a small group, the variations or heterogeneity that exists in the target population [36]. According to [33], random sampling is the best technique of selecting a representative sample because it enables the sample to have the same composition and characteristics as the target population.

3.4 Sample Size

The sample for this study was obtained using [37] formula $n=z^2pq/d^2$. Using this formula, n is the desired sample size of the study population, z is the standard normal deviate, p is the proportion of users in target population estimated to be using information system, $q = 1 - p$ and denotes proportion of users in target population estimated not to be using information system and d is the degree of accuracy allowed.

For the students sample, the study used 93% (0.93) confidence level which corresponds to standard normal deviate (z) of 1.81, p is unknown hence set at maximum variability value of 0.5 (50%, worst case value). The precision d allowed for this study is 7% (1 – 0.93) (0.07). Using this formula for the student sample, the sample size was found to be 167 as shown;

$$n = z^2pq/d^2$$

$$n = \frac{(1.81)^2(0.5)(0.5)}{0.07} = 167$$

Table 3.1 shows the expected distribution of student respondents.

For the staff sample, this study used 90.5% (0.905) confidence level which corresponds to standard normal deviate (z) of 1.67, p is unknown and hence set at worst case value of 50% (0.5) and d is 10% (0.095). Using this formula for staff sample, the sample was 77 as shown;

$$n = z^2pq/d^2$$

$$n = \frac{(1.67)^2(0.5)(0.5)}{0.095^2} = 77$$

As proposed by [38], the exact proportion of users who use information system in the target population was not known and hence p was set at the worst case value of 50% (0.5). Cochran'sformula is appropriate when target population is large or unknown [39]. The model validation sample was also obtained using [37] formula with 84% (0.84) confidence level which corresponds to standard normal deviate (z) of 1.42. The precision d allowed for validators is 16% (0.16). Using this formula for the validators' sample, the sample size was found to be 20 as shown.

$$n = z^2 pq / d^2$$

$$n = \frac{(1.42)^2 (0.5)(0.5)}{0.16^2} = 20$$

Using [37] formulae, the sample size is determined by the error the researcher is willing to accept in the study [37]. The only aspect that can be varied in the [37] formulae in order to control the sample size is d, the error level, as stated by [40]. [41] Recommends error margin of 0.30 or better (but not much beyond 0.20) for basic research and between 0.10 and 0.05 in cases where important decisions are to be made on the basis of the test scores. This study used 0.07 and 0.095 error margings for students and staff respectively, which fall within the [24] and [41] recommended level of 0.10 or below

3.5 Data Collection Instruments

Data was collected using various instruments among them content-analysis. This consists of analyzing the contents of documentary materials such as books, magazines, newspapers, journal articles and the contents of all other verbal materials which can be either spoken or printed [33]. This method can be used to analyze software and its documentation. This method was used to collect and analyze information on factors affecting information systems' user satisfaction.

Questionnaires were also used. A questionnaire consists of a number of questions printed or typed in a definite order on a form or set of forms [33]. Two sets of questionnaires were administered to the sample. One set of the questionnaires was administered to the students and the other to the staff using information systems. The questionnaires were formulated based on the objectives of the study. The study used structured questionnaires.

Structured questionnaires are those questionnaires in which there are definite, concrete and pre-determined questions. The questions are presented with exactly the same wording and in the same order to all respondents [33]. The questionnaires included both closed and open questions. According to [33], structured questionnaires are simple to administer and relatively inexpensive to analyze

4. RESULT AND DISCUSSION

4.1 Results on Factors Cited by Students as Affecting Information System Satisfaction

The section presents and analyses data on factors affecting information systems satisfaction. Figure 1 shows the factors cited by students as affecting information system satisfaction.
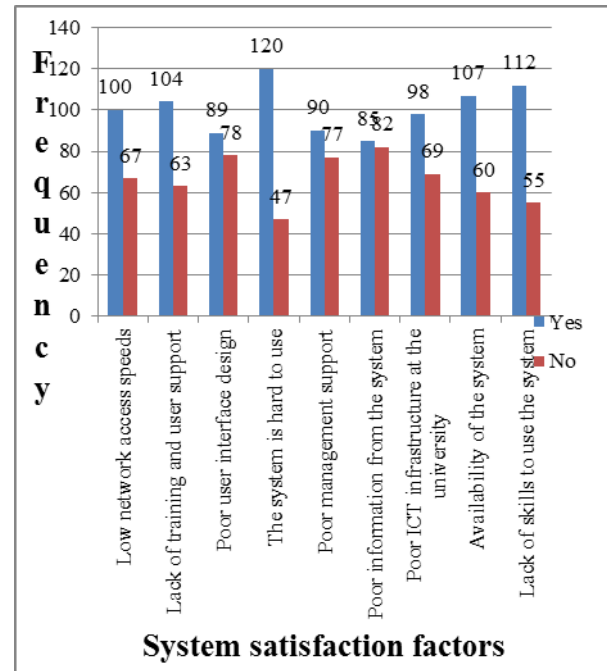

Figure 1: Factors affecting information system satisfaction (Student data)
Source: Research data

As shown in Figure 1, 100 (59.9%) of the students feel that low network access speed affects information system satisfaction while 67 (40.1%) felt that network speed has no effect on system satisfaction. There were 104 (62.3%) students who were of the opinion that lack of training and user support affects system satisfaction but 63 (37.7%) were on contrary opinion. A total of 89 (53.3%) students felt that poor interface design affects system satisfaction but satisfaction of 78 (46.7%) students was not affected by system interface.

The system is hard to use was cited by 120 (71.9%) students as a factor affecting information system satisfaction while 47 (28.1%) were not affected by systems' ease of use. A total of 90 (53.9%) felt that lack of management support affects system satisfaction while 77 (46.1%) were on contrary opinion. Poor information from the system was cited by 85 (50.9%) as affecting system satisfaction while 82 (49.1%) felt that poor information from the system does not affect system satisfaction.

Findings in Figure 1 show that 98 (58.7%) felt that poor ICT infrastructure at the university affects

system satisfaction while 69 (41.3%) were of the opinion that there is no effect of ICT infrastructure on system satisfaction. Availability of the system was cited by 107 (64.1%) of the students as affecting system satisfaction while 60 (35.9%) students were of contrary opinion. There were 112 (67.1%) students who felt that lack of skills to use the system affects system satisfaction while 55 (32.9%) were of contrary opinion.

Table 1 shows Pearson's correlation between student demographic factors and factors affecting information system satisfaction. The intention of this analysis was to determine the significance levels of the

factors in order to determine the significance of the findings.

As shown in Table 1, low network access speed had significant relationship with age r (165) = -0.160, p = 0.038. Lack of training and user support effects system satisfaction as the results are significant with level of study; r (165) = -0.140, p = 0.072 and with age r (165) = -0.165, p = 0.033. Poor user interface design had significant relationship with university r (165) = -0.321, p = 0.001; level of study r (165) = -0.206, p = 0.009 and with mode of study r (165) = 0.159, p = 0.040.

Table 1: Pearson's correlation for factors affecting satisfaction

Factor	University	Gender	Level of study	Year of study	Mode of study	Age
Low network access speed	-0.124 (0.110)	0.098 (0.209)	0.038 (0.629)	-0.065 (0.405)	0.075 (0.337)	-0.160 (0.038)
Lack of training and user support	0.004 (0.963)	-0.114 (0.143)	-0.140 (0.072)	0.030 (0.699)	-0.015 (0.848)	-0.165 (0.033)
Poor user interface design	-0.321 (0.001)	-0.115 (0.156)	-0.206 (0.009)	0.020 (0.792)	0.159 (0.040)	0.040 (0.510)
The system is hard to use	-0.215 (0.005)	0.079 (0.309)	-0.048 (0.536)	-0.028 (0.719)	-0.012 (0.877)	-0.110 (0.159)
Poor management support	-0.179 (0.058)	-0.125 (0.126)	-0.166 (0.036)	0.022 (0.790)	-0.169 (0.041)	0.050 (0.480)
Poor information from system	0.154 (0.048)	-0.039 (0.613)	0.204 (0.008)	-0.036 (0.641)	0.097 (0.212)	0.168 (0.030)
Poor ICT infrastructure in the University	0.039 (0.616)	0.054 (0.488)	0.066 (0.398)	0.035 (0.656)	-0.092 (0.240)	0.199 (0.010)
Availability of the system	-0.310 (0.001)	0.100 (0.199)	-0.147 (0.059)	-0.044 (0.570)	-0.072 (0.353)	-0.212 (0.006)
Lack of skills to use the system	-0.079 (0.312)	-0.105 (0.176)	-0.106 (0.171)	0.021 (0.790)	-0.159 (0.040)	0.055 (0.480)

Source: Research data

Another factor affecting satisfaction of information systems was systems' ease of use which had significant relationship with university r (165) = -0.215, p = 0.005. Poor management support also affects system satisfaction with significant relationships with university r (165) = -0.179, p = 0.058; level of study r (165) = -0.166, p = 0.036 and with mode of study r (165) = -0.169, p = 0.041. Poor information from the system had significant relationship with university r (165) = 0.154, p = 0.048; level of study r (165) = 0.204, p = 0.008 and with age r (165) = 0.168, p = 0.030.

Poor ICT infrastructure at the institution affects information system satisfaction with significant findings against age r (165) = 0.199, p = 0.010. Availability of the information system had significant relationship with university r (165) = -0.310, p = 0.001; level of study r (165) = -0.147, p = 0.059 and with age r (165) = -0.212, p

= 0.006. Lack of skills to use the information system had significant relationship with mode of study r (165) = -0.159, p = 0.040.

Table 1 shows Pearson's correlation between computer self-efficacy and system use and information system satisfaction among student respondents.

Findings show that ability to use a computer and period of using a computer affects satisfaction of information system r (165) = 0.457, p = 0.001 and r (165) = -0.225, p = 0.003 respectively. This means that, respondents who are able to use a computer on their own are more likely to be satisfied with information system than those who don't know how to use a computer. On the other hand, respondents who have used a computer for longer period are less satisfied with the system than those who have used the computer for shorter period.

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Table 2: Student computer self-efficacy and system satisfaction

| Computer self-efficacy/use	Pearson's correlation/Significance
Ability to use computer without help	0.457 (0.001)
Period of using a computer	-0.225 (0.003)
Period of using information system	0.176 (0.023)
Frequency of using information system	-0.307 (0.001)
Training on how to use information system	0.236 (0.002)

Source: Research data

As shown in Table 1, period of using information system and frequency of using the information system affects satisfaction r (165) = 0.176, p = 0.023 and r (165) = -0.307, p = 0.001 respectively. Training on how to use the system also affects system satisfaction and the findings are significant with a level of r (165) = 0.236, p = 0.002. Findings in Table 1 show that the more students use the information system in their university the more they are likely to be satisfied but those students who frequently use the system are less likely to be satisfied and that training has a positive impact on system satisfaction.

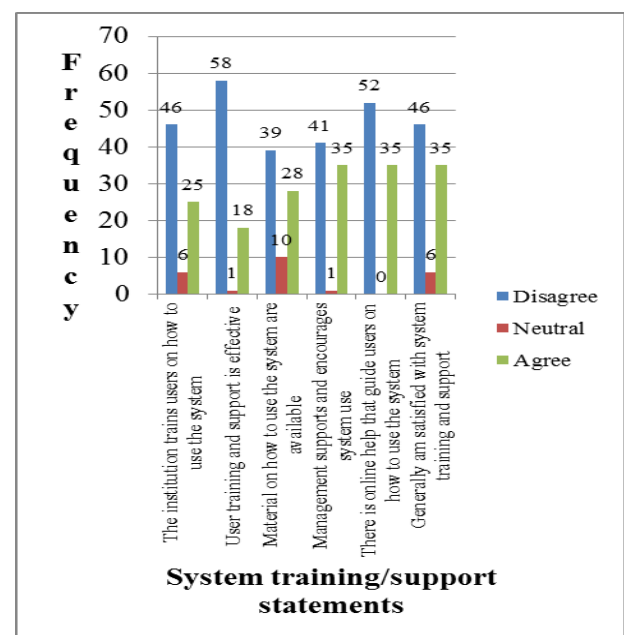**4.2 Students, and Staff Response on System Reliability**

Figure 2 show the distribution of student responses on reliability of information systems in their institution.

There were 77 (46.1%) students who disagreed to the assertion that the information from the system is reliable, 74 (44.3%) agreed to that assertion while 16 (9.6%) remained neutral. The information system performs its' task right was agreed upon by 91 (54.5%) of the student respondents, 60 (35.9%) disagreed and 17 (10.2%) were undecided. Students were also asked whether the information system is reliable where 121 (72.5%) said the system is unreliable, 39 (23.4%) agreed and only 7 (4.2%) were undecided. The assertion that information from the system is untrustworthy was agreed upon by 110 (65.9%) students, 50 (29.9%) disagreed and a small number of 7 (4.2%) were undecided.
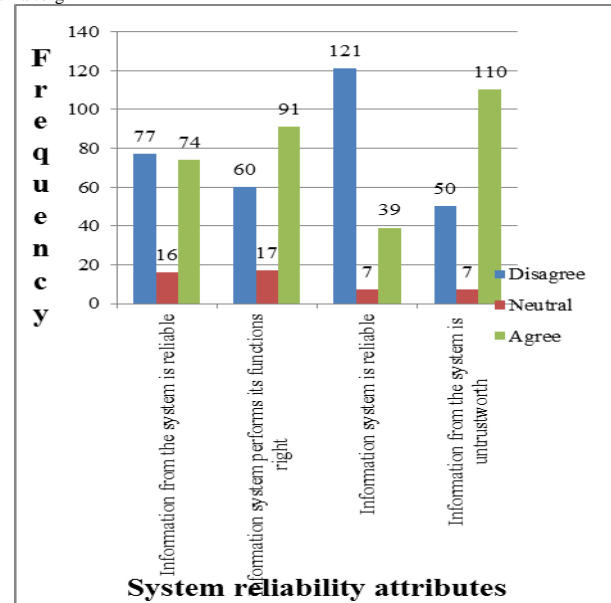
Figure 2: Student response on system reliability
Source: Research data

As shown in Figure 2, there were 42 (54.5%) staff respondents who disagreed to the assertion that the information from the system is reliable, 26 (33.8%) agreed to this assertion while 9 (11.7%) remained undecided. The information system performs its functions right was agreed upon by 27 (35.1%) of the staff respondents, 30 (39.0%) disagreed that the system performs its task right while 10 (13.0%) remained neutral. Staff were also asked whether the information system continues to work even when there is a fault and majority, 54 (70.1%) disagreed, 18 (23.4%) agreed that the system continue functioning even when there is a fault and only 5 (6.5%) were undecided.

Figure 3: Staff response of system reliability
Source: Research data

Findings in Figure 3 shows that majority of the staff respondents agreed that the information system is generally reliable with a leading frequency of 53 (68.9%), 19 (24.7%) felt that the system is not reliable and 5 (6.5%) were undecided.

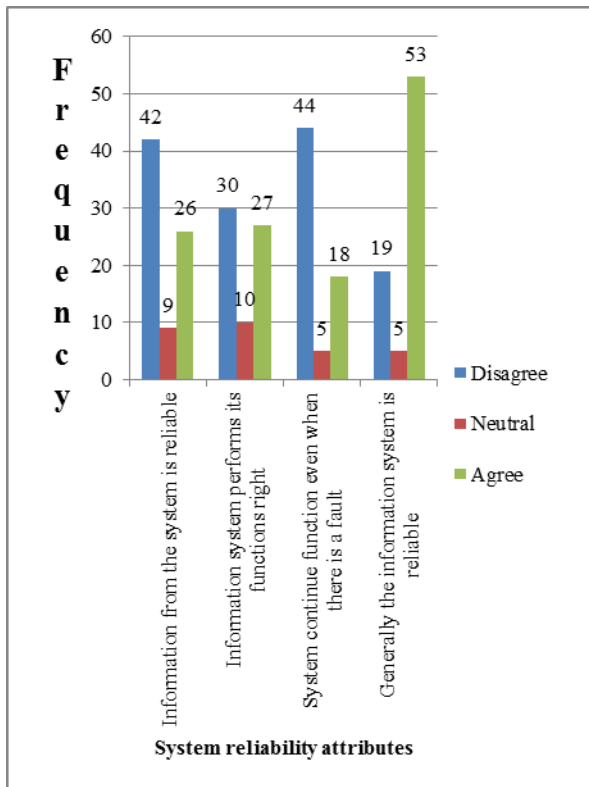### 4.3 Results on Factors Affecting Information System Training and Support

Figure 4: Staff response on training and support
Source: Research data

Findings in Figure 4 show that majority of the staff respondents, 46 (59.7%) disagreed that the institution trains users on how to use the system, 25 (32.5%) agreed and 6 (7.8%) were neutral. There were 58 (75.3%) staff respondents who disagreed to the assertion that user training and support is effective, only 18 (23.4%) agreed and 1 (1.3%) remained undecided. A total of 39 (50.6%) staff respondents disagreed that material on how to use the system are available, 28 (36.4%) agreed and 10 (13.0%) were neutral.

Respondents were asked whether management supports and encourages system use where 41 (53.2%) disagreed, 35 (45.5%) agreed and 1 (1.3%) remained undecided. The assertion that there is online help that guides users on how to use the system was agreed upon by only 35 (45.5%) while the rest 52 (67.5%) disagreed. A total of 46 (59.7%) were not satisfied with system training and support, 35 (45.5%) were satisfied while 6 (7.8%) were neutral.

4.4 Student, and Staff response on Security Mechanisms in the Information System

Figure 5 shows the student response on security mechanisms in the information system.
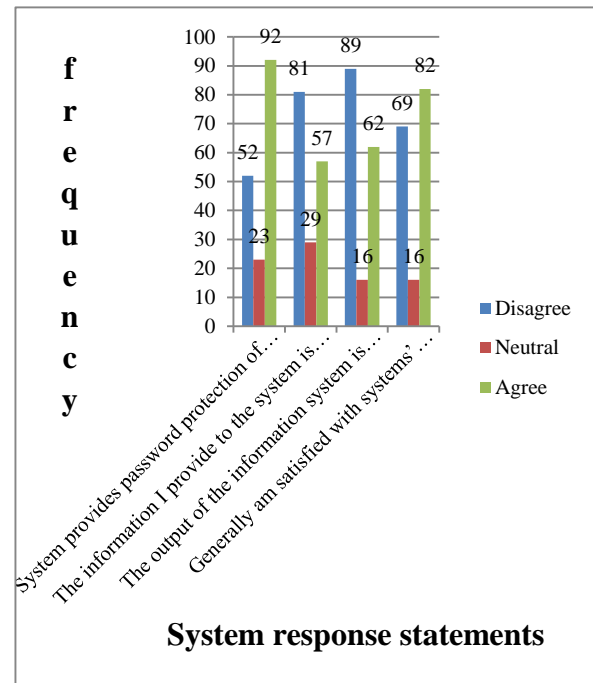

Figure 5: Student response on system security
Source: Research data

Findings in Figure 5 show that there were 52 (31.1%) who disagreed that the system provides password protection to all resources, 92 (55.1%) agreed to that assertion while 23 (13.8%) were undecided. There were 57 (34.1%) of the students who agreed that the information they provide to the system is protected, 81 (48.5%) agreed and 29 (17.4%) were neutral. The output of the information system is secure was agreed upon by 62 (37.1%), 89 (53.3%) disagreed while 16 (9.6%) were undecided. A total of 82 (49.1%) of the students agreed that they are satisfied with systems' security measures, 69 (41.3%) were not satisfied while 16 (9.6%) were undecided.

Figure 6 shows the staff response on system security measures. Findings in Figure 6 show that majority of staff respondents, 45 (58.4%) agreed to the assertion that system provides password protection to all resources, only 23 (29.9%) disagreed and 9 (11.7%) remained neutral. On whether the information provided to the system is protected, 36 (46.8%) of staff respondents agreed, 29 (37.7%) disagreed while 12 (15.6%) were neutral. A total of 40 (51.9%) of staff respondents disagreed that the output of the information system is secure, 31 (40.3%) agreed and 6 (7.8%) were neutral. There were 37 (48.1%) staff respondents who agreed that they are satisfied with security mechanisms in the system,

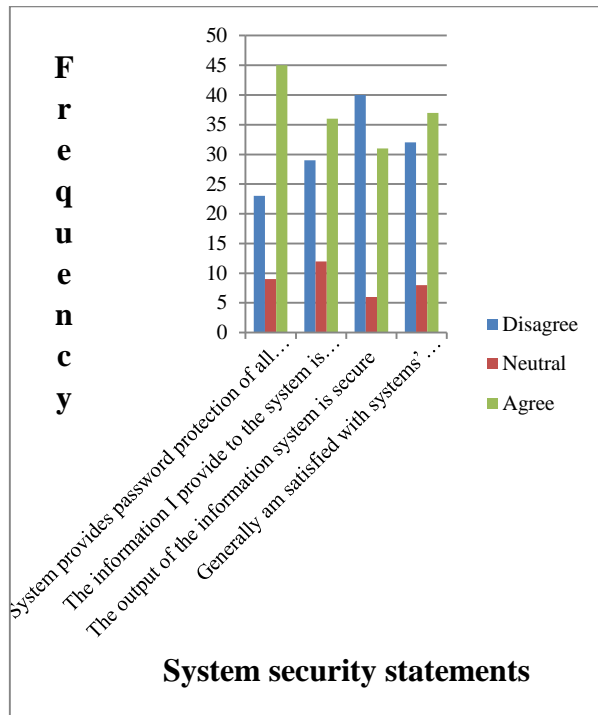32 (41.6%) were not satisfied while 8 (10.45) were undecided.

Figure 6: Staff response on system security
Source: Research data

5. DISCUSSION OF FINDINGS

5.1 Elements for Measuring Functionality

Functionality is the capability of the software system to provide functions which meet the stated and implied needs of users under specified conditions of usage (ISO/IEC 9126, 2001). To improve information system user satisfaction, the designers, developers and management should ensure the information system provides all functions expected by users. A whole process should be automated in single functional information system rather than automating half of the process and the other half performed by another non-integrated system.

ISO 9126 Software Quality Model (1991) splits functionality into five sub-attributes; suitability, accurateness, interoperability, compliance and security; which must be possessed by an information system in order to improve its satisfaction. Suitability is the ability of a software system to perform the tasks required; accurateness is the degree at which the results from the software system much the expected results; interoperability is the ability of the information system to interact with other systems; compliance is the degree at which the information system is compliant with standards, laws and regulations; and security is the capability of the system to prevent unauthorized access. To improve information systems' satisfaction, the system should have these five sub-attributes of the software system functionality.

5.2 Elements for Measuring Efficiency

Efficiency is defined by ISO 9126 Software Quality Model (1991), as the capability of the software system product to provide desired performance, relative to the amount of resources used, under stated conditions.

Efficiency is determined by systems' time and resource behavior. System response can be measured using throughput, which is a measure of how much output the system can produce within a given time; turn-around time; which the measure of the time a user needs to wait after giving input to a system until when he gets the output; and capacity which is the measure of the amount of input information that can be successfully processed by the information system over a given period of time.

Resource utilization can be measured in terms of memory utilization, which is the amount of memory needed by an information system to operate; disk utilization which is the measure of the disk space used by the information system, including both space used for storing its source code and the space used temporarily or permanently during execution. System response time and resource utilization should be put at optimum to improve information systems satisfaction in Kenyan universities.

5.3 Elements for Measuring Reliability

This is the capability of the software system product to maintain its level of performance under stated conditions for a stated period of time (ISO 9126, 1991).

Reliability of a software system is determined by software system maturity, systems' fault tolerance and system recoverability. Software system maturity is the degree at which most of the faults in the system have been eliminated over time, fault tolerance is the capability of the system to continue functioning in the event of an error and recoverability is the capability of the software system to resume working and restore lost data after a failure has occurred. In order to improve information systems satisfaction in Kenyan universities, system reliability must be considered. This can be done by ensuring the system is fault tolerant, the system is mature and recoverable.

5.4 Elements for Measuring Availability

Software system availability is degree at which the information system is up, accessible and usable by its intended users whenever and wherever they want to use it.

The users should be able access and use the information system from anywhere the system is accessible. To improve information system satisfaction in Kenyan universities, availability of the system should be improved by reducing down-times. This can be achieved by ensuring the underlying network and other hardware resources are reliable and fault tolerant.

6. CONCLUSION

The study sought to find out factors that affect information system satisfaction. It was found that

information system satisfaction in Kenyan universities is affected by low network access, system usability, lack of training and user support, poor user interface design, poor management support, poor ICT infrastructure at the university, availability of the system and lack of skills to use the system. The study also found that satisfaction is affected by user computer efficacy, and experience in using a computer and information systems. It was also found that satisfaction is significantly affected by user demographic factors like gender, age, level of study and system factors like information quality, perceived ease of use, system functionality, system availability and system efficiency. There was no difference in the factors between the two universities. Among the staff, there was significance difference in factors across staff universities with MMUST staff being more satisfied than MKU staff and also differed across age groups with staff aged above 35 years being more satisfied than the others

7. SUGGESTION FOR FURTHER STUDY

This study focused on assessing user satisfaction of information systems in Kenyan universities. Two universities were used; MMUST and MKU. The study recommends an in-depth investigation of information system satisfaction in other private and public institutions because each institution is unique. A study can also be done to instigate other aspects of information system other than satisfaction

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