

The Mediating Role of User Perception on the Relationship between Information Technology Integration and Performance of Selected Public Hospitals in Kenya

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Abstract Kenya's health sector is faced by shortage of resources, inefficiencies and ineffectiveness that deters the achievement of residents' goals of excellent health, fairness, cost effectiveness, acceptance and sustainable development. Therefore, this study analyzed the mediating effect of User Perception on the relationship between Information Technology Integration and Performance of selected Public Hospitals in Kenya. The study was anchored on Technology Acceptance Model and Diffusion of Innovations Theory. The study was guided by the philosophy of positivism research. An explanatory and cross-sectional survey research design were utilized. The target population of the study included ninety-eight, public hospitals in Kenya which have integrated managed equipment services. Multi-stage sampling technique was used to select a sample size of 294 respondents. The study used primary data collected using self-administered semi-structured questionnaire. Descriptive statistics and multiple regression were used for data analysis. The study findings showed that user perception had a significant effect on the relationship between information technology integration and performance of public hospitals in Kenya. The study concluded that user perception mediated the relationship between information technology integration and performance. The study recommends that management of public hospitals should conduct awareness forums to enlighten users of the technologies and correct the misconceptions and wrong perceptions about technologies among the employees.

Keywords: *information technology in Kenya, user perception, public hospitals, information technology integration*

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1. Introduction

Hospitals play a significant role in a country's social and economic vibrancy across various regions. Healthcare is a crucial part of the growth and management of any economy. Improved health results in improved productivity, increased educational performance, improved quality of life, continued investment and savings, lower healthcare costs and debt expenditure [1]. Public sector organizations' performance has been and remains under intense and close public scrutiny [2]. Likewise, citizens are increasingly demanding public institutions that are more efficient and performance-oriented.

Public institutions in developing nations are characterized by poor performance, among other organizational challenges [3]. A focus on performance issues in public organizations

remains a topic of current policy and reforms in most governments around the world. In particular, government reforms seek to improve organizational performance in both developed and developing countries [4].

The concept of performance has created a dilemma among researchers. Researchers have differed on the best measurements of hospital performance that has therefore prompted suggestions for different healthcare performance measurement approaches [5]. For instance, [6] assert that the choice of measures of performance are based on organization's targets, a specified measurement technique to think about; this ought to be chosen through individuals who are involved in running the organization. With the surge of the computer age in the previous century, the primary proliferation of financial information as a premise for assessing performance was not satisfactory to manage organizational performance [7]. This is more so amidst global financial integration, described as integrated supply

and demand chains. Non-financial measures such as customer satisfaction, item quality, or employee turnover are particularly, habitually utilized for performance assessment [8]. Further, reference [9] classifies non-financial performance metrics as efficiency, effectiveness, relevance and financial viability. The performance of non-profit organizations such as hospitals takes place at the organization's aggregate level, impacts on society and is generally estimated by theoretical models.

Reference [10], as cited by [11], these models are developed for particular types of programs to connect particular quantifiable inputs to particular quantifiable impacts. Logic models usually specify how system inputs, such as funds and man hours, generate operations and outputs, resulting in effects. One of the standout models for measuring the performance of an organization is the Institutional and Organizational Assessment (IOA) Model. Reference [11,12,13] observed that IOA model is a multidimensional initiative which is a mixture of effectiveness, relevance, efficiency and financial viability. Therefore, for non-profit making organizations like public hospitals, performance should be measured using indicators such as effectiveness, efficiency, relevance and financial viability. Consequently, these variables were adopted for this study.

To resolve hospital performance problems, governments have increased investments in information technology (IT). However, public hospitals' healthcare quality has not benefited from Hospital Management Information System (HMIS). Past studies have pointed to the need for Information Technology Integration (ITI) in public hospitals to mitigate the urban-rural gap and cross-border variation, lack of adequate staff and deteriorating quality of public hospital healthcare [14]. Reference [15] indicated that ITI is the advancement and reconfiguration of IT to support organizational operations. This involves the use of IT resources in organizations' operations strategies so as to positively impact on performance. Reference [15,16] noted that ITI concerns the technical and management capabilities in the field of information systems. Researchers suggest three dimensions for ITI: human ITI, Organization ITI and infrastructure ITI. IT human integration is concerned with IT assets management capabilities. Reference [15] argues that ITI is established over time through experience, which tends to be organizational-specific.

The Technology Acceptance Model (TAM) postulates that a user's belief creates the intent to utilize information technology. The intent to use results into the actual use decision. The importance of user perception towards IT has been widely recognized in various fields [17]. Reference [17] asserts that, the perceived ease of use and usefulness are significant dimensions in determining adaptation of innovations. Consequently, the greater the perceived ease of use and perceived usefulness of technological innovations, the more likely that it will be integrated into the organization's operations. Reference [18] further notes that, perceived ease of use is the individual's belief that the effort required in utilizing an innovation or degree to which a client trusts that utilizing a specific innovation will be easy. Earlier studies have determined perceived ease of use to be an essential factor influencing client acknowledgment and use of IT [19].

Perceived ease of use explains the view of the user of the level of effort required to use the technology.

Perceived ease of use was established from past studies to be an important attribute affecting acceptance by users and use behaviour of users of ITs [19]. Perceived ease of use consists of determinants of the ease to use such as ease of reading, use of understandable terms, the ability to search for relevant information and the ability to return to the previous page. This also involves support, intricacy and management of change.

Perceived usefulness describes the perception of the user as to how much technology will improve the performance of the work environment of the user [18]. This implies the user has a sense of how useful the innovation is in carrying out the tasks. This comprises reducing the time, efficiency and accuracy required to do the job. Therefore, people are more likely to use a system application or not to use it to the degree that they think it will help them better perform their duties.

Proper IT integration is required for effective use of technology and to foster organizational performance [20]. Reference [21] believes that user beliefs dictate the ability to access genuine information. While some users accept and use technology to enhance their performance. Others are unwilling to accept and use accessible technology skills and techniques [21].

2. Literature Review

2.1. Theoretical Review

Technology Acceptance Model (TAM), supported by Diffusion of Innovations (DOI) models were used to anchor this study. The TAM is an extension of Ajzen and Fishbein's Theory of Reasoned Action - TRA [22]. This was a theory introduced by Davis in 1986. Therefore, in the area of information systems, technology and services, TAM developed by [18] is among the most extensively used and prominent models. It has been verified as a potent frame work for predicting the acceptance of new technology by users. TAM's goal is to estimate acceptance of the information system, diagnose design issues before users have any substantial system understanding. TAM model is relevant to this study because it explains the factors that influence acceptance of new technology.

TAM postulates that there are two dimensions to user perception of new technologies that indirectly influence acceptance; perceived usefulness and perceived ease of use. Perceived usefulness is the extent to which a user perceives that utilizing a given technology will have some benefits. Further, perceived ease of use is the degree to which a person believes that a particular system will be easy to use [18]. Reference [18] observed that, perceived ease of use has direct influence on the perceived usefulness. In this study, TAM was used to determine how perceived usefulness and perceived ease of use influence ITI and performance.

DOI Theory was developed by [23]. The theory advances that technology adoption is determined by relative advantage, compatibility, trialability, observability and complexity. The theory affirms that relative advantage, compatibility, trialability and observability correlate with

the rate of technology adoption while the fifth factor is negatively correlated with the rate of technology adoption. Reference [23] affirms that, relative advantage is how much a technology is seen as being better than the thought it supersedes. The moment the organization establishes that the technology will improve their performance, it is likely to deploy the technology faster. Reference [23] and [16] intimate that relative advantage could positively impact on adoption of an innovation.

Reference [24] views compatibility as the degree to which a technology may be complimenting the norms, existing operational needs of probable implementers. [24] found a positive relationship between compatibility and innovation adoption while [25] failed to establish a positive relationship. The nature of the innovation or the study context may have been responsible for this variation in findings. In addition, complexity is the level to which an innovation is regarded as being fairly difficult to grasp and use. As perceived by people in society, the complexity of an innovation has a negative effect on the rate of adoption [24]. Past studies have found a negative correlation on the effect of complexity on ITI [25,26]. Thus, it is anticipated that the more challenging ITI is perceived to be, the more difficult it is to be adopted. The model's robustness includes; the ability to recognize possible future barriers and facilitators in evaluating, perceiving, and embracing new concepts; the ability to control intended change efforts via a broad view that espouses the importance and effect of system and characteristics of individual, system, and communication patterns.

2.2. Empirical Literature Review

Reference [27] found that perceived ease of use has a significant mediating effect on the relationship between the quality of tax services and the online tax system. Statistically significant was the relationship with the value of 0.93. The findings of the study further revealed that perceived ease of use is a mediating variable with an efficient service offered by the tax administrator which leads to increased use of the online tax system by users. The study was conducted in Nigeria and surveyed 206 respondents, using semi-structured questionnaires. The surveyed data was analyzed using structural equation modelling.

However, the study focused only on the electronic facets of service quality, not on the non - electronic, as the study's respondents were those who used the system. Because of a specific group of users, these results could not be generalized. Therefore, the current study considers perceived usefulness variable, carried out on numerous public hospitals, thus enhancing the generalizability of the findings.

Reference [19] established that perceived ease of use contributes to use of electronic technology. The study further found out that the perceived ease of use explained up to 15% of the variance in the behavioral use. However, perceived ease of use of the technology did not exclusively contribute to the prediction of behavior when perceived usefulness was considered, indicating a mediation effect. The survey used questionnaires to study the relationships among the main constructs by using the partial least squares technique. However, the study only

focused on one user perception variable, the perceived ease of use; it ignored perceived usefulness, thus creating a conceptual gap. Further, the study used survey design to study a single learning organization in Malaysia hence the findings could not be generalized.

Reference [28] investigated employee perception and its effect on organizational performance factoring its influence on digital inclusion and division. Primary data was collected from Pakistan's government and private banks to evaluate employee technology perception trends. In the quantitative survey, 400 questionnaires were administered with a response rate of 70 percent. The study used descriptive and inferential statistics for data analysis. The study revealed a significant effect on perception of employees and its impact on organizational performance. This study was carried out on private banking sector in Pakistan while the current study was conducted on public hospitals in Kenya thus creating a contextual gap.

3. Research Methodology

This study used explanatory and cross-sectional survey. Explanatory study research design focused on the extent and nature of cause-and-effect relationship besides assessing impacts of specific changes on existing norms and various processes. It also focused on analysis of the situation or the specific problem to explain the patterns of relationships between variables, [29].

Reference [29] also stresses that the extent and nature of cause-and-effect relationships between variables are determined by explanatory research design. The same authors assert that cross-sectional survey seeks to evaluate the relationship between variables at a particular time to explain the relationship patterns between variables. The study target population included ninety-eight public hospitals in Kenya that have integrated managed equipment services, comprising ninety-four from the forty-seven counties and four national referral hospitals [30].

The study focused on ten departments of the hospitals including Admission, IT, Imaging, Pharmacy, Accident and Emergency, Medical Records, Laboratory, Wards, Surgery and Hospital Administration. The study used multi-stage sampling to choose the required sample size of 294 respondents. This formed the unit of observations of the study. Reference [29] and [31] advise that a higher sample is a good population representation, thus minimizing types I and II errors. The researcher developed a semi-structured questionnaire for data collection based on knowledge obtained from a literature review of studies related to ITI and organizational performance [11,32]. Using the semi-structured questionnaire, the researcher was able to gather both quantitative and qualitative data [29]. This study also used secondary data obtained through document review of hospital reports.

Reference [33] proposes, a four-step technique was used to perform multiple regression analyses and assess the significance of the coefficients at each step. Reference [33] is regarded as a better choice over [34] since the former takes into account both linear and non-linear variables effects. The schematic diagram of the model that guided the test for mediation is shown in Figure 1.

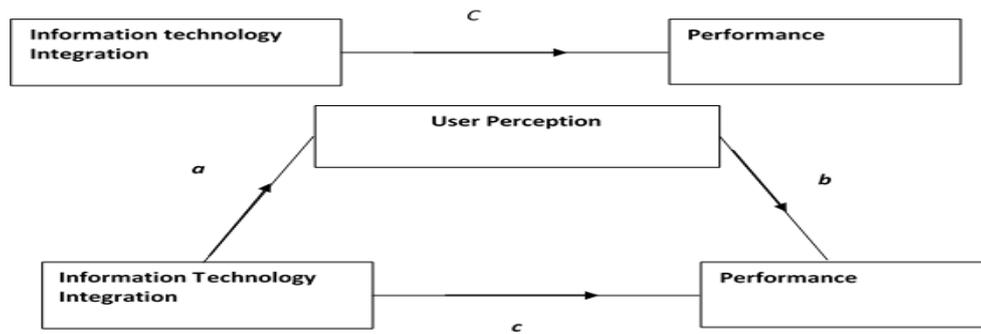


Figure 1. Mediation Model (Source: Author (2018))

In Figure 1, C is the total effect of ITI (independent variable) on performance (dependent variable). Then c is the direct effect of ITI on performance after controlling user perception (UP). Further, a is the effect of ITI on UP, whereas b is the effect of UP after controlling ITI [35].

Model 1 was analyzed as the base model to determine the effect of ITI on performance.

Model 2 analyzed the effect of mediating variable (user perception) on the independent variable, ITI.

Model 3 was estimated to establish whether there was complete, partial or no mediation between the independent variables and the dependent variable.

$$PPH = \beta_0 + \beta_1ITI + \varepsilon \quad \text{Model 1}$$

Regression equation of independent variable predicting Mediating variable.

$$UP = \beta_0 + \beta_1ITI + \varepsilon \quad \text{Model 2}$$

Where, PPH = Composite Index for Hospital Performance
 UP = Composite Index for User Perception
 ITI = Composite Index for IT Integration

Regression equation of independent variable and mediating variable predicting dependent variable.

$$PPH = \beta_0 + \beta_1ITI + \beta_2UP + \varepsilon \quad \text{Model 3}$$

Where, PPH = Composite Index for Hospital Performance
 ITI = Composite Index for IT Integration
 UP = Composite Index for User Perception.

4. Results and Discussion

4.1. Descriptive Results

The study assessed the users' perception on IT integration in public hospitals in Kenya. The study sought

to test whether users' perception mediated the relationship between information technology integration and performance of public hospitals. The study measured user perception by conducting the assessment on respondents' perceived ease of use and perceived usefulness of information technology.

4.1.1. Assessment of Perceived Ease of Use of IT in Public Hospitals in Kenya

This section presents the findings on perceived ease of use of IT in public hospitals in Kenya. The study used percentages, mean and standard deviation to assess the respondent perceived ease of use of ITs in selected public hospitals.

The respondents were asked whether an integrated system enables one to accomplish tasks more quickly; the statement had a mean response of 4.1 which implied that majority of the respondents agreed and strongly agreed with the statement. The mean score of 4.14 also indicated that respondents agreed and strongly agreed that integrated system has improved my quality of work. On whether, integrated system makes it easier to do my job, the findings showed that the statement had a mean of 4.14 that also confirmed that majority of the respondents agreed integrated system makes it easier to do their job.

The study sought to establish whether the integrated system had improved respondents' productivity; the study findings showed that majority of the respondents agreed and strongly agreed as indicated by the mean response of 4.07. Similarly, a mean of 4.07 showed that majority of the respondents agreed that the integrated system gave them greater control over their job. The study finally sought to establish whether the integrated system enhanced effectiveness on the job. The mean of 4.21 indicated that majority of the respondents agreed.

Table 1. Descriptive Results for Perceived Ease of Use of IT in Public Hospitals

	Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree	Mean	Std Dev
The integrated system enables me to accomplish tasks more quickly	7.1%	7.1%	7.1%	14.3%	64.3%	4.21	1.27
The integrated system has improved my quality of work	7.1%	7.1%	14.3%	7.1%	64.3%	4.14	1.31
The integrated system makes it easier to do my job	7.1%	7.1%	14.3%	7.1%	64.3%	4.14	1.31
The integrated system has improved my productivity	7.1%	14.3%	7.1%	7.1%	64.3%	4.07	1.40
The integrated system gives me greater control over my job	7.1%	14.3%	0.0%	21.4%	57.1%	4.07	1.34
The integrated system enhances my effectiveness on the job	7.1%	7.1%	7.1%	14.3%	64.3%	4.21	1.27

Source: Study Data (2018).

The findings generally implied that respondents considered the IT in selected public hospitals to be easy to use. These findings implied that integration would be easy; there was a perception of ease in use by users. Reference [18] found out that perceived ease of use had a direct influence on the behavioral intention of adoption of technologies.

4.1.2. Assessment of Perceived Usefulness of IT in Public Hospitals in Kenya

This section presents the findings on perceived usefulness of IT in public hospitals in Kenya. Perceived usefulness is among user perception about the information technology adoption that enhances its level of integration. The study used percentages, mean and standard deviation to assess the respondent perceived usefulness of information technologies in selected public hospitals.

The study sought to test if respondents' interaction with the integrated system had been clear and understandable. The findings showed that 42.9% and 28.6% of the respondents agreed and strongly agreed. The statement had a mean of 3.79, further confirming that majority of the respondents agreed. On whether overall, the integrated system is easy to use, the finding showed that 28.6% and 42.9% of the respondents agreed and strongly agreed respectively. The mean response of 3.79 further indicated that majority of the respondents agreed that learning to operate the integrated system was easy for them.

The study also sought to establish if respondents rarely become confused when they use the integrated system; 28.6% agreed, similar 28.6% strongly agreed and 21.4% slightly disagreed. Further, 14.3% and 7.1% of the respondent disagreed and strongly disagreed respectively. The study also sought to establish if respondents rarely made errors when using the integrated system. Some 50.0% and 14.3% of the respondents agreed and strongly

agreed respectively. The mean of 3.79 further indicated that majority of the respondents rarely got frustrated when using the integrated system.

The study findings implied that majority of the respondents considered ITI to be useful to them in carrying out their duties at the hospitals. These findings further showed that users of information technology among the selected public hospitals in Kenya had positive perception. Reference [20] notes that the perceived ease of use and usefulness are important factors in determining adaptation of innovations. Consequently, the greater the perceived ease of use and perceived usefulness of technological innovations, the more likely that it would be integrated into the organization's operations. Reference [31] further argued that perceived ease of use consists of determinants of the ease to use, ease of reading, using understandable terms, ability to link, to search for related information and ease of returning to previous page. This includes support, complexity and change management.

4.2. Test of Hypothesis

4.2.1. Test for Mediation Effect of User Perception

The study employed [33] model to test if user perception was a mediator of the relationship between information technology integration and performance of selected public hospitals in Kenya. The mediation effect of user perception was measured using [33] model by conducting multiple regression analyses and assessing the significance of the coefficients at all the four steps. Table 3 and Table 4 contain the summary of the four steps as recommended by [33]. Table 3 presents the model summary and goodness of fit of the model. Table 3 presents the regression coefficient and significance of the predictor variables.

Table 2. Descriptive Results for Perceived Usefulness of IT in Public Hospitals

Step 1		β	Std. Error	Beta	T	Sig.
Step 1 PPH = $\beta_0 + \beta_1 ITI + \epsilon$	(Constant)	0.704	0.348		2.026	0.046
	ITI	0.986	0.114	0.699	8.623	0.000
Step 2 UP = $\beta_0 + \beta_1 ITI + \epsilon$	(Constant)	0.589	0.5		1.177	0.243
	ITI	1.043	0.165	0.583	6.334	0.000
Step 3 PPH = $\beta_0 + \beta_1 UP + \epsilon$	(Constant)	1.742	0.265		6.573	0.000
	UP	0.51	0.068	0.647	7.493	0.000
Step 4 PPH = $\beta_0 + \beta_1 ITI + \beta_2 UP + \epsilon$	(Constant)	0.535	0.321		1.666	0.100
	ITI	0.687	0.129	0.487	5.327	0.000
	UP	0.286	0.072	0.363	3.972	0.000

Source: Study Data (2018).

Table 3. Model Summary and ANOVA for Test for Mediation

Step	Model	Model Summary	ANOVA
Step 1	PPH = $\beta_0 + \beta_1 ITI + \epsilon$	R-squared =0.488 Adjusted R-squared=0.481	F=74.352 (p=0.000)
Step 2	UP = $\beta_0 + \beta_1 ITI + \epsilon$	R-squared =0.340 Adjusted R-squared=0.331	F=40.122 (p=0.000)
Step 3	PPH = $\beta_0 + \beta_1 UP + \epsilon$	R-squared =0.419 Adjusted R-squared=0.411	F=56.140 (p=0.000)
Step 4	PPH = $\beta_0 + \beta_1 ITI + \beta_2 UP + \epsilon$	R-squared =0.575, Adjusted R-squared=0.564	F=52.110 (p=0.000)

Source: Study Data (2018).

Table 4. Regression Coefficients for Models Used to Test for Mediation

Step 1		β	Std. Error	Beta	T	Sig.
PPH = $\beta_0 + \beta_1 ITI + \epsilon$	(Constant)	0.704	0.348		2.026	0.046
	ITI	0.986	0.114	0.699	8.623	0.000
Step 2						
UP = $\beta_0 + \beta_1 ITI + \epsilon$	(Constant)	0.589	0.5		1.177	0.243
	ITI	1.043	0.165	0.583	6.334	0.000
Step 3						
PPH = $\beta_0 + \beta_1 UP + \epsilon$	(Constant)	1.742	0.265		6.573	0.000
	UP	0.51	0.068	0.647	7.493	0.000
Step 4						
PPH = $\beta_0 + \beta_1 ITI + \beta_2 UP + \epsilon$	(Constant)	0.535	0.321		1.666	0.100
	ITI	0.687	0.129	0.487	5.327	0.000
	UP	0.286	0.072	0.363	3.972	0.000

Source: Study Data (2018).

The results of Step 1 show that ITI accounted for (Adjusted R-squared=0.481) 48.1% of the variation in performance of public hospitals and the model had a goodness of fit ($f=74.352$, $p=0.000 < 0.05$). The results of Step 2 show that ITI accounted for (Adjusted R-squared =0.331) 33.1% of the variation in user perception and the model had a goodness of fit ($f=40.122$, $p=0.000 < 0.05$). The results of Step 3 show that user perception accounted for (Adjusted R-squared=0.441) 44.1% of the variation in performance of public hospitals; the model also had a goodness of fit ($f=56.140$, $p=0.000 < 0.05$). The finding of the final step shows that ITI and user perception explained (Adjusted R-squared=0.564) 56.4% of the variation in performance of public hospitals and the model also had a goodness of fit ($f=52.110$, $p=0.000 < 0.05$). The findings implied that all the models fitted for mediation effect were statistically significant.

Table 5. Summary for Mediation Analysis

OUTCOME	CONCLUSION
β_1 significant in model 3.3	Partial Mediation
β_1 significant in model 3.4	
β_1 significant in model 3.5	
β_1 significant and β_2 significant model 3.7	

Source: Study Data (2018).

Since all the variables were significant in all the four steps, the study concluded that there was partially mediation hence the study rejected H_0 : User perception does not mediate the relationship between information technology integration and performance of selected public hospitals in Kenya. Therefore, user perception mediated the relationship between information technology integration and performance of selected public hospitals in Kenya. The finding of this study echoes those of [27] who also found that perceived ease of use had a significant mediating effect on the relationship between tax service quality and online tax system. The study finding also concurs with the finding of [19] established that perceived ease of use contributes to use of electronic technology.

5. Conclusions and Policy Recommendation

The study concluded that user perception information influences the relationship between information technology adoption and performance of selected public hospitals in Kenya. The study recommends that the management of public hospitals should conduct awareness forums to enlighten users of the technologies and correct the misconceptions and wrong perceptions about technologies among the employees. This would increase adoption of IT. The Ministry of Health should come up with right policies and legal frameworks that would ensure that all public hospitals in Kenya adopted use of modern technologies and that hospitals allocated sufficient budget to ITI.

The current study focused on mediating role of User Perception on the relationship between ITI and performance of selected public hospitals in Kenya. The study relied on stratified random sampling technique and included public hospitals only. The study suggests further research on other factors that explain the remaining percentage in variation of performance of public hospitals since only 48.1% of the variation in performance of public hospitals in Kenya could be accounted for by information technology integration.

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