Assessment Model for Electronic Health Management Information Systems Success in a Developing Country Context: A Case of the Greater Bushenyi Districts in Uganda

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Abstract

Electronic information systems are gradually replacing traditional information systems in most public and private organisations in developing countries. This is motivated by the wide acceptance of use of information technology at almost all levels of Government institutions and private institutions. No matter the trends in the economy the organisations strive to know the investments in information systems (IS) to determine their success because they are often implemented to solve a particular business need or opportunity. Thus imperative to establish the IS effectiveness for every investment in the IS project given the evolution of information technology. This paper aims at examining the DeLone and MacLean model, 2016 for suitability of assessment electronic information systems success in a developing country context looking at the case of Uganda. Guided by the pragmatic thought and a rare abductive research approach which combines inductive and deductive perspectives were used. It utilized the concurrent transformative research designs for data collection.

Keywords: Assessment model; eHMIS model; success model; factors influencing eHMIS; developing countries; Greater Bushenyi Districts.

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1. Introduction

In the world today, information systems are of supreme importance in the operation of national, private and public organizations [5] Information systems process and distribute information among different departments in the organisation. These are designed with the aim of increasing productivity between the system and its users in line to increase the effectiveness and efficiency of people while performing their duties. Entire sectors of an economy depend on substantial investment in information systems [8] In developing countries, traditional information systems are progressively being replaced by modern systems with more sophisticated software and hardware applications (World Bank, 2010). These developments are forcing organizations to re-evaluate and re-assess their information systems effectiveness. However, according to World Bank [19] developing countries is a general term used to refer to a group of countries that require equitable and sustainable social and economic growth classified such countries as low income countries with the gross national income (GNI) per capita $995. Health Management Information System (HMIS) which is "an information system especially designed to assist in the management and planning of health programmes, as opposed to delivery of care". It is acceptable worldwide that Health Management Information Systems build on existing data and health information system standards and infrastructure. The Ministry of Health Uganda (MoH) adopted an electronic Health Management Information System in August 2010, whose full implementation was in January 2012 [14]. This system was envisaged to overcome all the shortfalls of a manual system. Electronic Health Management Information Systems have been handy in the management of heath care services in developed countries. However efforts to implement eHMIS in developing countries continue to suffer high rate failures because several factors that are peculiar to the developing countries context which Uganda is a candidate. The outstanding factors include attitude, culture, transferring an IS from one environment to another, resistance to change, inadequate skills, frequent power interruptions, lack of management support and unreliable internet connection [2;6;7]. Health Information System failure is associated with huge financial loss, poor quality health services delivery and shame. The current information systems success assessment models are generic in nature not representing the inequalities that exit between contexts of system implementation [13].These situations mandated this study to develop an assessment model for the eHMIS success in the developing country context. Before the birth of the DeLone and McLean (D&M) of Information Systems Success in 1992, researches involving information systems success were in existence for instance the communication research by Shannon and Weaver, 1994 and the information influence of Mason , 1978. The 1992 D&M model introduced taxonomy in Information Systems research based on the "Systems quality" Information quality, use, user satisfaction, individual impacts, and organisational impacts. The model adopted the Shannon and weaver framework of 1949 and the extensions of Mason in 1978 which to date still appears relevant despite the decades passed it. The model was based on process and causal relationships of success dimensions to determine if there exits causal relationships among them. For example the increase in information quality would increase the use of the system and the decrease would lead to decreased use of the system. The model was widely validated and tested empirically by many studies that suggested modifications and extensions made on the model that motivated D&M to modify the model in 2003. The updated D&M model [4] of information systems success consolidated the views and criticisms from different researchers in the area of Information systems success that rose from the previous model of 1992[18; 15]. The updated model had the three quality diamensions.ie Information quality, System

quality and service quality, intention to use, use, user satisfaction and net benefits.

Information quality: this deals with the content and characteristics of the information system output [4]. It was measured in terms of information output timeliness, accuracy, reliability, and trust worthiness. The study considered information quality as accuracy, relevancy, conciseness, understandability, completeness, usefulness

System Quality: this measures the desirable characteristics of information system such as perceived ease of use, system features, response time and flexibility [4]. This study considered system quality as ease of use, flexible, reliable, ease of learning and use, clarity of features and system response time.

Service quality: this measures the quality of support rendered by the information systems developer [15]. The dimension is measured by support team assurance and responsiveness, provision of user training. This study considered support team is reliable, technically competent, team is empathetic, team is responsive

2. Methodology

The study was guided by the pragmatic thought and a rare abductive research approach that combines inductive and deductive perspectives was used. It utilized the concurrent transformative research designs for data collection [9]. The target population included 310 participants from the155 health units from the five Districts that form the greater Bushenyi and purposive sampling supported by snowball sampling technique were applied to select the study participants [1]. The interview and questionnaire methods were used for data collection. The instruments were tested for reliability and validity in which reliability for quantitative data was tested by cronbach's alpha values above for 0.7 and transcript code checks for consistence for qualitative data [17]. Content validity was determined by information systems success measurement experts and construct validity was for the instruments was determined by SPSS version 22.0 factor analysis and KMO's barletts test was performed and recommended values above 0.7 were achieved for all constructs [16]. Data analysis was done in SPSS version 22.0 for quantitative data and Constant Comperative analysis for the qualitative data

3. Findings

Two hundred forty eight questionnaires were distributed but only 154 were received back. Implying a 89% response rate. There were ten (10) key informants and were all interviewed successfully and their transcripts well documented. The questionnaire measurement for the study was the Likert scale measurement with a five point scale: 5 strongly agree, 4 agree, 3 somewhat agree, 2 disagree and 1 strongly disagree. For the eHMIS success construct measurement for information quality, system quality, service quality, management support, resource supply and education and training. Data analysis for the quantitative data was performed using the statistical package for the social scientists (SPSS version 22.0) to find the descriptive statistics presented in percentages, correlations and regression analysis. The results from the primary data collected from the five districts of the greater Bushenyi region and the qualitative data the Constant comparative method and content analysis was applied which included transcribing the interview results into the first line coding, refining codes, categories the codes and came up with themes/final category codes

3.1 Quantitative findings

3.1.1 Information quality

According to the data obtained from Health Unit In charges and Health Information Assistants represented in Figure 1 below, the data shows t that respondent's relative percentages with the information quality construct variable reports are relevant. 78% of the respondents agreed that while 22% disagreed, the majority respondents were upper quartile above the median percentage of 50%. On the variable reports generated by the system are understandable, 86% agreed while 14% disagreed the majority were above median percentage. 45% of the respondents agreed that reports generated by the system are accurate while 41% disagreed and 14%somewhat agreed on the variable, the majority of respondents were below the median percentage of 50% in agreement. 40% of the respondents agreed that reports generated by the system are concise, 36% somewhat agreed while 24% disagreed, respondents agreement was below 50%   the median   percentage On the variable reports generated by the system are complete 46% of the respondents agreed, 28% disagreed while 26% somewhat agreed. 47% of the respondents agreed that the system generates reports timely while 30% disagreed and 21% somewhat agreed, respondents were agreements were below 50% median score in agreement. On the variable reports generated by the system are usable 60% agreed, 22% somewhat agreed while 18% disagreed, the majority of respondents were above 50% median percentage in the agreement with the variable
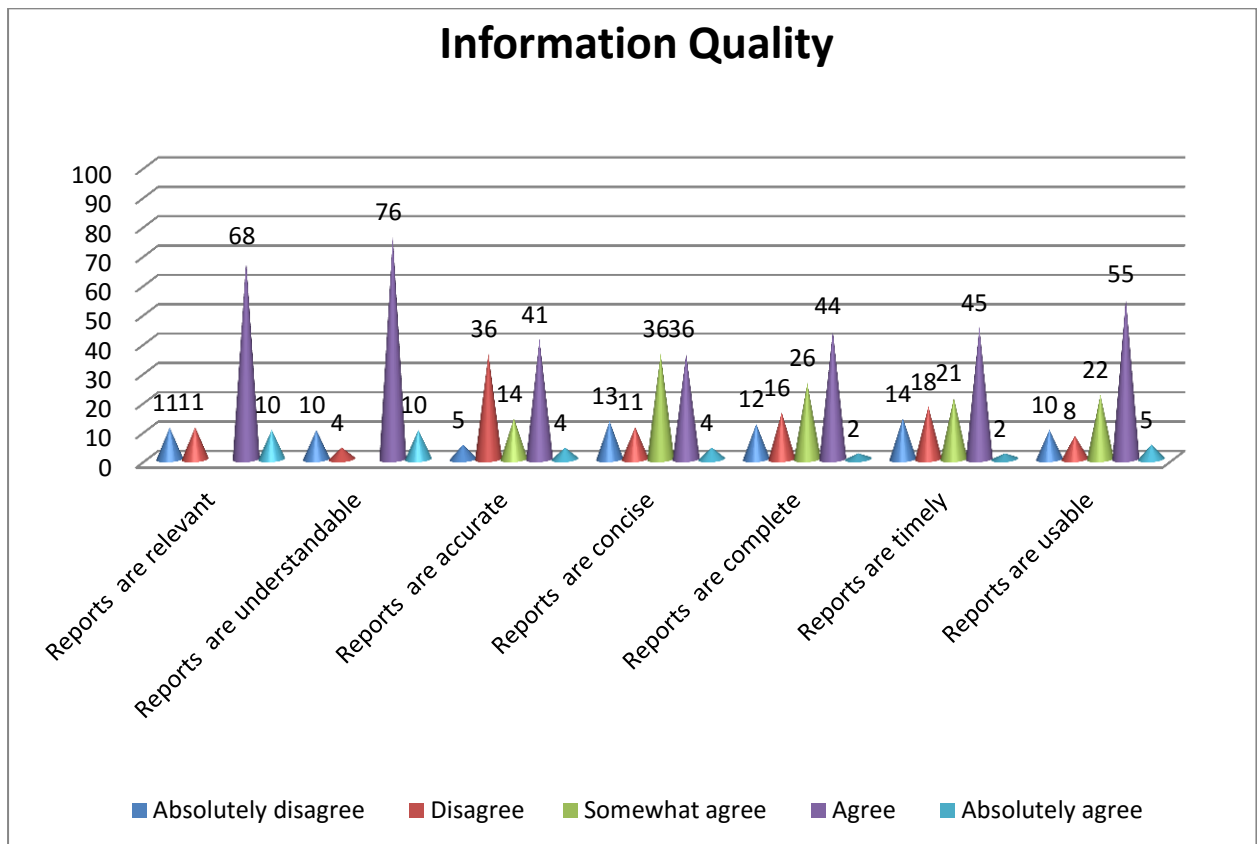

Figure 1: Information quality

Source: Primary data, 2018

3.1.2 System Quality

According to Figure 2 below, explored the respondent's agreement levels on the system quality construct variables that included system ease of use which scored relatively 35% agreement, 36% disagreement and 29% of respondents somewhat agreed, the majority of respondents were below 50% median percentage. 32% agreed that that the system is flexible, 58% disagreed while 10% somewhat agreed, the majority of respondents above the median percentage disagreed. 47% of the respondents agreed that the system was reliable, 29% somewhat agreed and 24% disagreed, respondents position was below 50% median percentage. On the variable system is easy to learn and use 49% of the respondents agreed, 31% somewhat agreed while 20% disagreed, it is evident that the responds position was below the median percentage. 41% of the respondents agreed that the system features are clear, 35 disagreed while 24% somewhat agreed, making it below 50% median percentage position in respondents agreement. On the variable system response time is good 53% of the respondents agreed 28% somewhat agreed while 19% disagreed, more that 50% of respondents agreements position in agreement was above the median %.
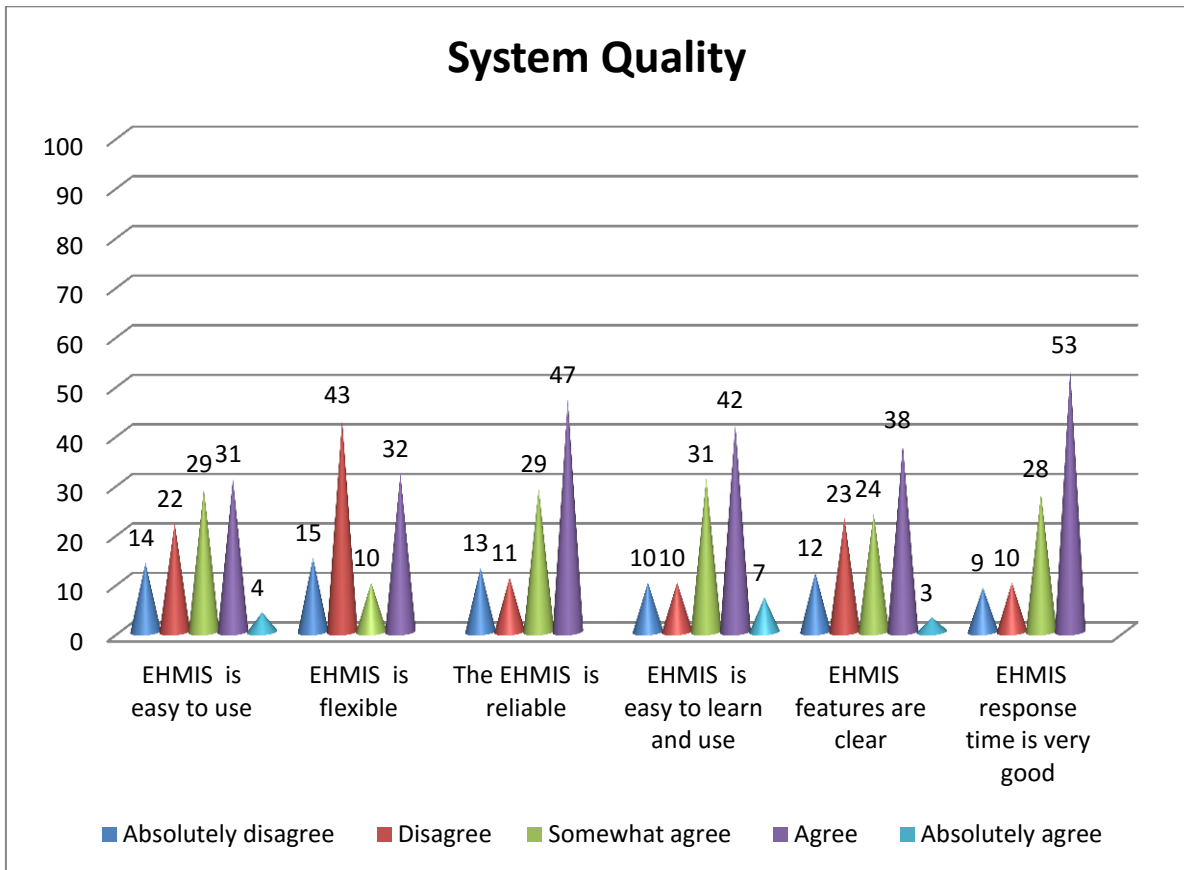

Figure 2: System quality

Source: Primary data, 2018

3.1.3 Service quality

From Figure 3 below, investigated the service quality construct variables   the variable help desk time is responsive scored 46% respondents agreement, 32% somewhat agreed while 22 % disagreed, the majority of respondents were positioned below 50% median percentage . 53% of the respondents agreed that the helpdesk gives accurate information, 29% somewhat agreed while 18% disagreed, it is observed that respondents were positioned above 50% median %. On the variable help desk having reliable personnel 49% agreed, 33% disagreed while 18% were undecided. 73% of the respondents agreed that the help desk has technically competent personnel, 17% disagreed while 10% somewhat agreed, the majority of respondents were positioned above 50% median percentage. 53% of the respondents agreed that the helpdesk has empathetic personnel while 35% disagreed and 12% somewhat agreed, it was evident that the majority of respondents were positioned above 50% median percentage.
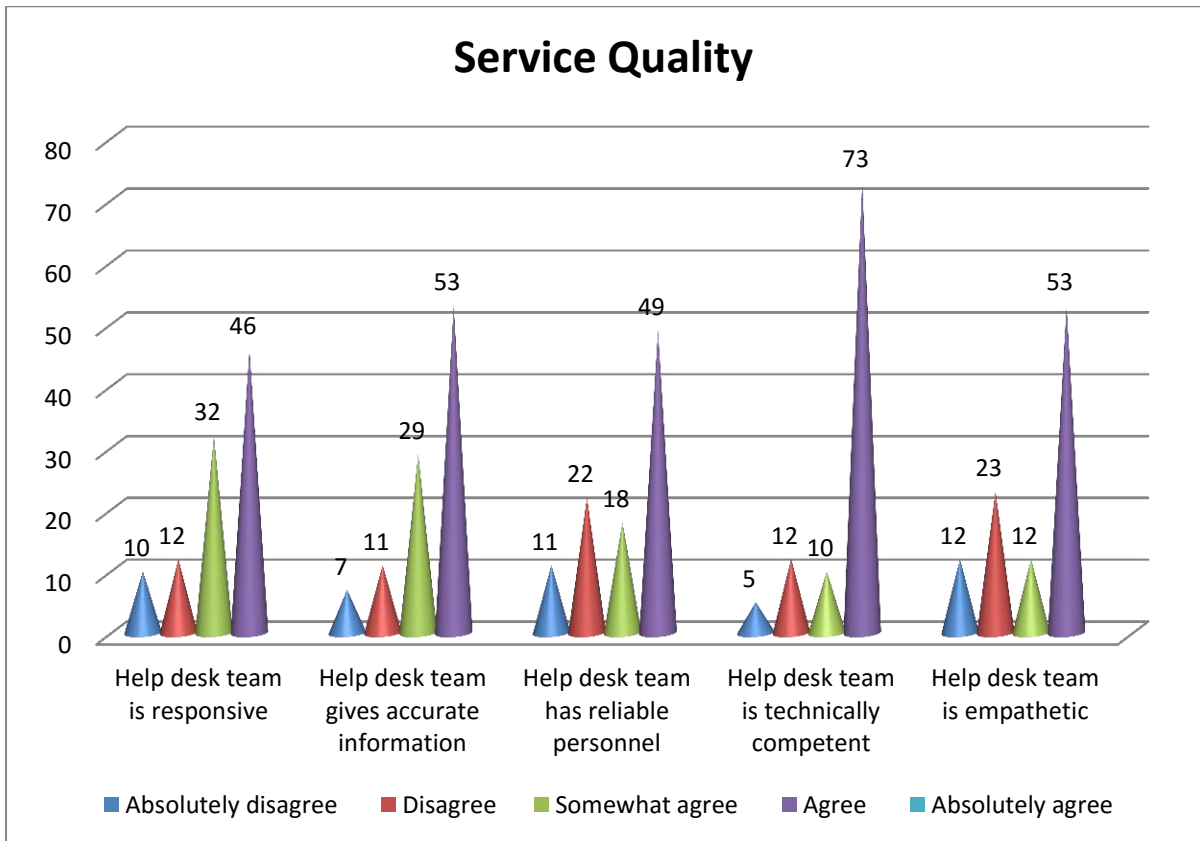

Figure 3: Service Quality

Source: Primary data, 2018

3.1.4 External factors construct

Based on the literature review, additional variables beyond the D&M, 2016 model of information systems

success were investigated so as to evaluate their interplay in the success eHMIS. The results are reflected in sections below

3.1.4.1 Management Support

Management support entails approvals and continuous support during the information system development process and operational phase of the system however; inadequate management support was identified as the factor that causes the failure of eHMIS in the developing countries. Observations in Figure 4 below, the variable staff have been explained the goals and objectives of eHMIS scored 46% of respondents' agreement, 30% disagreed while 24% somewhat agreed, the respondents agreement positioning is below 50% median percentage. The variable eHMIS aligns well with health unit activities scored 68% agreement from respondents, 26% somewhat agreed while 6% disagreed; the majority of respondents were above 50% median percentage. The variable our supervisors motivate the users of eHMIS scored 45% agreement, 35% disagreed while 20% somewhat agreed, the respondents were positioned below 50% median percentage. The variable our supervisors are involved in the EHMIS use scored 56% agreement, 29% disagreed while 15% somewhat agree, the majority of respondents were clustered above 50% median percentage
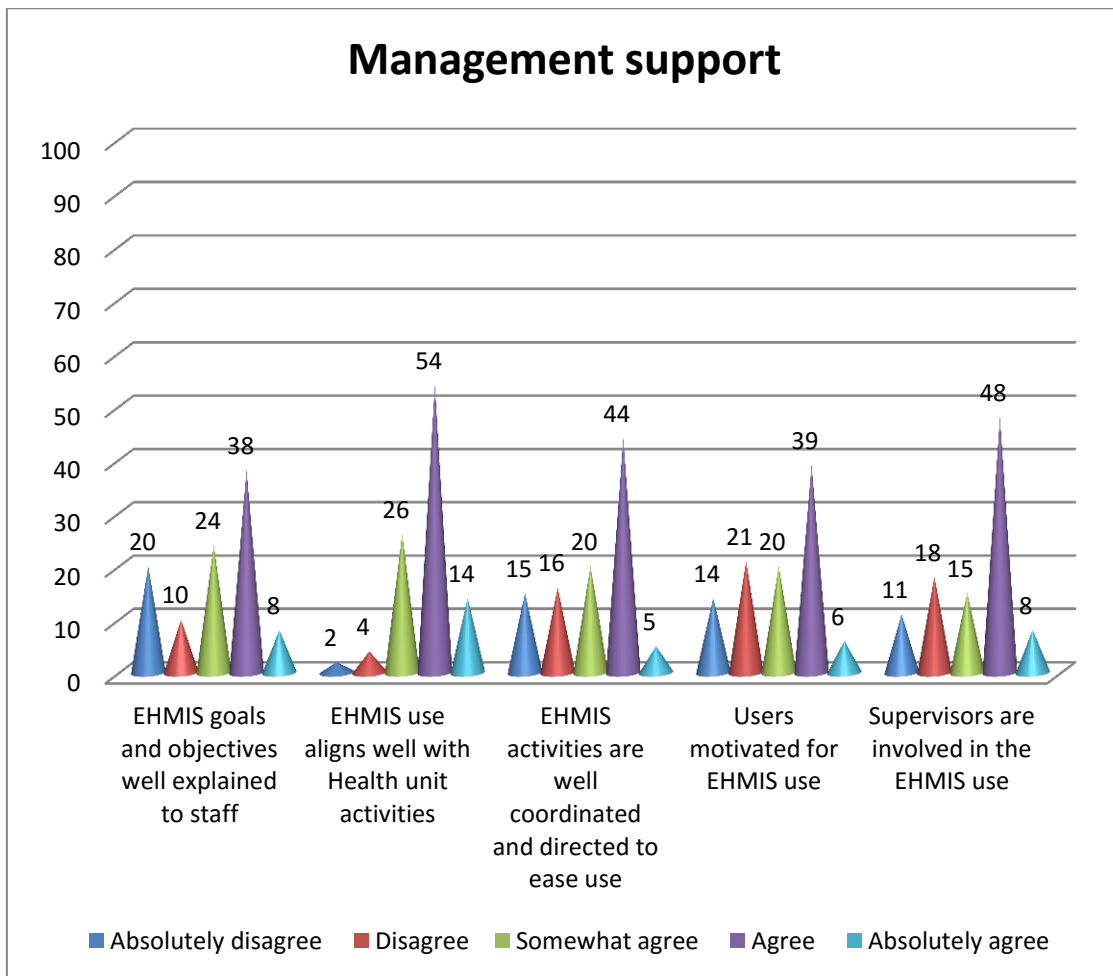

Figure 4: Management support

Source: Primary data, 2018

3.1.4.2 Resource supply

These are the required facilities that support information systems activities to be operational, lack of resources or inadequate resources is a key factor that catalyses the failure of eHMIS in the developing countries. Figure 5 below revealed the following were the findings. The variable the facility having computers, power source, Internet scored 67% disagreement from respondents, 20% agreed while 13% somewhat agreed, the majority of respondents above the median% were in disagreement. The variable facility has reliable computers, internet, power supply scored 67% disagreement, 15% agreed while 21% somewhat agree, the majority of respondents above the median% were in disagreement. The facility requires a secure software platform scored 64% disagreement, 21% somewhat agree while 15% agreed, the majority of respondents above the median% were in disagreement. There is an ICT technical personnel to support staff scored 65% disagreement, 18% somewhat agree while 15% agreed, the majority of respondents above the median% were in disagreement. The variable required resources are supplied timely scored 65% disagreement, 18% somewhat agree while 15% agreed, the majority of respondents above the median% were in disagreement.
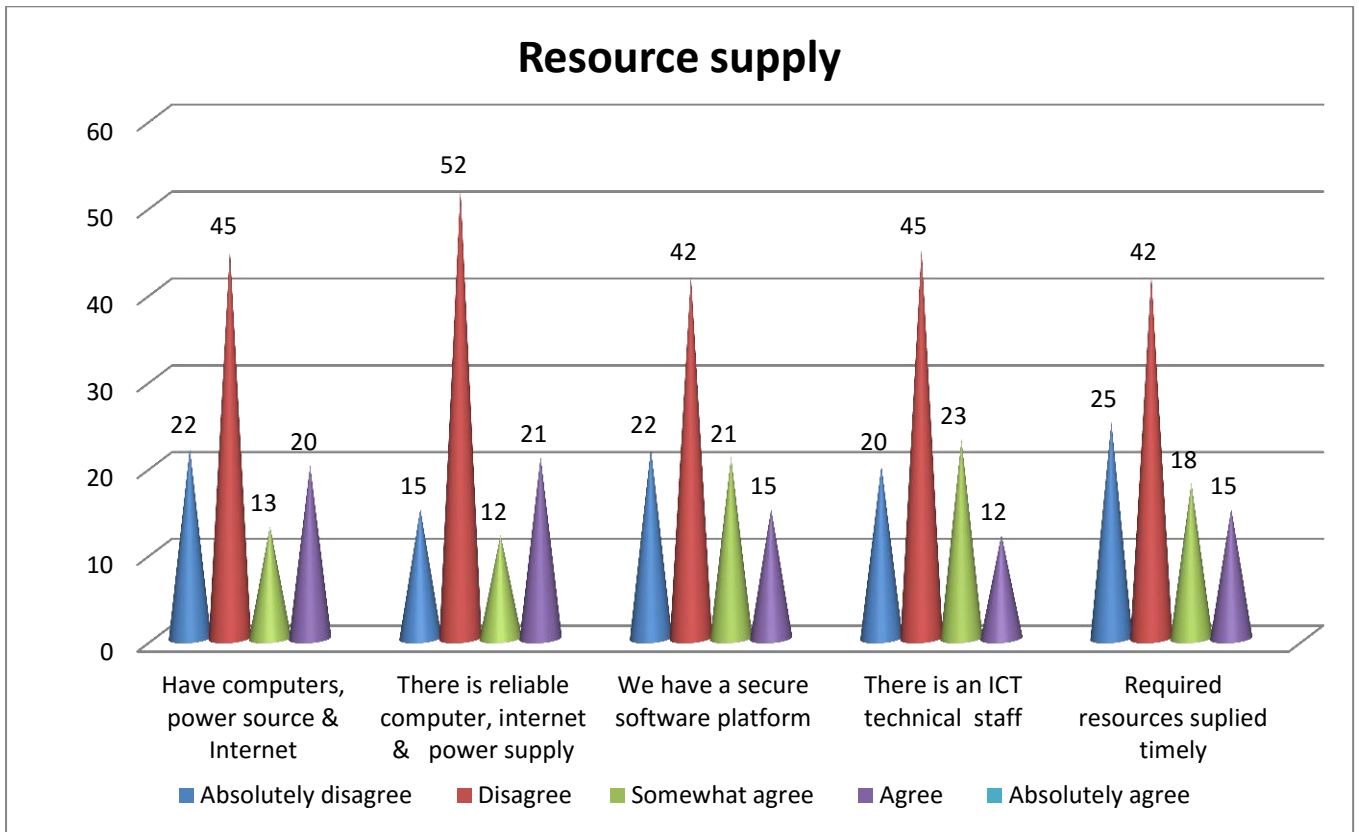

Figure 5: Resource supply

Source: Primary data, 2018

3.1.4.3 Education and training

Education referring to the degree to which staff possess the required skills and knowledge to perform the required tasks while training is learning process that involves acquisition of new knowledge, skills enhancement and changing attitudes and behaviour to enhance performance of the assigned tasks. Lack of expertise and knowledge of ICT propels the IS failure in the developing country context. Figure 6 revealed that the variable staff has sufficient level of knowledge about eHMIS use scored 67% disagreement from respondents, 12% somewhat agree, 21% agreed, the majority of respondents above the median% were in disagreement. Staff have received on job training about eHMIS use scored 66% disagreement, 18% somewhat agree while 18% agreed, the majority of respondents above the median% were in disagreement. The variable staffs are explained the relevancy and benefits of eHMIS scored 63% of disagreements 21% somewhat agree while 16% agreed, the majority of respondents above the median% were in disagreement. And the staff have no past record of use of an electronic system scored 82% disagreement whereas 18% somewhat agree, the majority of respondents above the median% were in disagreement.
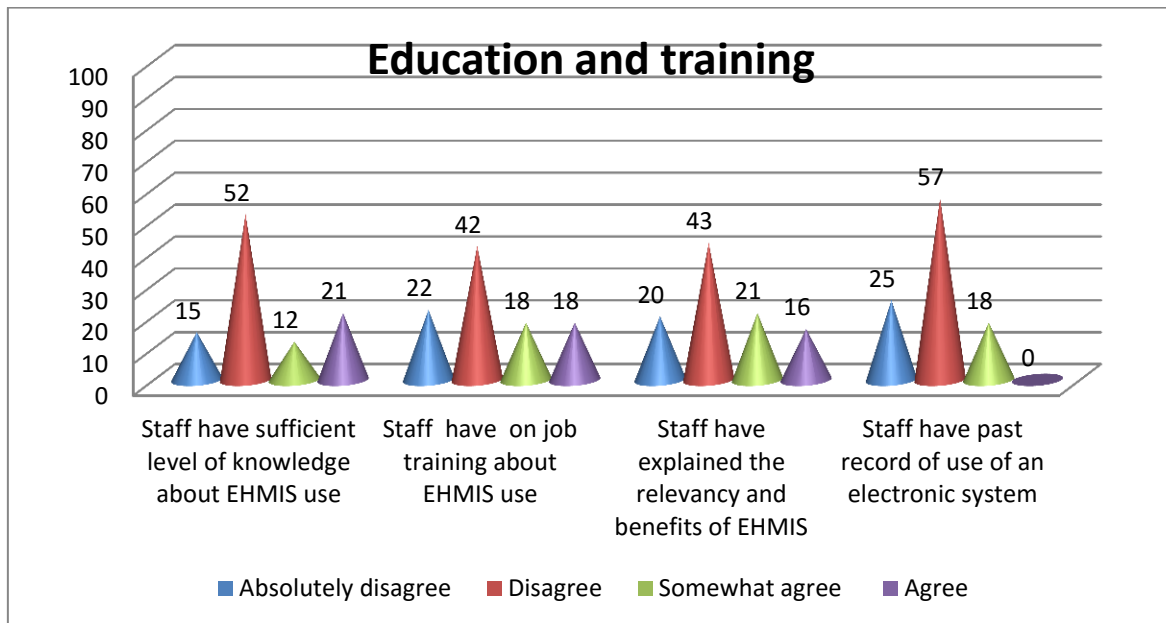

Figure 6: Education and training

Source: Primary data, 2018

3.1.5 The antecedent Use

The manner in which staff use the capabilities of an information system such as the amount of use, frequency of use, extent of use, and purpose of use. In this study the purpose of use was investigated and the following was revealed. Figure 7 shows that the variable I would use the system to enter data scored 36% disagreement, 22% somewhat agree while 42% agreed, the majority of respondents agreements were below 50% median percentage. I would use the system to generate reports scored 34% disagreement, 21% somewhat agree were while 46% agreed, the majority of respondents agreements were below 50% median percentage. I would use the system to view reports scored 36% disagreement, 21% somewhat agree while 43% agreed, the majority of

respondents agreements were below 50% median percentage. I would use the system to validate the data scored 48% disagreement from respondents, 18% somewhat agree while 34% agreed, the majority of respondents agreements were below 50% median percentage. I would use the system for data verification scored 36% disagreement from respondents, 21% somewhat agree while 43% agreed, the majority of respondents agreements were below 50% median percentage.
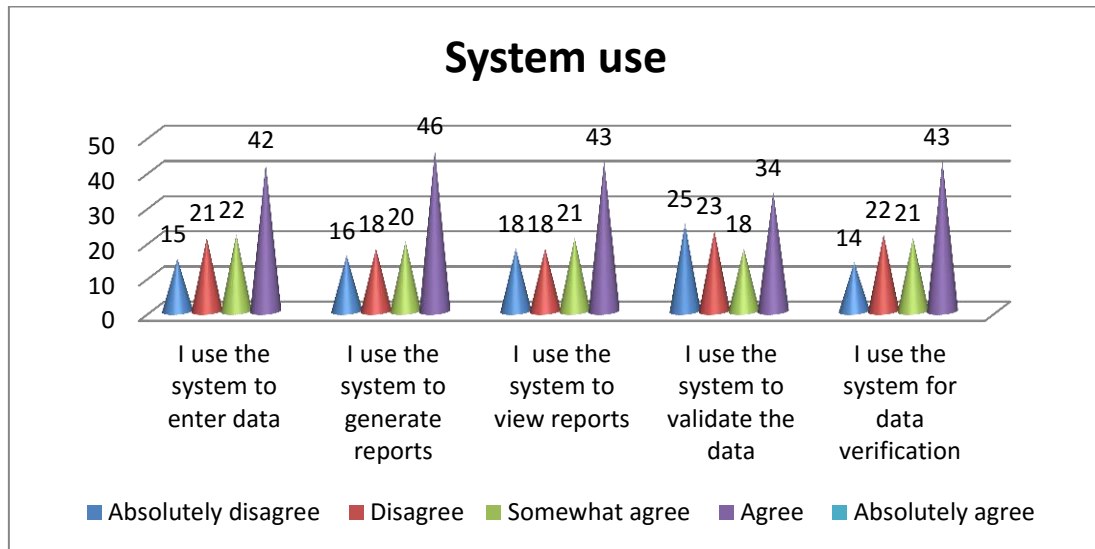

Figure 7: System use

Source: Primary data 2018

3.2 Qualitative data

The quantitative findings were supported by findings from the interviews of 10 (ten) key informants from the five districts who were the District Health Officers (DHOs) and Biostatisticians. They generated a number of responses which were analysed using the constant comparative method.

3.2.11 Information quality

Table 1: Information quality

Final categories, codes in them with the percentages			
Category	**Codes**	**Frequency**	**Percentage**
Information quality	eHMIS produces accurate data	9	90%
	eHMIS reports are relevant	7	70%
	eHMIS reports are concise	8	80%
	eHMIS reports are understandable	7	70%
	eHMIS reports are complete	10	100%
	eHMIS output is usable, relevant, and useful	10	100%

Source: Primary data 2018

The desirable characteristics of system outputs such as relevance of information, understand ability, accuracy, completeness, and usability of information. Out of 10 respondents 9 said that the system was relevant "***the system is quite relevant to the health unit activities and reports.***" That was respondent 4. Respondent 8 had this to say on that matter "***the system is relevant to our services".*** On clarity of system features 7 respondents said the system output was understandable Respondent 1 "***Generally speaking the system output in form of reports is understandable".*** However, respondent 5 on the same point had a different opinion "***some of the output is not understandable like the Figures made by the system***". On the issue of accuracy, all the ten respondents concurred it was accurate. On the issue completeness all the ten respondents said it was generating complete reports, as respondent 8 " ***the system will produce are complete report if all required data for the report is entered***. On the issue of timelines all respondents said the reports generated from the system are timely. On the issue of accuracy all the ten respondents said it was accurate.

3.2.2 System Quality

Table 2: System Quality

Final categories, codes in them with the percentages			
Category	**Codes**	**Frequency**	**Percentage**
System Quality	eHMIS is easy to use	8	80%
	eHMIS is flexible	7	70%
	eHMIS is reliable	6	100%
	eHMIS is easy to learn and use	7	100%
	eHMIS features are clear	7	70%
	eHMIS response time is very good	7	70%

Source: Primary data, 2018

This dealt with the desirable characteristic of an information system such as its ease of use system flexibility, systems reliability and ease of learning. Out of 10 respondents 8 said that the system was easy to use "***I personally find the system easy to use***". That was respondent 4. Respondent 8 had this to say on that matter "***using the system requires dedication and training because it is not easy to use".*** On clarity of system features 7 respondents said the features were clear Respondent 1 "***Generally speaking the system features are clear and can easily be followed***". However, respondent 5 on the same point had a different opinion "***the features are not as clear as they do not clearly match the raw data collection materials***". On the issue of efficiency and reliability, 8 respondents said it was efficient and reliable but respondent 9 said this "***the system is not reliable because you can only access it with an internet connection which we usually don't have***". On the system response time, 6 respondents said it was responsive while four had the other opinion. Respondent 7 said "***the system is usually not responsive because of poor net work connection which delays data entry into the system***".

3.2.3 Service Quality

Table 3: Service Quality

Final categories, codes in them with the percentages			
Category	**Codes**	**Frequency**	**Percentage**
Service Quality	eHMIS support team is reliable	6	60%
	Support team is technically competent	6	60%
	eHMIS support team is empathetic?	7	70%
	eHMIS support team responsive	8	80%

Source: Primary data, 2018

This dealt with the quality of system support that users get from the IT department such as responsiveness, accuracy, and technical competence from personnel staff. 6 respondents out 10 said the technical support team was reliable. Respondent 7 said that "*the staffs at MoH are times not reliable when you call them for help; some says I will get back to you and you wait two hours or three without response*". 6 respondents also said that the technical support team had competent staff. However, respondent 10 said "The *technical staff can make you wait on feedback and when they tell you the procedure it fails to work out*"7 respondents said the technical team had empathetic staff and 8 respondents said the support team was responsive.

4.2.4 Management support

Table 4: Management support

Final categories, codes in them with the percentages			
Category	**Codes**	**Frequency**	**Percentage**
Management support	Inadequate support from MoH	8	80
	Donor dependence	9	90
	Under utilisation of data	5	50
	Inadequate motivation	3	30
	Delays in reports from Lower facilities	4	40

Source: Primary data, 2018

Management support entails approvals and continuous support during the information system development process and operational phase of the system. The study discovered that MoH has not done much in ensuring that the system rolled out is operational on ground. Districts are struggling on their own to ensure the system is sustained at the district headquarters. Much of the system use is enforced by development partners (Star west and Rhites) who target data that generates information for their indicators from the health facilities. Excerpts from respondents on this issue Respondent 1. "*Ministry of health began with high efforts and promises but just got lost on the way- they had started installing net work cables and that switch was installed by people who said where from the ministry but they never completed the work six years ago, the switch is there no*

further action on it" respondent 10 "*from the MOH as they don't regularly visits to see our progress and solving our problems relating to the system*" respondent 6 "*our ministry has not put much to see that the promises of equipping health unit with the required electronics for this system are supplied country wide for easy use and implementation- they have all gone like political statements nothing is coming on to the health facilities*". 8 respondent 0ut of 10 reported this inadequate support problem as a hindrance to effective use of the system. 5 out 10 respondents cited a problem of inadequate motivation as the factor affecting the usage of the system in that there is no will in utilisation of data locally and only donors are interested in the reports which are passed to them. The Biostatisticians are frustrated by data entry and failure to analyse the data for local use, inadequate resources to allow them supervise lower level units for data quality improvement. Respondent 10"*we also get data entry fatigue because only one person enters for the whole district, we don't even get time to analyse the data, we only submit it to the system, donors are much interested in their relevant indicator data and thus the other aggregated data is not much paid attention*" 5 respondents out of 10 pointed out the challenge of delayed reports from the lower level health units which District health Officers could be addressing and laxity of some health unit in charges to respond positively towards reports submission timely. This situation suffocates them during the times the system is open for data entry window. Missed reports are entered during data cleaning after three months respondent 8 "*the system data entry period catches with me because many forms to enter and delayed to be submitted from the lower units and missed forms are updated after three months during data cleaning for quarterly reports*"

3.2.5 Resource Supply

Table 5: Resource Supply

Final categories, codes in them with the percentages			
Category	Codes	Frequency	Percentage
Resource supply	Lack of computer hard ware devices	9	90
	Inadequate internet	10	100
	Power fluctuations	10	100
	Inadequate staffing	10	100
	Inadequate funding	4	40

Source: Primary data 2018

These are the required facilities that support information systems activities to be operational; these increase the level of user's intention to use system. Out of 10 respondents involved in this study, 9 respondents reported that there is a challenge of inadequate computer hardware devices required for the system success. Mentioned in particular were computers and modems for accessing internet. Respondent 2 "*we thought that ministry was to keep its promise of supplying required computers and modems to health centres but this was done up to now*".

The system plan was that all health units would manage their data electronically which would facilitate quick

/timely reporting and accurate reporting but all units still use manual forms to transmit data would be at all health units this is true for all facilities in the greater Bushenyi Districts All 10 out of 10 respondents expressed inadequate internet as the key factor that hinders the use of the eHMIS as it can be seen in the above table. The system is web based and thus access of it is through internet which is not reliable and often not available. According to respondent 5 *"as you came, I was not here had gone up in the hill to access the internet because some important mail form ministry was sent and my friend has just notified to check it out as they know I have to be notified otherwise I miss many functions communicated by email even our Biostatistician at times travels to enter data from another district".* Respondent 1 had this to say *"internet is the big challenge in that during the reporting window we find ourselves delayed by internet connectivity that at times I wake up by midnight to begin entering forms when there is some internet".* Power /any form of electricity is a key factor for use of any system that is electronic because the hardware devices require power to run. Computers are electronic devices that need to be charged. In this study it was identified that most health units do not access to power and thus difficult for the electronic health management system to be used there. All the 10 respondents accrued to this problem. Some excerpts on un reliable power supply Respondent 6*"at times power gets off during the reports entry period and we find it hard as there is no alternative source of power at the same time many of our health units do not have the access to electricity,* Respondent 4 *"It should be noted that power is a big blow to the majority of our health centres as the system use targets all the health facilities most of them do not access national grid".* This study found out that inadequate staff was a threat to the electronic health management system use in the greater Bushenyi districts.

There a few dedicated staff to the electronic health systems in the category of Health information Assistants. Data management is responsibility of health unit in charge who is occupied with treatment of patients and general administration of health unit activities. There is little priority for health unit data management as the in charges forward it to the district to fulfil the reporting requirements and utilisation is so low. Except from respondent 6*"health workers are not dedicated to data collection and utilisation"*, respondent7*"I also get data entry fatigue because only one person enters for the whole district and district has few health information assistants and thus not able to get people to help in the system use",* Respondent 10, *"also the lack of dedicated staff in the majority of health units affects the quality of data collected as the health unit in charges do not pay close attention to report completion and including all the data".* Respondent 4 "e*HMIS first stalled due lack of computers but donors gave in the computers only to district and health centres that had power unfortunately at health centres there no health information assistant to use them, they are kept safely"* All the ten respondents cited this challenge as pertinent to the use of the system. 4 respondents out of 10 cited inadequate funding as the challenge affecting the eHMIS use; these are financial resources that affect these districts. A respondent 4 had this to say "*we are affected by budget constraints where payroll is always at ceiling and we cannot bring in more staff like health information assistant that are qualified with computer skills*"

3.2.6 Education and training

Education referring to the degree to which staff possess the required skills and knowledge to perform the required services while training is learning process that involves acquisition of new knowledge, skills

enhancement and changing attitudes and behaviour to enhance performance of the assigned tasks. 4 out 10 respondents said they had no past experience of using an electronic system before. Respondent 7 said ***"in the health care system we have always used manual data bases, this electronic is the first in its kind"*** 6 out of 10 respondents cited existence of errors in the reports submitted to the district and at times they go un noticed to the Ministry of Health. Respondent 10 attributed it to, "inadequate ***training given to health workers in data collection and utilisation".*** The staff are transferred and others leave public service while others go for further studies which renders regular training necessity that is often not met excepts from respondents 3***"there are no health information assistants who are dedicated to HMIS nurses and unit in charges compile the reports and at times they have errors",*** respondent 7," ***I don't even get time to analyse the data, we only submit it to the system we have had bad experience of sending reports with errors to the headquarter and brought CDC here to check for a contagious rare disease ".*** 7 respondents out of 10 in this study cited need for training as a pertinent issue in the use of the e electronic health management information system. Respondents had this to say on the issue, respondent 1 ***"The health information assistants at health centres where donors have given computers need to be trained on the use of the system so they can enter data from their health centres",*** respondent 9, ***"There health units here that have computers but are not able to enter their data and upload it to the system, I think they need to be trained on data entry and system use"***

Table 6: Education and training

Final categories, codes in them with the percentages			
Category	**Codes**	**Frequency**	**Percentage**
Education and training	Past record of using an electronic system	4	40%
	Errors still exist in reports	6	60%
	Need for training	9	90%
	Staff skills for use of eHMIS	5	50%

Source: Primary data, 2018

3.3 Model design and development

The study outlined the model using Visual paradigm community edition as the designing tool. Based on the findings of the study, a modification of D&M, 2016 model of IS success was done to create a suitable eHMIS success model that introduced a new construct external factors.

A regression analysis was used to determine the significance level for each of the constructs. Only constructs that were significant were included in the model that included, external factors which made the strongest prediction of the dependent variable system use with 0.450 (45%) which was significant at .000, this was followed by service quality which scored 0.418 (41.8) and significance of .000, information quality made a contribution of 0.279 (27.9%) and was significant at .000 while system quality made the lowest contribution of 0.268 (26.8) and was significant at .000.
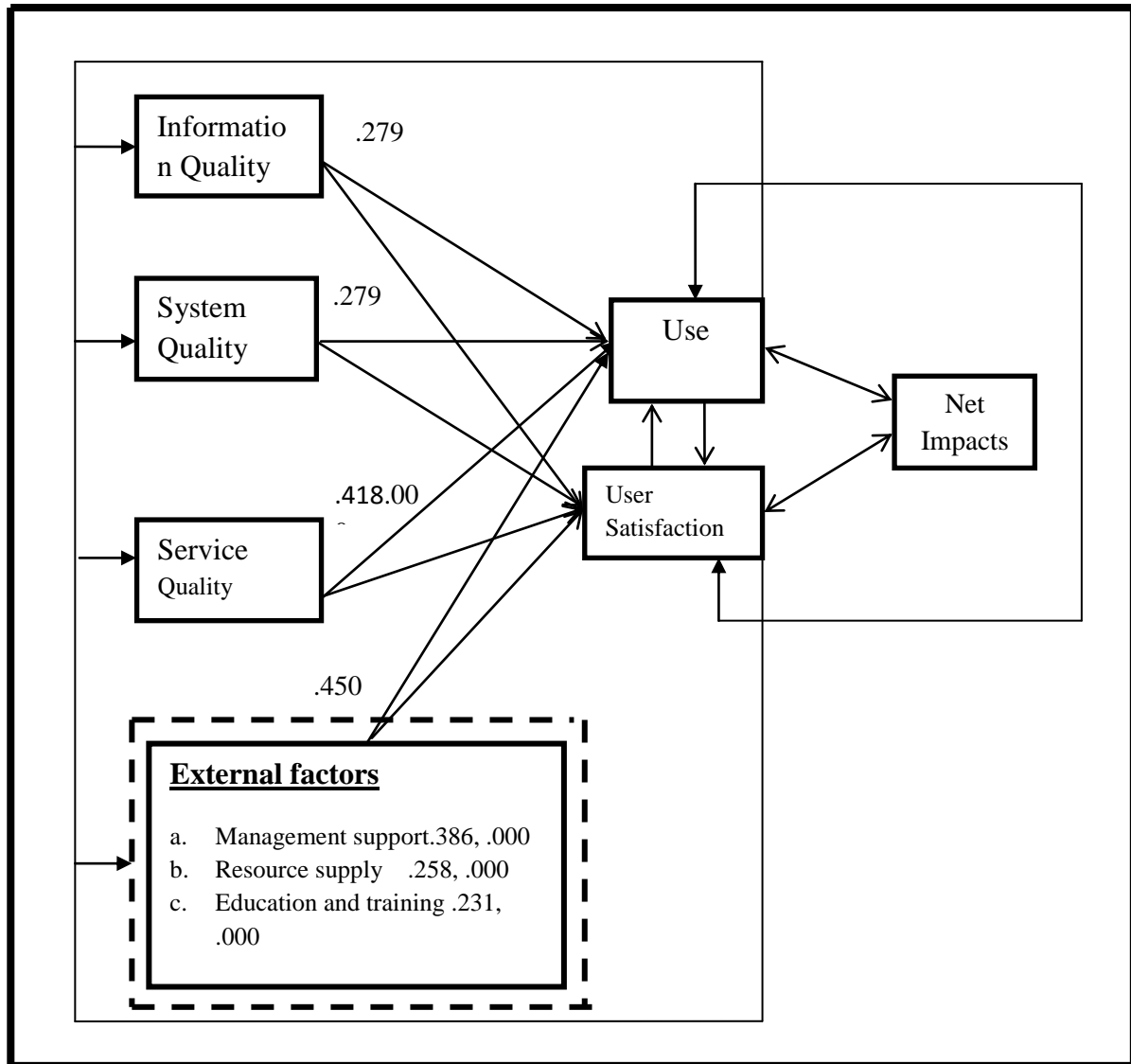
Figure 1.1: eHMIS success model in context of the developing country

The developed model removed the Intention to use dependent variable from the model and remained with the use and User satisfaction. The study constructs (independent variables) information quality; system quality and service quality in the D&M were retained and introduced on the new independent variable external factors.

3.4 Model validation

Validation of the model is process of determining the degree to which a model is accurate representation of the real world from the perspective of the intended uses of the model, validation involves the methods of judging a model for accuracy in the predictions it makes (David and his colleagues 2012). Though there are many methods of model validation including face validity, verification validity, cross validity, external validity and predictive validity. This study chose to use external validity. External validity was used to check the models' generalizability in the developing countries where new data was collected six month after the first one. If the first model fitted the second data set, there was some assurance of generalizability of the model. In this case the

output from the second data fitted the previous model, it was significant and there was increased predictive power for the constructs (Omwansa, 2012). The external factors made the strongest prediction of the dependent variable system use with 0.647 (64.7%) which was significant at .000, this was followed by information quality which scored 0.607 (60.7%) and significance of .000, Service quality scored 0.585 (58.5%) and was significant at .000 while system quality made the lowest contribution of 0.523 (52.3%) and was significant at .000.
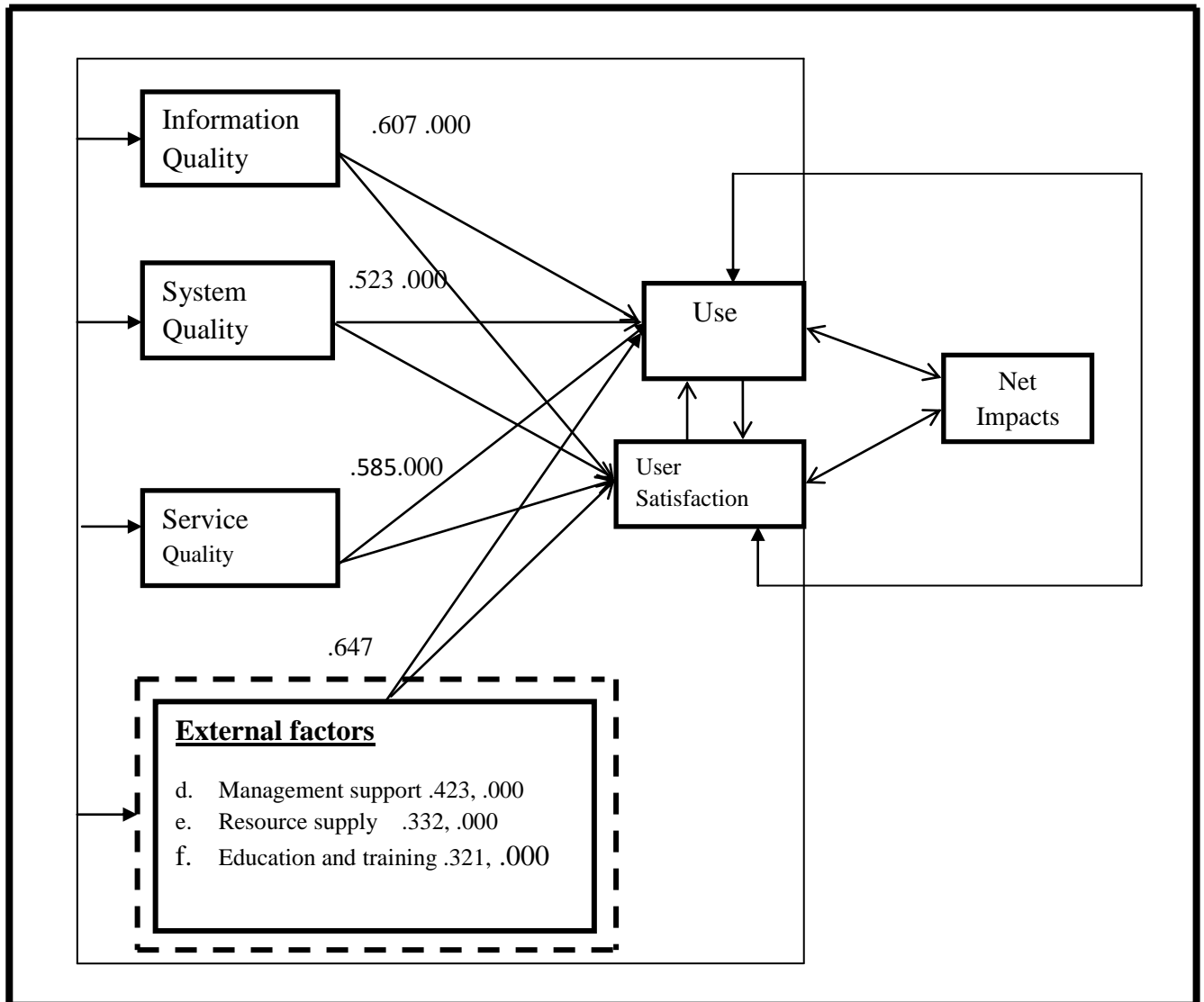

Figure 1.2: Validated eHMIS success model in context of developing countries

4. Recommendations

It is recommended that MoH and District local Governments should not focus only on the IT artefact quality as the means of ensuring system success but rather ensure that external factors management support, resource supply and education and training are addressed properly. Again, the study recommended that the health policy makers to adopt the eHMIS successes model developed as it can help visualize the system success as it was intended and document decisions taken on the system

5. Conclusions

The study evaluated the factors that influence the success of eHMIS in context of a developing country that include:- information quality, system quality, service quality and external factors. Also, a regression analysis was used to determine the significance level for each of the constructs and only constructs with significant values were included in the model Again, the developed model was validated using external validity and model predictive strength that involved collection of new data from the same population after six month and is therefore reliable and valid

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