PERCEIVED USEFULNESS AND EASE OF USE AS MEDIATORS OF THE EFFECT OF HEALTH INFORMATION SYSTEMS ON USER PERFORMANCE

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ABSTRACT: *Health information systems (HISs) have transformed health organizations by playing a supportive role in improving efficiency and quality of healthcare. This paper explores the mediating role of perceived usefulness (PU) and perceived ease of use (PEOU) on the relationship between task technology fit (TTF), information quality (IQ), system quality (SQ) and user performance (UP) in health organizations in Kenya. A framework was generated by modifying the dimensions of TTF, DeLone and McLean IS Success Model (D&M) and Technology Acceptance Model (TAM). Descriptive survey design was utilized and the proposed model provided empirical evidence based on a questionnaire administered to 395 HIS users. Mediation analysis was carried out using ordinary least squares (OLS) path analysis and results indicated that PU and PEOU mediated the association between TTF, IQ, SQ and UP. The results indicated that performance outcomes are higher when individual users perceive HISs to be useful and easy to use.*

KEYWORDS: Health information systems, mediation analysis, perceived usefulness, perceived ease of use, user performance

INTRODUCTION

In this ever-changing world of technology, healthcare organizations have come forth as more knowledge-intensive organizations. Consequently, the prerequisites for effective information sharing with health sector employees and managers have remarkably increased. The flow of data and information is a paramount part of the daily work operations of health services, and managers in health firms have become accomplished members of staff. This has necessitated the development of the current health information system which is different from the one introduced in the 1980s to store generic information

(Shusaku, 2002). Lippeveld, Rainer and Bodart (2000) define a health information system as "a set of components and procedures organized with the objective of generating information which will improve health care management decisions at all levels of the health system". As it can be seen from the definition, the modern HIS manages information from all healthcare-related activities ranging from planning, organizing, monitoring, coordinating and ultimately decision making. These systems no doubt offer the prospective to improve the quality of healthcare delivery and that of system users but also reduce their costs significantly (Spring *et al.*, 2013). Therefore, comprehension of the way in which people react to new technologies is of great importance to the field of health informatics (Ketikidis, Dimitrovski, Lazuras & Bath, 2012).

Many studies have adapted the use of TTF, TAM and D&M frameworks while addressing different aspects of user performance (Tariq & Akter, 2011; Gagnon, Orruno, Asua, Abdeljelil & Emparanza, 2012; Aggelids & Chatzoglou, 2009; Junglas, Abraham & Watson, 2008; Ali & Younes, 2013). Aggelidis and Chatzoglou developed and tested a modified TAM model factoring other pertinent models found in the literature. The results indicated that perceived usefulness and perceived ease of use significantly affected hospital personnel behavioural intention. Training had a strong indirect impact on behavioural intention through perceived ease of use. At the moment, healthcare is progressively being influenced by technology, and the utilization of HISs represents a new dawn of technological possibilities. As more advanced systems to manage patient particulars become available, there is a rising supposition that these HISs will result in accomplishments for users, managers, and patients. These aftereffects are therefore expected to improve the efficiency and effectiveness of healthcare services. A successful execution procedure is key to gaining the economic and competitive advantages that inventiveness offers, although little is understood about the deployment process because efforts have often been partial or complete failures.

Although there are many studies on the influence of ISs on organizational performance, the number of studies on user performance in healthcare setting is limited. Secondly, notwithstanding the fact that many researchers have looked at the direct impacts of ISs on user performance, the mediating role of perceived usefulness and perceived ease of use on the association between HIS and user performance implications have not been sufficiently explored. Thirdly, researchers have used TTF, TAM and D&M independently to evaluate the use of HIS and a focus on their integration has not been adequately addressed. Fourthly, few researchers have studied these relationships in healthcare organizations in developing countries.

To fill this research gap, the researchers developed a unified model integrating TTF, TAM and D&M to study the intervening role of perceived usefulness and perceived ease of use on the relationship between HIS and user performance in healthcare settings in a developing country perspective. Theoretical models and frameworks on the evaluation of ISs are examined in the literature review. Considering the theoretical foundations and literature review, this research hypothesizes that task technology fit, information quality and HIS quality affects user performance indirectly through perceived usefulness and perceived ease of use in health organizations in Kenya. The model analysis was conducted

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using ordinary least squares (OLS) path analysis. The paper finally discusses implications, limitations and provide recommendations for scholars and managers of healthcare organizations.

THEORETICAL UNDERPINNINGS

This study drew its basis from the Task Technology Fit (Goodhue & Thompson, 1995), the Technology Acceptance Model (Davis, 1986, 1989) and DeLone and McLean Information System Success Model (DeLone & McLean, 2003). These models complement each other and have been successful in explaining usage of various types of information systems.

Task Technology Fit
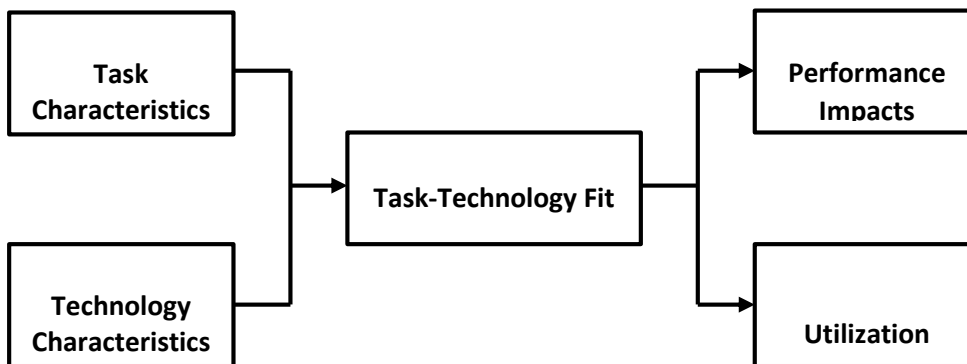
Figure 1: Task Technology Fit
Source: Goodhue and Thompson (1995)

TTF postulates that IT is to a greater extent probable to have a favourable impact on individual performance and be used if the proficiency of the IT matches the undertaking that the user must perform (Goodhue and Thompson, 1995). Goodhue and Thompson defined 'fit' as 'task-system fit' which allude to the level to which information systems or their environments abet an individual in performing a range of endeavours". They came up with a measure of TTF made up of 8 factors, namely: quality, locatability, authorization, compatibility, ease of use or training, production timeliness, systems reliability, and relationship with users. They found that TTF measure in connection with utilization to be a remarkable predictor of user reports of ameliorated work performance and usefulness.

DeLone and McLean IS Success Model
DeLone and McLean (2003) re-examined the prevailing inference of information systems success and their equivalent measures and categorized them as: information quality, system quality, user satisfaction, use, individual impact and organizational impact. He went ahead and brought forth a framework with interrelationships between the contrasting success groups.
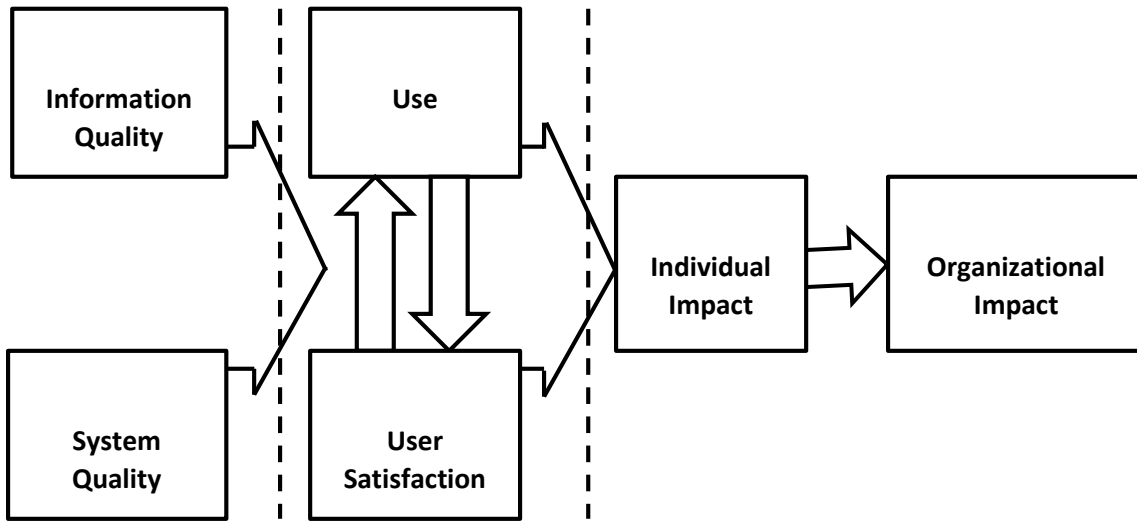
Figure 2: DeLone and McLean IS Success Model
Source: DeLone and McLean (2003)

Researchers have attempted to broaden and redefine the original model. A decade later, DeLone and McLean (1992) refined their success model to incorporate service quality and net benefits. System quality measures have concentrated on performance elements of the system under study. Investigators have examined utilization of resources and investment, gathering of details, human factors, system trust, accuracy, reliability, usability, adaptability and maintainability (Liao, Chen & Yen, 2007; Udo, Bagchi & Kirs, 2010).

Technology Acceptance Model
TAM was introduced by Davis (1986, 1989) to explain the behaviour of computer usage. The model was refined from Theory of Reasoned Action (Fishbein & Ajzen, 1975) in social psychology. TAM holds that perceived usefulness and ease of use deduce an individual's forethought to use a system with forethought to use serving as an intermediary of actual use of the system.
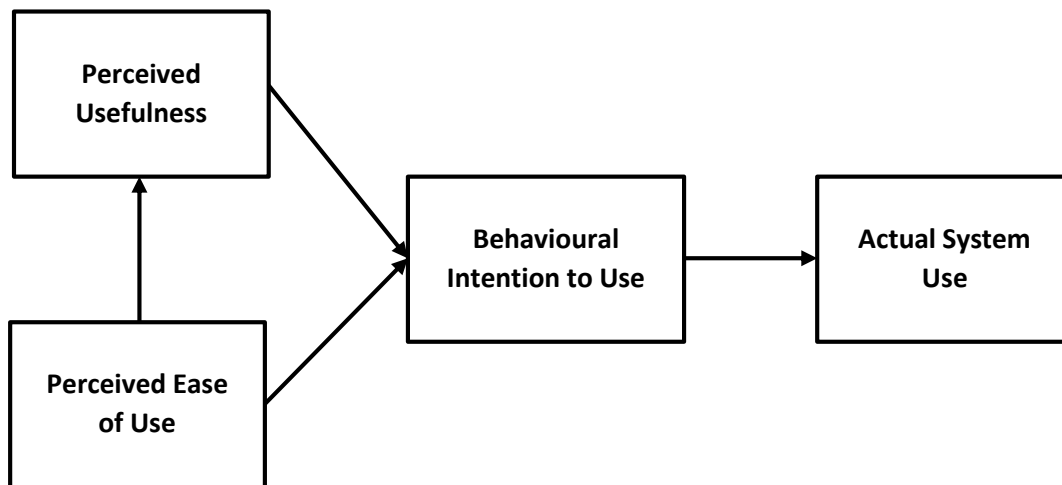
**Figure 3: Technology Acceptance Model**

Source: Davis (1986, 1989)

Davis (1989) went ahead to define Perceived usefulness (PU) as "the degree to which an individual believes that using a particular system would enhance his or her job performance" and Perceived Ease of Use as "the degree to which an individual believes that using a particular system would be free of physical and mental effort". PU is also perceived as being directly influenced by perceived ease of use. TAM has been modified by several researchers by introducing elements from related frameworks, by bringing forth supplemental or substitute belief constructs, and by examining precursors, mediators and moderators of perceived usefulness and perceived ease of use (Wixom & Todd, 1975).

Proposed Model and Hypothesis Development
Research Model
This paper intends to divulge how HIS affects UP indirectly through PU and PEOU of HIS. It is proposed that that task technology fit, information quality and HIS quality influences the performance of users indirectly through perceived usefulness and perceived ease of use in health firms. The proposed model is illustrated in Figure 4 below. The researchers developed the theoretical model based on scoping review of theories in IS literature above. The resulting model is generated by integrating TTF with the original constructs of D&M, system quality and information quality with two elements of TAM, perceived usefulness and perceived ease of use.
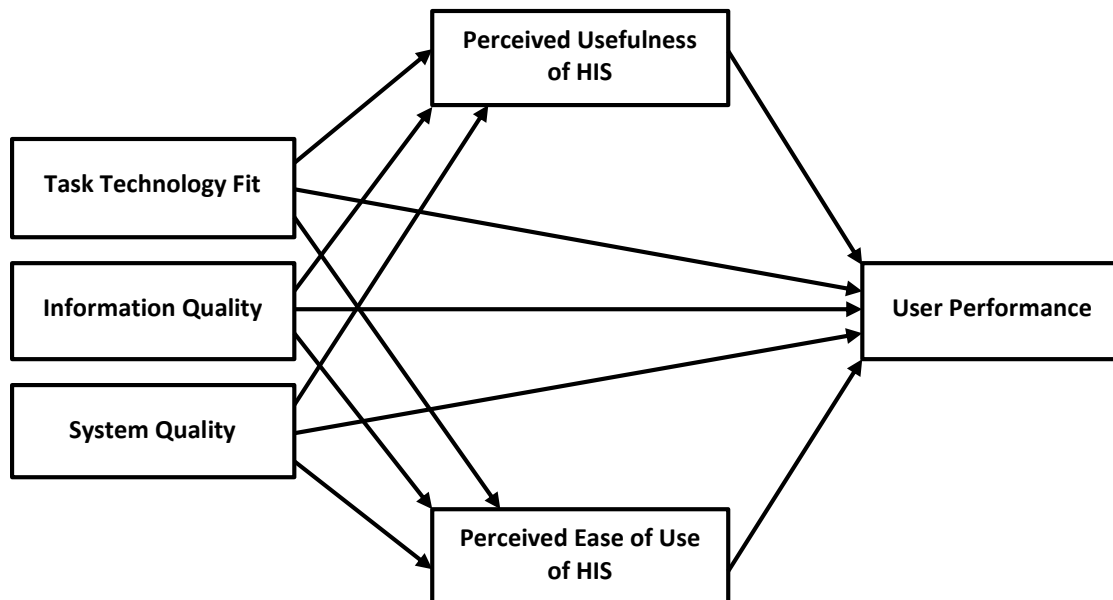
Figure 4: Operational Research Model

There is a relationship between TTF, information quality, system quality on one hand and user performance on the other hand as demonstrated by Ali and Younes (2013) and Zaied (2012). Ali and Younes indicated that user performance is at its best when the users perceive the system easier to use. Their findings further imply that perceived usefulness is a very crucial factor affecting the use of the system and mitigates the effect on the performance of users. Information and system quality are salient factors affecting the

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merits of use (DeLone & McLean, 2003). Studies on these models suggest that integrating them into one would provide a better model of IS utilization than each of them separately.

Hypothesis Development

Abugabah and Sansogni (2010) proposed a framework that linked information quality, system quality, user characteristics and TTF to assess the effects of IS through perceived ease of system use and perceived usefulness on the users' performance. They concluded that TAM, D&M, TTF are useful frameworks, but need to be integrated into a comprehensive one to include variables related to technology, system and human concurring. The resultant model provided a better way of utilizing IS rather than either an attitude or a fit model provided alone.

As observed by Bhattacherjee (2002), the inclination of a person to interact with a particular system is already considered beneficial. It is therefore expected that users will adopt a system if they are convinced that it will help them to achieve the desired performance achievements (Amoako-Gyampah & Salam, 2004). Renny, Guritno and Siringoringo (2013), in their study on *Perceived usefulness, ease of use, and attitude towards online shopping usefulness towards online airlines ticket purchase*, found that the attitudes towards usability of airlines ticket reservation is impacted by perceived usefulness more than perceived ease of use and trust. Earlier researches provided substantiation of the effect of perceived usefulness on behavioural intention to use (Davis, Bagozzi & Warshaw, 1989; Venkatesh, 2000).

Previous studies have established that perceived ease of use is a critical factor influencing the acceptance of users and usage of information systems. Information systems research such as Davis *et al*. (1989) and Venkatesh (2000) has amassed evidence supporting the importance of perceived ease of use on inceptive user acceptance and continued usage of systems. Consistent with Theory of Reasoned Action (Fishbein & Ajzen, 1975), TAM suggests that the effect of external variables, e.g. system design characteristics on intention is mediated by the key beliefs, i.e., perceived ease of use and perceived usefulness.

Almahamid, Mcadams, Kalaldeh and AL-Sa'eed (2010) investigated empirically the correlation between perceived usefulness and ease of use, perceived information quality, and the aim to use e-government to put together information and conduct transactions by Jordanian citizens. They found out that the Jordanians believed that e-government system is easy to use, useful and had a high level of information quality. The results also indicated a significant positive relationship between perceived usefulness, perceived ease of use and perceived information quality and intention to use e-government for gathering information and conducting transactions. Based on the operational research model in Figure 4 and literature above, we can therefore hypothesize that:

H1: TTF affects user performance indirectly through perceived usefulness and perceived ease of use in health organizations in Kenya.

H2: Information quality affects the performance of users indirectly through perceived usefulness and perceived ease of use in health organizations in Kenya.

H3: HIS quality affects the performance of users indirectly through perceived usefulness and perceived ease of use in health organizations in Kenya.

MATERIALS AND METHODS

Setting and Sample

The setting for this study was the top 10 hospitals in Kenya (Wisdom Africa, 2016) as named below: (i) Moi Teaching and Referral Hospital (ii) Aga Khan University Hospital (iii) Nairobi Women Hospital (iv) Gertrude Gardens Children's Hospital (v) Kenyatta National Hospital (vi) Kijabe Mission Hospital (vii) The Mater Hospital (viii) Nairobi Hospital (ix) PCEA Kikuyu Hospital and (x) Aga Khan Hospital - Mombasa. These facilities were chosen as they have invested heavily in HISs and have highly skilled staff who have adequate knowledge on the use HIS and therefore could express their views clearly.

The sampling frame used in this study was a full list of all Medical Doctors / Consultants, Dentists / Dental Technologists, Nurses (including B.Sc. Nursing), Pharmacists / Pharmaceutical Technologists, Lab Technologists / Technicians, Health Records and Information Officers / Technicians, Public Health Officers / Technicians, Medical Engineering Technologists / Technicians, Health Administrative Officers and Accountants / Accounting Officers working in the top 10 hospitals in Kenya. The sampling frame followed the straight numerical system of personnel staff numbers. The inclusion criteria were (i) the top 10 hospitals in Kenya who have heavily invested in HISs and (ii) respondents who have used health information systems. We excluded (i) hospitals which have not invested in health information systems and (ii) respondents who have not used health information systems.

Stratified random sampling was employed to pick out the population that participated in the study in order to obtain a representative sample (Kothari & Garg, 2014). The sample size was stratified based on their profession in order to capture the views of users regarding HISs. Systematic random sampling was then used to select HIS users from the organizations under study. A total of 495 respondents were sampled based on Taro Yamane's sample size formula (Yamane, 1967).

Data Collection

The study first sought human subjects review and approval from the Moi Institutional Research and Ethics Committee (IREC). Informed consent for voluntary participation was obtained from all individuals and all participating healthcare providers prior to their participation in the survey. A 51-item structured questionnaire was administered and then rated on a 5-Point Likert scale ranging from Strongly Agree (SA) to Strongly Disagree (SD). All measures of TTF, information quality, system quality, perceived usefulness and user performance were taken from existing literature. To increase the response rate, questions were modified to match the context of the study. TTF was measured with a mean of four items: compatibility, meaning, adequacy and IT Support (Ali & Younes, 2013; Goodhue & Thompson, 1995; Kositanurit, Osei-Bryson & Ngawenyama, 2011) while HIS information quality was measured using a mean of five items: accuracy, relevance, timeliness, completeness, and accessibility (Ali & Younes, 2013; DeLone & McLean, 1992; Wixom & Todd, 2005). HIS system quality was measured in terms of correctness, response time, integration and reliability (Ali & Younes, 2013; DeLone & McLean, 1992;

Wixom & Todd, 2005). Individual impacts were assessed as effectiveness, efficiency and creativity (Ali & Younes, 2013; Goodhue & Thompson, 1995; Kositanurit *et al.*, 2011).

RESULTS

Demographic Characteristics

The profile of the participating respondents is presented in Table 1. Data was analysed to provide frequencies and percentages to describe the population. The following 495 health information systems users who were male (66%) and Female (34%) were surveyed: Medical Doctors / Consultants (5%), Dentists / Dental Technologists (1%), Nurses (66%), Pharmacists / Pharmaceutical Technologists (2%), Lab Technologists / Technicians (8%), Health Records and Information Officers / Technicians (3%), Public Health Officers / Technicians (10%), Medical Engineering Technologist / Technicians (2%), Health Administrative Officer (2%) and Accountant / Accounting Officer (1%). In regard to the period in which the respondents had been using health information systems, the classes were represented as follows: 0-5 years (58 %), 6-10 years (31 %), 11-15 years (7 %) and over 15 years (4 %). The majority of the respondents who had used HISs were in the class of 0 to 5 years.

Table 1: Respondents' Demographic Characteristics

Profile	Items	Frequency	Percentage
Gender	Male	261	66.1%
	Female	134	33.9%
	Total	**395**	**100%**
Profession	Medical Doctors / Consultants	20	5.1%
	Dentists / Dental Technologists	4	1.0%
	Nurses	263	66.6%
	Pharmacists / Pharmaceutical Technologists	9	2.3%
	Lab Technologists / Technicians	32	8.1%
	HRIOs / HRITs	11	2.8%
	Public Health Officers / Technicians	41	10.4%
	Medical Eng. Technologists / Technicians	6	1.5%
	Health Administrative Officers	6	1.5%
	Accountants / Accounting Officers	3	0.8%
	Total	**395**	**100%**
HIS Usage	0 – 5	229	58.0%
	6 – 10	122	30.9%
	11 – 15	28	7.0%
	>15	16	4.1%
	Total	**395**	**100%**

Mediation Analysis

Mediation analysis is a statistical method used for testing suppositional mechanisms through which an independent variable, X, might evoke a dependent variable, Y, indirectly through the mediating variable, M (Baron & Kenny, 1986; Hayes, 2013). Deductive tests for direct and indirect effects are presented with an emphasis on approaches that do not

make excessive or unwarranted assumptions such as those made by the historically significant and popular causal steps approach to mediation analysis by Baron and Kenny (Baron & Kenny, 1986). The causal steps approach preconditions the existence of the association between X and Y to explain the underlying effect of X on Y but is no longer recommended (Hayes, 2013).

Bollen (1989), in his book, *Structural Equations with latent Variables*, stated "lack of correlation does not disprove causation" and "correlation is neither a necessary nor a sufficient condition of causality". The 21st century scholars of mediation analysis have adopted Bollen's perspective (Hayes, 2013; Shrout, 2002; MacKinnon, 2008; Rucker, Preacher, Tormala & Petty, 2011). The simple mediation model oversimplifies the complex dynamics through which X Influences Y in real processes that scientists study. The underlying reasons behind the abandonment of the Baron and Kenny (Baron & Kenny, 1986) causal steps procedure include the following: (i) indirect effects are not quantified and no inferential tests are required about it. The existence of indirect effect is logically deducted from the outcome of a set of null hypothesis tests about a quantification of something other than the indirect effect. (ii) Mediation occurs only when there is a rejection of three null hypotheses. If one of the null hypotheses is not rejected, then the game is over. (iii) The causal step procedure begins by first testing whether X affects Y. A failure to reject the null hypothesis means that the step of establishing the mediator is rendered irrelevant. (iv) Mediation is thought of in qualitative terms by researchers as no quantification of indirect effect is made.

Causal steps approach has dominated the practice of statistical mediation analysis until recently (Hayes, 2013; Hayes & Preacher, 2014). Many studies have advocated a bias-corrected bootstrap confidence interval (CI) for statistical inference about relative indirect effects as it performs well as substantiated in many studies (Hayes, 2013; MacKinnon, 2008; Hayes & Preacher, 2014; Biesanz, Falk & Savalei, 2010). Unlike the normal theory approach i.e. the product of coefficients approach (Sobel test), no assumption is made about the shape of the sampling distribution of the indirect effect. Bootstrap CI respect the non-uniformity of the sampling distribution of the indirect effect and as a result yield deductions that are more likely to be accurate than normal theory approach (Hayes, 2013). A bootstrap CI for an indirect effect is formulated by repeatedly taking a random size *n* from the original sample, with replacement and estimating the indirect effect in each resample. With thousands of bootstrap estimates of each specific indirect effect, endpoints of the confidence interval are calculated using bias-corrected method. The respective indirect effect is regarded statistically different from zero if the CI does not straddle zero, whereas if the CI straddles zero, the conclusion is that there is insufficient evidence that X affects Y through M.

In this study, the direct and indirect effects of X were derived from three linear models (Hayes, 2013), one estimating M_1 from X:
$$M_1 = i_{M_1} + a_1 X_1 + a_2 X_2 + a_3 X_3 + \varepsilon_{M_1},$$
a second one estimating M_2 from X:
$$M_2 = i_{M_2} + a_4 X_1 + a_5 X_2 + a_6 X_3 + \varepsilon_{M_2}$$
and the last one estimating Y from X, M_1 and M_2:

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$$Y = i_Y + c'_1 X_1 + c'_2 X_2 + c'_3 X_3 + b_1 M_1 + b_2 M_2 + \varepsilon_Y$$

Whereby M_1 and M_2 refers to the mediators, perceived usefulness and perceived ease of use subsequently, while Y refers to user performance; i_{M_1}, i_{M_2}, and i_Y are the model intercepts; a_1, a_2, a_3, a_4, a_5, a_6, c'_1, c'_2 and c'_3 are the multiple regression coefficients; X_1 denotes Task Technology Fit, X_2, Information Quality and X_3, System Quality; ε_{M_1}, ε_{M_2} and ε_Y are the term errors.
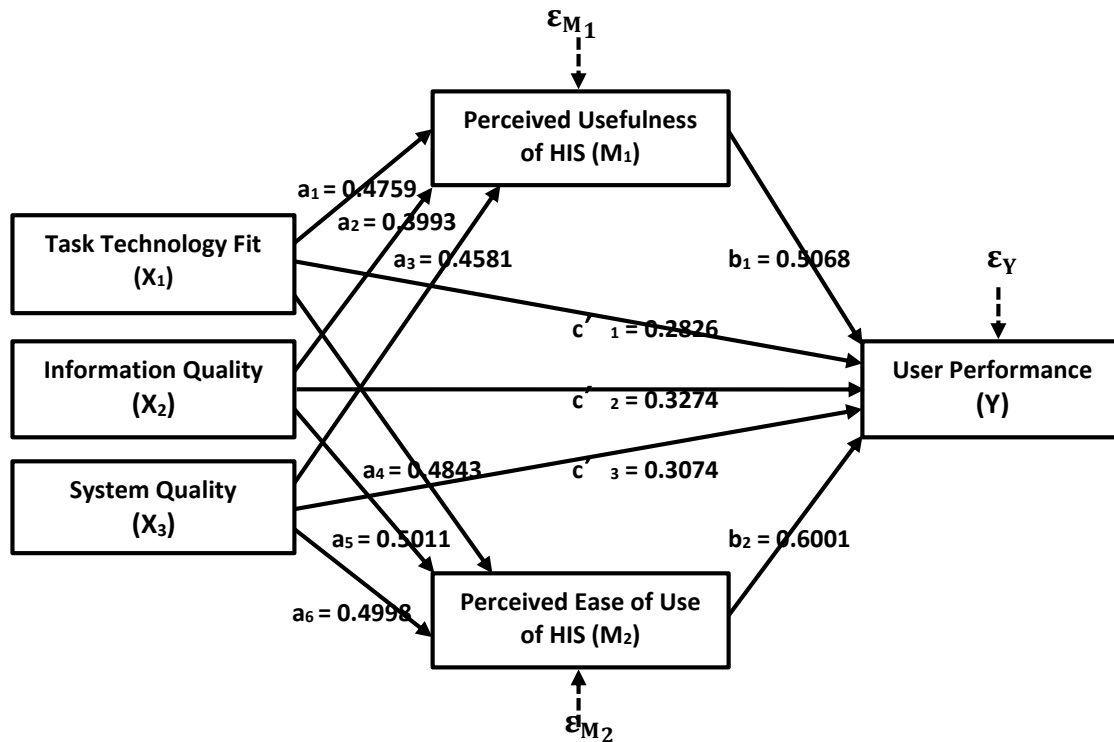
Figure 5: Statistical Model Predicting User Performance

From a simple mediation analysis carried out using ordinary least squares path analysis, TTF influenced user performance indirectly through perceived usefulness and perceived ease of use of HIS. As it can be seen in Figure 5 above and Table 2 below, when the users perceive the information system as useful and fitting well to their work requirements, they perceive the system to have a positive and significant effect on their performance ($a_1 = 0.4759$) and that the use of HIS had a positive impact on their performance ($b_1 = 0.5068$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_1 b_1 = 0.2412$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0079 to 0.5433). There was no evidence that the use of HIS enabled the participants to achieve their goals and objectives independent of the influence on perceived usefulness of HIS ($c'_1 = 0.2826$, p = 0.3992). Similarly, when the users perceive the information system as easy to use and fitting well to their work requirements, they perceive the system to have a positive and significant effect on their performance ($a_4 = 0.4843$) and that the use of HIS had a positive impact on their performance ($b_2 = 0.6001$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_4 b_2 = 0.2906$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0003 to 0.5597). There was

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no evidence that the use of HIS enabled the participants to achieve their goals and objectives independent of the influence on perceived usefulness of HIS ($c'_1 = 0.2826$, p = 0.3992).

Table 2: Model Summary Information

Antecedent		Coeff.	SE	P		Coeff.	SE	P		Coeff.	SE	P
		M_1 (PU)				**M_2 (PEOU)**				**Y (UP)**		
X_1 (TTF)	a_1	0.4759	0.095	0.0015	a_4	0.4843	0.1064	0.0062	c'_1	0.2826	0.1927	0.3992
X_2 (InfoQ)	a_2	0.3993	0.102	0.0078	a_5	0.5011	0.1041	0.0073	c'_2	0.3274	0.1651	0.4824
X_3 (SysQ)	a_3	0.4581	0.0754	0.0024	a_6	0.4998	0.0794	0.0003	c'_3	0.3074	0.0878	0.4708
M_1 (PU)		-	-	-	-	-	-	-	b_1	0.5068	0.0755	0
M_2 (PEOU)		-	-	-	-	-	-	-	b_2	0.6001	0.0714	0
Constant	i_{M_1}	1.169	0.2285	0	i_{M_2}	1.708	0.2989	0	i_Y	0.421	0.264	0.0023
		$R^2 = 0.4502$				$R^2 = 0.5661$				$R^2 = 0.7144$		
		F = 60.5079, P = 0.0000				F = 66.2166, P = 0.0000				F = 77.9232, P = 0.0000		

On the other hand, information quality influenced user performance indirectly through perceived usefulness and perceived ease of use of HIS. As shown in Figure 5 and Table 2, the respondents believed that when information systems provide good quality information, they are discerned as very useful systems by users ($a_2 = 0.3993$) and that the information retrieved from the HIS was useful ($b_1 = 0.5068$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_2b_1 = 0.2024$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0150 to 0.5691). Again, there was no evidence that information retrieved from the HIS was useful independent of the influence on perceived usefulness of HIS ($c'_2 = 0.3274$, p = 0.4824). Consequently, the respondents believed that when information systems provide high quality information, they are perceived as easy to use by users ($a_5 = 0.5011$) and that the information retrieved from the HIS was useful ($b_2 = 0.6001$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_5b_2 = 0.3007$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0090 to 0.5807). Again, there was no evidence that information retrieved from the HIS was useful independent of the influence on perceived usefulness of HIS ($c'_2 = 0.3274$, p = 0.4824).

Finally, system quality influenced user performance indirectly through perceived usefulness of HIS. This can be shown in Figure 5 and Table 2, where the respondents believed that when information systems are perceived as high quality systems by users, they are more likely to be perceived as useful ($a_3 = 0.4581$) and that the use of the HIS led to positive impacts on user performance ($b_1 = 0.5068$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_3b_1 = 0.2322$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0050 to 0.5962). There was no evidence that the use of the HIS led to positive impacts on user performance independent

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of the influence on perceived usefulness of HIS ($c'_3 = 0.3074$, $p = 0.4708$). Similarly, where the respondents believed that when information systems are perceived as high quality systems by users, they are more likely to be perceived as easy to use ($a_6 = 0.4998$) and that the use of the HIS led to positive impacts on user performance ($b_2 = 0.6001$). A bias-corrected bootstrap confidence interval for the indirect effect ($a_6b_2 = 0.2999$) based on 5,000 bootstrap samples (95% bootstrap confidence interval) was entirely above zero (0.0305 to 0.5802). There was no evidence that the use of the HIS led to positive impacts on user performance independent of the influence on perceived usefulness of HIS ($c'_3 = 0.3074$, $p = 0.4708$).

The test outputs narrated above provide decent reliability to the results and the emerging multiple regression equations are as follows:

$$M_1 = 1.1690 + 0.4759x_1 + 0.3993x_2 + 0.4581x_3$$
$$M_2 = 1.7082 + 0.4843x_1 + 0.5011x_2 + 0.4998x_3$$
$$Y = 0.4210 + 0.2826X_1 + 0.3274X_2 + 0.3017X_3 + 0.5068M_1 + 0.6001M_2$$

DISCUSSION

The first hypothesis tested in this study was the proposal that the TTF affects the performance of users indirectly through perceived usefulness and perceived ease of use in health organizations in Kenya. The findings show that task technology fit affects user performance indirectly through perceived usefulness and perceived ease of use of HIS as evidenced by bootstrap confidence intervals that do not contain zeros, i.e. 0.0079 to 0.5433 for perceived usefulness and 0.0003 to 0.5597 for perceived ease of use. This hypothesis is therefore accepted. These findings are in conformance with previous studies by scholars such Ali and Younes (2013) and Abugabah and Sanzogni (2010) that perceived usefulness and perceived ease of use contribute to the relationship between task technology fit and user performance. This is in line with Goodhue and Thompson (1995) who suggested that for users to derive benefits from the IS, the system must be perceived as useful. This study confirms the importance of TTF theory where task characteristics and technology determine the correlation between working requirements of HIS and task requirements.

The second hypothesis posited in this study was that information quality affects the performance of users indirectly through perceived usefulness and perceived ease of use in health organizations. The outcome of the study shows that information quality influenced user performance indirectly through perceived usefulness of HIS as corroborated by bootstrap confidence intervals do not contain zeros, i.e. 0.0150 to 0.5691 for perceived usefulness and 0.0090 to 0.5807 for perceived ease of use. This second hypothesis is also supported. These results concur with the findings of Ali and Younes (2013) and DeLone and McLean (2003) that underlines the importance of information quality as a pivotal component that indisputably impact the performance of users. In healthcare sector, the study concurs with the findings of Aggelidis and Chatzoglou (2009) whereby the core construct of TAM, perceived usefulness was found to significantly affect hospital personnel's user performance.

The third hypothesis asserted in this study was that HIS quality affects the performance of users indirectly through perceived usefulness and perceived ease of use in health

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organizations. The findings of the study indicate that system quality influenced user performance indirectly through perceived usefulness of HIS as manifested by bootstrap confidence intervals that do not contain zeros, i.e. 0.0050 to 0.5962 for perceived usefulness and 0.0305 to 0.5802 for perceived ease of use. This hypothesis is accepted as well. The study goes ahead to demonstrate that when HIS are perceived as good quality systems by the users, they are more probable to be regarded to greater extent as useful, leading to affirmative effects on the performance of users. This is agreement with Goodhue and Thompson (1995) who suggested that for users to achieve benefits from the system, the IS must be perceived as useful.

Perceived usefulness and perceived ease of use have therefore proven to be very key elements that affect the use of the system and mediate the effect on user performance. HIS effects can therefore be maximized by training and providing organizational support in order to help users understand the benefits of using HIS and subsequently improve adaptability of these systems with users' needs. This study therefore confirmed that HIS powerfully determines perceived usefulness and perceived ease of use toward system use, which is strongly influencing the performance of users when using a system. The study suggests that a good HIS can provide good quality information, has no or minimum errors and is able to fix performance problems if they occur.

Limitations
This research is not without limitation notwithstanding the importance of the findings for scholars and managers of healthcare organizations and others in third world countries in the operation of implementing health information systems. Developing countries faces different challenges from those of developed countries such as infrastructure development. This study findings may not be applicable directly in the deployment of HISs in first world countries. Further examination is required in developed countries perspective to strengthen these results.

CONCLUSION

The purpose of this study was to establish the role of perceived usefulness and perceived ease of use on the relationship between TTF, information quality, system quality and the performance of users of HIS in health organizations in Kenya. The study affirmed the findings of previous studies which show that user performance is as its best when the system is perceived as more useful and easy to use. Earlier studies which have looked on the impacts of IS on users have indicated information quality and system quality as very important factors affecting the benefits of use. Task technology fit and system quality on the other hand help increase the quantity of users work and improving the quality of performance. Adequate level of adaptation between HISs and users' needs and job demands was depicted considering the attributes of HIS. This research contributes to the studies in HIS community as it presents empirical corroboration that existing theoretical models of individual performance of IS in different industries can be integrated and incorporated to advance our understanding of user performance of HIS systems usage. Granted that HIS are different from IS in business organizations involving non-financial services or goods, there are facets of these systems that can be investigated using existing

models to comprehend and oversee individual performance in the use of HISs. Therefore, HIS implementers should consider the requirements of system users working in healthcare industry so as to enable smooth implementation of HISs.

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