

Exploratory Study of Information System User Satisfaction: A Study of University of Ibadan Post Graduate School Web Portal

Simeon Ambrose Nwone

Department of Information Studies, School of Social Science,
University of KwaZulu-Natal, Pietermaritzburg, South Africa.
Email: simeonnwone {at} gmail.com

Abstract— The study examined the influence of information system (IS) characteristics namely; system quality, information quality and service quality derived from the extended DeLeon & McLean (2003) IS success model, in addition to the influence of a hypothesized technological/infrastructural factor on postgraduate (PG) students satisfaction of the University of Ibadan (U.I) postgraduate (PG) school web portal. The study was a descriptive survey of PG students of the University of Ibadan. A sample of 385 students were selected using proportional stratified sampling technique. A self structured questionnaire was used to collect data from the study respondents. Data was analyzed using descriptive and inferential statistics. The result shows that all the information system characteristics; system quality ($\beta = 0.380$), service quality ($\beta = 0.223$), information quality ($\beta = 0.153$), and technological /infrastructural factor ($\beta = -0.111$) in that order, significantly ($p < 0.05$) influenced postgraduate students satisfaction of the web portal. The study recommends the need for the university to implement an IT policy that will ensure efficient management of the information system, in addition to large scale investment in internet infrastructure to maximize users satisfaction.

Keywords- System Quality, Information Quality, Service Quality, User satisfaction

I. INTRODUCTION

A Web portal usually features specific functions, such as search mechanisms, access to databases, user registration and personalization options. Web portals have been widely used during the last years and can be classified into horizontal portals, which cover many areas of interest and vertical portals, which are focused on one specific area. Web portals serve a variety of purposes, such as personal, governmental, informational, entertaining and educational purposes [1],[2]. Despite the significant changes in the end-user computing environment during the past decade and proliferation of web-based information systems, there has been little research on measurement of user satisfaction with web-based information systems especially in the academic domain.

There are information systems (IS) that range from *hedonic*, developed for pleasure and enjoyment, to *utilitarian*, developed to improve individual and organizational

performance [3]. Organizations focus on developing, using, and evaluating utilitarian IS. There is a plethora of utilitarian IS used in organizations, such as decision support systems, computer-mediated communications, e-commerce, knowledge management systems, as well as many others. However, in this study, the utilitarian IS considered is the University of Ibadan (U.I) postgraduate (PG) web portal.

Researchers have created models to measure information system success [4],[5], emphasizing the need for better and more consistent success metrics. To measure IS success, user satisfaction is possibly the most extensively used single measure [6], [7], [4], [8], [9], [10]. Amongst the IS models, DeLone and McLean [4], [11] IS success model is one of the most widely cited [12], [13] and will be used in this study to examine PG students satisfaction of U.I PG school web portal.

DeLone and McLean [11] IS success model, which is an extension of DeLone and McLean [4] model is an attempt to represent the interdependent, process nature of six IS success constructs, namely; System Quality, Information Quality, Service Quality, Use, User Satisfaction, and Net Benefit. System quality describes the desirable characteristics of an information system, and includes ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response time. Information quality is the desirable characteristics of the system outputs, as it relates to relevance, accuracy, conciseness, completeness, understandability, currency, timeliness, and usability. Service quality encompasses the quality of the support that system users receive from the IS department and IT support personnel, in terms of responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff. System use measures the degree and manner in which staff and customers utilize the capabilities of an information system, and covers the amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use. Use must precede user satisfaction in a process sense, but positive experience with use will lead to greater user satisfaction in a causal sense. Increased user satisfaction invariably leads to a higher intention to use [11]. User satisfaction is measured by

the users' level of satisfaction with reports, web sites, and support services. Net benefits is the extent to which IS are contributing to the success of individuals, groups, organizations, industries, and nations. For example: improved decision-making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development.

Besides the IS success factors identified by [4], [11], one essential antecedent factor that could determine IS success is technological factor. It is hypothesized that this factor may contribute greatly to the IS success in the context of the study. In addressing this research gap, this study attempts to investigate the contribution of technological factors on IS success. Similar studies [14], [15], [16], [17]; [18] have identified technological factors to include IS facilities, IS integration, IS competency, IS structure and user support. IS facilities refer to the availability of IS/IT resources and infrastructure that are provided during any IS project implementation [14], while IS integration is the integration of technologies across other organizational units [19]. IS competency refers to the degree to which project staff possesses the required skills and knowledge in order to perform the required services [16]. According to [20], IS structure refers to the extent to which the information systems are structured or dispersed throughout an organization. User support deals with the technical support and help given to users in terms of operating the information systems in the organization [21].

However, this study will consider along with the technological factor, only four factors from the extended [11] IS success model namely system quality, information quality, service quality, and user satisfaction. Since the use of the PG school web portal was not an option, but rather mandatory to the PG students, the construct "use" was subsumed in user satisfaction since users' satisfaction of an information system could only be preceded by its use. Net benefit as a construct was dropped since measuring it will be out of context in this study. User satisfaction which includes 'use' in this context remains the most viable measure of the IS success. This leads to the modification of the [11] IS success model in accessing users satisfaction within the context of the study.

The University of Ibadan (in Nigeria) PG school web portal was designed to provide online services to postgraduate students, which includes; facilitating admission processes, checking admission status, course registration, payment of school fees, request for accommodation and providing relevant information about the University. In spite of the benefits of this information system to the university postgraduate students, measuring its overall success will depends largely on students' satisfaction. Measurement of success of U.I PG School web portal performance can only be achieved through a feedback from users. The feedback will act as a signal and a scale for stakeholders to justify their investment in the system and appraise their effort in the system development. This vital feedback can only be achieved

through a survey of the web portal IS users to discover their candid view of the system.

The study will adapt McLean and DeLeon [11] IS model in understanding how information system characteristics namely; system quality, information quality and service quality, in addition to how the hypothesized technological factors affect postgraduate students' satisfaction of the U.I PG school web portal. Since the study will use empirically tested IS measurement constructs, the outcome of the study will bring to the foreground which IS measurement indices account the most in users satisfaction. The outcome will assist stakeholders to channel resources appropriately based on the observed satisfaction indices.

II. RESEARCH OBJECTIVES

- 1) To determine the influence of system quality on PG students' satisfaction of U. I PG School web portal.
- 2) To examine the influence of information quality on PG students' satisfaction of U. I. PG School web portal.
- 3) To investigate the influence of service quality on PG students' satisfaction of U. I. PG School web portal.
- 4) To examine the influence of technological and infrastructural factors on PG students' satisfaction of U. I. PG School web portal.

III. RESEARCH HYPOTHESES

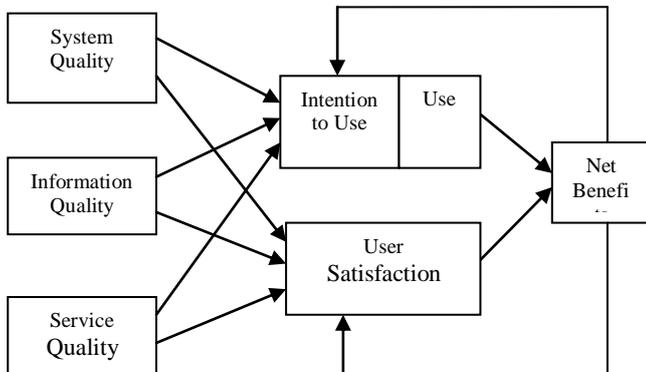
- H0₁: There is no significant relationship between system quality and users' satisfaction of U. I PG School web portal.
- H0₂: There is no significant relationship between the information quality and users' satisfaction of U. I. PG School web portal.
- H0₃: There is no significant relationship between the service quality and users' satisfaction of U. I. PG School web portal.
- H0₄: There is no significant relationship between technical and infrastructural factors and users' satisfaction of U.I. PG School web portal.

IV. THEORETICAL FRAMEWORK

DeLone & McLean [11] IS success model was used to unravel the information systems characteristics that influenced PG students' use of U.I PG school web portal. The DeLone & McLean [11] IS success model was the result of the enhancement made to the DeLone & McLean [4] model after a review of the research published during the period 1981–1987. Based upon this review, the authors created a taxonomy of IS success, which are: system quality, information quality, service quality, use, user satisfaction, and net benefits.

However, these six components are not independent success measures, but are interdependent variables. In that review the [11] further clarified the ‘use’ construct. The authors explains that ‘use must precede “user satisfaction” in a process sense, but positive experience with “use” will lead to greater “user satisfaction” in a causal sense’, while increased user satisfaction will lead to a higher intention to use, which will subsequently affect use [11]. The final updated (DeLone & McLean [11] model is depicted in fig 1.

Figure 1: The updated IS Success Model (DeLone & McLean, 2003)



The D&M model has also been found to be a useful framework for organizing IS success measurements. The model has been widely used by IS researchers for understanding and measuring IS success. The components of DeLone & McLean, [11] IS success model are described below:

System quality – the desirable characteristics of an information system. For example: ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times.

Information quality – the desirable characteristics of the system outputs; that is, management reports and Web pages. For example: relevance, understandability, accuracy, conciseness, completeness, understandability, currency, timeliness, and usability.

Service quality – the quality of the support that system users receive from the IS department and IT support personnel. For example: responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff.

System use – the degree and manner in which staff and customers utilize the capabilities of an information system. For example: amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use.

User satisfaction – users’ level of satisfaction with reports, Web sites, and support services.

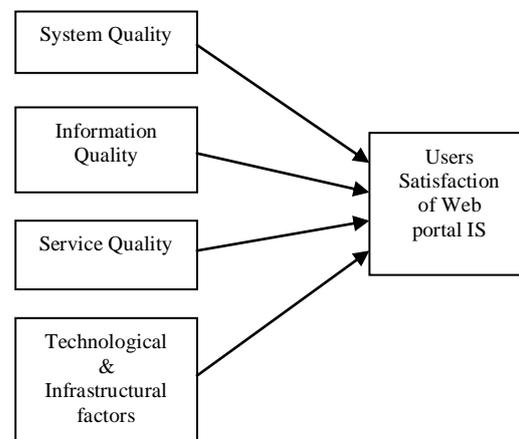
Net benefits– the extent to which IS are contributing to the success of individuals, groups, organizations, industries, and nations. For example: improved decision-making, improved

productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development.

V. CONCEPTUAL MODEL

The conceptual framework for this study was adapted from DeLone and McLean [11], IS success model. For the purpose of the study, some of the [11] constructs were retained while others were discarded in order to address the aim of the study. The construct retained from the [11] model are system quality, information quality, service quality (independent variables) and user satisfaction (dependent variable). Since use of the university postgraduate portal is not an option but mandatory to all postgraduate students, ‘use’ and ‘user satisfaction’ were merged together since satisfaction of an information system means positive experience of use of that system. Net benefit was excluded in the conceptual model. However, technological/infrastructural factor was added as one of the independent variables that could influence users satisfaction. Fig 2 shows the resultant model.

Fig 2: Conceptual model



The resultant conceptual model (Fig 2) adapted from the extended DeLone and McLean’s [11] IS success model depicting system quality, information quality, service quality, and technical/infrastructural issues as independent variables capable of influencing users satisfaction, the dependent variable.

VI. LITERATURE REVIEW

The literature review in this section covers the variables used in addressing the research objectives. The variables are system quality, information quality, service quality, user satisfaction, and technological/infrastructural factor.

System Quality and User Satisfaction

There is strong support for the relationship between system quality and user satisfaction [22]. Several types of IS have been examined, and the type of information system affects

how some researchers measure system quality. For example, the functionality of a management support information system, which is one measure of system quality, has been found to be significantly related to user satisfaction [23]. For knowledge management systems, system quality was also found to be strongly related to user satisfaction [24], [25], [26]. For web sites system quality, measured as reliability and download time, is significantly related to user satisfaction in two different studies [27], [28]. Researchers have also examined more general IS and found a strong relationship between system quality and user satisfaction using a variety of measures and IS [29], [30], [31], [5], [32], [33], [34], [35], [36].

Information Quality and User Satisfaction

The relationship between information quality and user satisfaction is strongly supported in the literature [22], [25]. Studies have found a consistent relationship between information quality and user satisfaction at the individual unit of analysis [29], [5], [32], [33], [34], [36], [24], [37], [26]. Studies specifically examining the information quality aspects of Web sites, such as content and layout, have found significant relationships between these constructs and user satisfaction [27], [28]. Marble [38], however, did not find a significant relationship between measures of information quality and user satisfaction in two organizational IS examined in his study.

Service Quality and User satisfaction

Several studies have examined the relationship between service quality and user satisfaction. However the findings of these studies suggest mixed support for this relationship. Researchers have measured service quality using multiple methods, which may account for the inconsistent findings. Some researchers have looked at service quality by examining the characteristics of the support personnel; however, examining the relationship between personnel characteristics and user satisfaction has produced mixed results. Choe [39] found that IS personnel experience does not significantly affect user satisfaction of accounting IS in Korean firms. Another study found that the technical performance of the developers (based on their responsiveness to problems) was positively related to user satisfaction [40]. Yoon, Guimaraes, and O'Neai [30] had a similar result in that developer skill had a significant effect on user satisfaction of expert systems. A case study performed by [41] found that the relationship between the IS function and users as well as the quality of support and services provided by the IS function had an impact on user satisfaction.

Technological/Infrastructural Factor

Several studies [42], [14], [43], [15], [16], [17], [18], have examined the effect of technological factors in an IS environment. Amongst these factors, five were identified that are potential antecedents of IS success. These factors are IS facilities, IS integration, IS competency, IS structure and user support. IS facilities refer to the availability of IS/IT

(information technology) resources and infrastructure that are provided during IS project implementation. Infrastructural facilities were found to be positively related with IS success and adoption [14]. In an empirical study by [14], IS infrastructure was found to be one of the top predictors of IS success among several factors investigated. Byrd, Sambamurthy & Zmud, [44] defined IT infrastructure as the shared information services delivery base within an organization that is built around information technologies and a specific body of knowledge such as skills and experience. The authors used IT innovativeness and IT sophistication to operationalize the IT infrastructure and found that large agencies with mature IT infrastructures were better able to develop higher quality IT plans. A study by [45], found that physical IT infrastructure contributed to e-business adoption in European firms. Whyte & Bytheway [16] defined IS competency as the degree to which project staff possesses the required skills and knowledge in order to perform the required services. The authors found IS competency among the significant attributes of IS success. Previous studies had indicated that IS competency was found to be one of the top ten dimensions for assessing IS function performance [19]. Byrd and Turner [46] found that organizations with a team of highly technical staff tend to have better IT infrastructure flexibility, and at the same time are able to increase the organization's competitive advantage in key business management areas. In another study, [47] found that IT department technical quality which includes staff competency, had an influence on IT impact on the supply chain that leads to the firm's performance. IS integration refers to the degree to which different systems are integrated in terms of data, functionality and appearance [18]. Saunders & Jones [19], states that integration refers to the integration of technologies across other organizational units. They added that IS integration is needed to ensure a smooth and cost-effective flow of information across all business functions. The authors found that IS integration is among the top-ten dimensions of IS function performance assessment. However, Grover [14] did not find significant support for IS integration in influencing IT adoption. IS structure refers to the extent to which the information systems are structured or dispersed throughout an organization. Allen & Boynton [20] and [48] pointed that the extent of IS structure can be assessed by the existence of centralized computing structures, the dissemination of personal and mini computers, or the use of network technologies. Ang, Davies and Finlay [18] found that organizations with a distributed structure of IT facilities are associated to IT usage. The author found that a decentralized IS structure has more influence on IT use than a centralized IS structure. But, other researchers found that centralized IS structure tend to promote efficiency and effectiveness. User support deals with the technical support and help given to users in terms of operating the information systems in the organization. The importance of user support to the success of user computing has been highlighted in many studies [21] [49], [50], [51]. Many researchers found significant support

for the relationship between personal computing success and user support [52], [53],[54].

VII. METHOD

A descriptive survey design was used to examine the information system users’ satisfaction indices amongst the postgraduate students of University of Ibadan, Nigeria. The population for the study comprises postgraduate students from all faculties in the University. A proportional stratified sampling technique was used to select 385 respondents from all the faculties. A self structured questionnaire using the information system’s constructs of DeLone and McLean, [11] was used to collect data from the postgraduate students. The survey was conducted through face-to-face contact with the respondents. In all, 500 questionnaires were distributed and 385 copies were retrieved and found fit for data analysis. The data was analyzed using descriptive and inferential statistics.

VIII. RESULT

Demographic characteristics of respondents

Table 1 presents the demographic characteristics of the respondents. Males accounted for (53.3%) of the respondents, while (46.7%) were females. Respondents between ages 25-29 accounted for the highest percentage (50.2%), followed by those within ages 30-34years (25.7%). Those between 18-24years were (15.4%), while those between 35-39years and 40-44years accounted for (3.8%) and (3.1%) respectively. Those between age groups 45-49 and above 50 accounted for (0.9%) respectively.

Table 1. Demographic Characteristics of the Respondents

Variables	Measurement	Frequency	Percent
Age	18-24yrs	49	15.5
	25-29yrs	160	50.2
	30-34yrs	82	25.7
	35-39yrs	12	3.8
	40-44yrs	10	3.1
	45-49yrs	3	0.9
	Above 50yrs	3	0.9
Gender	Male	170	53.3
	Female	149	46.7

VIII DESCRIPTIVE ANALYSIS OF COMPONENTS EXTRACTION AND FACTOR LOADINGS

Table 2 presents the summary of the principal components extracted variables that explains users’ satisfaction in using the PG school web portal with their factor loadings and the corresponding mean and standard deviation. In the *system quality* segment, “The user interface of PG school web portal measures up to global standard” has the highest mean score (1.90) and the highest standard deviation (0.709) compared to other factors within the group. “I am satisfied with the speed of the web portal” has a mean of (1.76) with a standard deviation of (0.627). I am satisfied with how quickly the web

portal loads pages and images have a mean of (1.73) with a deviation from the mean (0.662). U.I PG School web portal is easy to use has the least mean and the least deviation from the mean (0.560). There cumulative eigenvalues (3.142, 1.193, 1.027 and 1.010) accounted for (57.92%) of the total variation, together these variables are sufficient to represent the group.

TABLE 2: DESCRIPTIVE ANALYSIS OF COMPONENTS EXTRACTION AND FACTOR LOADINGS

Factors	Mean	Std. Dev	F1	F2	F3	F4
System Quality						
U.I PG School web portal is easy to use	1.34	0.560	.726			
I am satisfied with the speed of the web portal	1.76	0.627		-.761		
I am satisfied with how quickly the web portal loads pages and images	1.73	0.662			-.710	
The user interface of PG school web portal measures up to global standard	1.90	0.709				.700
Information Quality						
The information on the PG school portal is always timely (timeliness)	1.75	0.705	-.759			
The information on the PG school portal is always accurate (accuracy)	1.73	0.938		-.704		
The information on the PG school portal is usually relevant (relevance)	1.26	0.570			.704	
Service Quality						
The support staff of UI Pg School are technically competent (competence)	1.83	0.758	..660			
The support staff of U.I. PG school are fast in attending to complaint (speed)	1.93	0.544		-.804		
The support staff of U.I. PG school are very reliable (reliability)	1.95	0.707			.838	
Technological and Infrastructural factors						
Unstable power supply is a major challenge to user satisfaction	1.32	0.640		-.672		
The PG school portal is very slow and need to be upgraded	1.40	0.685		-.778		
Lack of sufficient internet facilities around the university limits user satisfaction	1.27	0.579			.719	
User Satisfaction						
I am satisfied with the overall system quality of P.G. school web portal	1.78	0.666	-.700			
I am satisfied with the overall information quality of U.I. school web portal	1.66	0.668		.707		
I am satisfied with the overall service quality of U.I. school web portal	1.83	0.671			.851	

Under the information quality section, “The information on the PG school portal is always timely” has the highest mean score (1.75) with a standard deviation of (0.705), while “The information on the PG school portal is always accurate” has mean (1.73) and the highest standard deviation (0.938). “The information on the PG school portal is usually relevant” has the least mean score (1.26) and the highest standard deviation (0.570). The three components account for (61.309%) of the total variability and can be used to represent the entire group.

In the service quality section, “The support staff of U.I. PG school are very reliable” has the highest mean score (1.95) and a deviation from the mean (0.707). “The support staff of U.I. PG school are fast in attending to complaint” has a mean score of (1.93) and standard deviation (0.544), while “The support staff of UI Pg School are technically competent” has the least mean score (1.83) and the highest standard deviation (0.758). Together the three components extracted accounted for (73.34%) of the total variability and is considered sufficient to represent the entire group.

In technological/infrastructural factor segment, “The PG school portal is very slow and need to be upgraded” has the highest mean score (1.90) and the highest standard deviation (0.685) and “Lack of sufficient internet facilities around the university limits user satisfaction” has the least mean (1.27) with a standard deviation of (0.579). “Unstable power supply is a major challenge to user satisfaction” has a mean of (1.32) with a deviation from the mean (0.640). There cumulative eigenvalues (1.644, 0.866, and 0.756) accounted for (81.64%) of the total variation, together these variables are sufficient to represent the group.

Under the user satisfaction section, “I am satisfied with the overall service quality of U.I. school web portal” has the highest mean score (1.83) with the highest standard deviation (0.671), while “I am satisfied with the overall information quality of U.I. school web portal” has the least mean score of (1.66) and a deviation from the mean (0.668). “I am satisfied with the overall system quality of P.G. school web portal” has a mean score (1.78) and the least standard deviation (0.666). The three components account for (88.87%) of the total variability and hence, can be used to represent the entire items of user satisfaction.

IX TEST OF HYPOTHESES

H₁: There is no significant relationship between System Quality and Users’ Satisfaction of the U. I PG School web portal.

The result (see Table 3) shows a positive correlation ($\beta = 0.380$, $t = 6.781$) [$F(4,259) = 32.023$], between system quality and user satisfaction. The table shows that system quality has the highest ‘*t*’ value, this implies that system quality has more impact on users satisfaction than other measures. At $p < 0.05$, we reject the null hypothesis, and conclude that system quality significantly influence users’ satisfaction of U.I PG school web portal system.

H₂: There is no significant relationship between the information quality and users’ satisfaction on the U. I PG School web portal.

The result shows a moderate but positive relationship ($\beta = 0.153$, $t = 2.669$) [$F(4,259) = 32.023$], $p = .008$, between information quality and user satisfaction. Information quality of the U.I PG school web portal is a significant predictor of users satisfaction of the information system web portal. Since, $p < 0.05$, we reject the null hypothesis (see Table 3).

H₃: There is no significant relationship between the service quality and user’s satisfaction on the U. I PG School web portal.

The interaction between service quality and users satisfaction show a high positive correlation ($\beta = 0.223$, $t = 4.106$) [$F(4,259) = 32.023$], $p = .000$. The ‘*t*’ value shows that service quality ($t=4.106$) is next to system quality ($t=6.781$) in terms of its impact on users satisfaction. At $p < 0.05$, we reject the null hypothesis and state that service quality significantly influences the satisfaction of users of the web portal system (see Table 3).

H₄: There is no significant relationship between infrastructural and technical issues and users satisfaction of the U. I PG School web portal.

The result (see Table 3) of the interaction between infrastructural/technical issues and user satisfaction reveal a significant but negative correlation ($\beta = -0.111$, $t = -2.174$, $p = .031$) [$F(4,259) = 32.023$], between both items. There is a significant relationship between technological/infrastructural issues and users satisfaction of the U. I PG school web portal. At $p < 0.05$, we reject the null hypothesis.

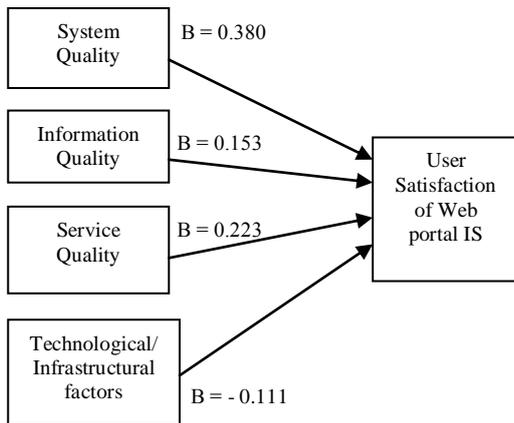
Table 3 shows the summary result of the interaction between system quality, information quality, service quality, infrastructure /technological factor and user’s satisfaction.

Table 3: Summary Regression result of the relationship between measures of information system success and users’ satisfaction of the PG school web portal system.

Dependent Factor:	Beta	t	Sig
User Satisfaction			
Independent factors:			
System Quality	.380	6.781	.000*
Information Quality	.153	2.669	.008**
Service Quality	.223	4.106	.000*
Technological/Infrastructure factor	-.111	-2.174	.031**

*significant at 0.01 ** significant at 0.05

Fig 3: The resultant conceptual model depicting the result of IS measures on user satisfaction of UI PG school web portal.



X. DISCUSSION

The ever increasing budget on information technology (IT) despite pressure on the part of management to cut costs is a recurrent issue facing many organization. This has necessitated the need for organizations to measure and examine the benefits and costs of technology. The impacts of IT are often indirect and influenced by human, organizational, and environmental factors [55]; therefore, measurement of information systems (IS) success is both complex and illusive. There are IS that range from hedonic, developed for pleasure and enjoyment, to utilitarian, developed to improve individual and organizational performance [3]. Organizations focus on developing, using, and evaluating utilitarian IS. There is an excess of utilitarian IS used in organizations, such as decision support systems, computer-mediated communications, e-commerce, knowledge management systems, as well as many others. However, this study considered the web portal utilitarian information system and how users (postgraduate students) perceive its functionality in satisfying their demands on the system. The results show the wholesome significance of the information system interactions on user satisfaction. The discussion is based on the outcomes of these interactions.

System Quality and User Satisfaction

The influence of system quality on user satisfaction further reaffirm the importance of this construct in a contemporary information system. The culture that precedes people's expectation of an information system demands systems to be flexible and easy to use even for novice. Highly rated information system are expected to be reliable, user friendly, fast response, while also offering every functionality that places it above or at least at par with competing systems

elsewhere. Furthermore, this study confirms the universality of the system quality attribute in predicting IS performance. Similarly, many studies have observed the importance of system quality on user satisfaction on different types of information systems. Gelderman, [23] found system quality to be significantly related to user satisfaction of a management information system. Likewise, in a knowledge management system, system quality was also found to be strongly related to user satisfaction [24], [25], [26]. In two different studies, [27], [28] on web sites, system quality, measured as reliability and download time, was significantly related to user satisfaction. Furthermore, [56], found perceived ease of use to be significantly related to user satisfaction. There is therefore, strong support for the relationship between system quality and user satisfaction [22]. Researchers, have also examined IS in more general terms and found a strong relationship between system quality and user satisfaction using a variety of measures and IS [29], [30], [31], [5], [32], [33], [34], [35], [36]. However, on the contrary, [57] found no relationship between the complexity of a system and user satisfaction.

Information Quality and User Satisfaction

The study observed the significance of information quality on user satisfaction of the PG school web portal, measured in terms of understandability, completeness, timeliness, currency, accuracy, and relevance of the information it contains. These attributes underlie the perception of users and form a criteria for judging system efficiency. The relationship between information quality and user satisfaction are also strongly supported in literature [22], [25]. Studies [32], [38], [36], [24], [37], [26] have found a consistent relationship between information quality and user satisfaction at the individual unit of analysis. Studies [27], [28] specifically examining the information quality aspects of Web sites, such as content and layout, have found significant relationships between these constructs and user satisfaction. Marble [38], however, did not find a significant relationship between measures of information quality and user satisfaction of two organizational IS examined in his study. At the organizational level of analysis, support also exists for the effect of information quality on user satisfaction, but there are not enough studies examining this relationship to reach a strong conclusion. In a qualitative study on system success, data quality and user satisfaction, measured by user attitudes, were found to be directly related to one another [58]. Another qualitative case study identified multiple comments from respondents suggesting an association between information quality (i.e., content, accuracy, timeliness, and format) and user satisfaction [59]. Furthermore, a quantitative study also found a significant link between information quality and managerial satisfaction of hardware, software, and support of an information system [60]. The findings of this study on PG school web portal system is consistent with studies already observed in literature and confirms the importance of information quality in a Nigerian academic information system environment.

Service Quality and User Satisfaction

This study found service quality to be a significant attribute in measuring user satisfaction of U.I PG school web portal information system. Service quality is measured in terms of performance of service personnel in response to complaint and issues arising from system abnormalities. The responsiveness of support staff goes a long way in addressing problems encountered by users. In addition to this is the technical competence of the support personnel, which is equally vital in addressing complexities associated with system attributes. The value of empathy and speed of response are vital parts of service expected by the users. The latter emphasizes that the response time to compliant be short while the former instills the notion of respect and humility in attitude of the support personnel. Moreover, several studies have examined the relationship between service quality and user satisfaction; however, the findings of these studies suggest mixed support for this relationship. The inconsistent findings may be due to the multiple methods adopted by researchers in measuring this construct. Some researchers have looked at service quality by examining the characteristics of the support personnel; however, examining the relationship between personnel characteristics and user satisfaction has produced mixed results. Choe[39] found that IS personnel experience does not significantly affect user satisfaction of accounting IS in Korean firms. A study by [40] found that the technical performance of the developers (based on their responsiveness to problems) was positively related to user satisfaction. Yoon [30] had a similar result in that developer skill had a significant effect on user satisfaction of expert systems. Chiu [37] examined the role of support on user satisfaction in an e-learning environment and found a non-significant relationship. Choe (1996)[39] also examined the role of training and education on user satisfaction of an information system and found no significant relationship at any stage of IS implementation. Examining service quality more broadly, rather than just in terms of personnel and training, there is still mixed support for its effect on user satisfaction. Using the SERVQUAL instrument, which examines the expectations and perceptions that users have on service quality, [61], similarly, found that service quality is positively and significantly related to user satisfaction of information services in a survey of undergraduate students rating the university's computing services department.

Technological/Infrastructural factors and user satisfaction

This study revealed the significant effect of technological and infrastructural issues on users' satisfaction of U.I PG school web portal system. The significance of this construct in measuring user satisfaction in the Nigerian environment is greatly emphasized, partly as a result of lack of standardized and world class infrastructural deployment and on the other hand, due to the weak maintenance culture peculiar with the Nigerian system. This unique characteristics of the Nigerian situation however is never palatable with information system users, since the seemingly culture cannot replace for efficiency

in service quality expectation of the system user. The importance of stable power supply is sublime for information system efficiency just as infrastructural provision; especially internet facilities would enhance positively the experience of users. Infrastructural and technological issues are key determinants of satisfaction in the perception of users of information system as revealed in this study. This finding is consistent with [42], [19], [14], [15], [16] on the significance of Technological dimensions on IS success. Infrastructural facilities were found to be positively related with IS success and adoption [14]. In an empirical study by [14], IS infrastructure was found to be one of the top predictors of IS success among several factors investigated. In a related study, [62] found that the technology used for development was associated with technical implementation success. Yet, in a study by [45], they found that physical IT infrastructure contributed to e-business adoption in European firms. The study is of the view that provision of sufficient and good facilities in any electronic government project implementation will result in implementation success. The observed literature gives credence to our finding that technological and infrastructural issues are positively correlated, hence, a good predictor of information system users satisfaction.

XI CONCLUSION

The benefits of the investment in the U.I. PG school information system web portal was weighed against users' assessment of the portal's attributes; namely system quality, information quality, service quality and technological and infrastructural issues. The study found all the information system attributes to significantly predict user satisfaction. System quality has the highest impact, while infrastructural issues had the least impact on users' satisfaction of the web portal. The findings of this study could be a signal on the need for the university authority to take proactive measures through timely maintenance and upgrade of the web portal IS system, and addressing the technological and infrastructural impediments observed in the study.

XII RECOMMENDATION

Based on the findings from this study, the following recommendations are made:

1. Since system, service and information qualities were major determinants of users' satisfaction, the University authority should implement and enforce an IT policy that will ensure the efficient management, timely maintenance and upgrade of the information system to maximize users satisfaction.
2. Since technological and infrastructural issues were impediments to user satisfaction, the university authority should consider the provisioning of autonomous power plant, in addition to large scale investment in internet infrastructure as well as ensuring wholesome availability of internet services to all students in the university community.

3. The stakeholders in the Federal Ministry of Education could formulate an IT policy that would guide all institutions of higher learning to foster a universal standard that would ensure students satisfaction of institutional information system, in addition to pioneering a free IT literacy scheme for institutional IS end-users.

REFERENCES

- [1] A. Tatnall, "Web portals - The new gateways to Internet information and services," Hershey, PA: Idea Group Publishing, 2005.
- [2] A. Tatnall, "Gateways to portals research," International Journal of Web Portals, Vol. 1(1), Idea Group Publishing, 2009.
- [3] H. Van Der Heijden, "User acceptance of hedonic information systems," MIS Quarterly 28(4), pp. 695–704, 2004.
- [4] W. H. DeLone and E.R. McLean, "Information Systems Success: The Quest for the Dependent Variable," Information Systems Research, Vol. 3, pp. 60-95, March, 1992.
- [5] P.B. Seddon, and M.Y. Kiew, "A partial test and development of DeLone and McLean's model of IS success," Australian Journal of Information Systems, vol. 4(1), pp. 90–109, 1996.
- [6] W.J. Doll, and G. Torkzadeh, "Developing a multidimensional measure of system-use in an organizational context," Information & Management, vol. 33(4), pp. 171–185, 1998.
- [7] M. Igbaria, and S. A. Nachman, "Correlates of user satisfaction with end user computing," Information and Management, vol. 19(2), pp. 73-82, 1990.
- [8] A. W. Gatian, "Is user satisfaction a valid measure of system effectiveness," Information and Management, vol. 26 (3), pp. 119-131, 1994.
- [9] J. Etezadi-Amoli and A. F. Farhoomand, "A structural model of end user computing satisfaction and user performance," Information & Management, vol. 30(2), pp. 65-73, 1996.
- [10] M. Igbaria and M. Tan, "The consequences of information technology acceptance on subsequent individual performance, Information and Management, vol. 32(3), pp. 113-121, 1997.
- [11] W. H. DeLone and E. R. McLean, "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," Journal of Management Information Systems, vol. 19 (4), pp. 9- 30, 2003.
- [12] B. L., Myers, Kappelman, L. A., and Prybutok, V. R. "A comprehensive model for assessing the quality and productivity of the information systems function: Toward a theory for information systems assessment," Idea Group Publishing, Hershey, pp. 94-121, 1998.
- [13] J. Heo and I. Han, "Performance measure of information systems in evolving computing environments: an empirical investigation," Information & Management, vol. 40(4), pp. 243–256, 2003.
- [14] V. Grover, "An empirically derived model for the adoption of customer-based inter organizational systems," Decision Sciences, vol. 24(3), pp. 603-639, 1993.
- [15] W.R., King and T.S.H., Teo, "Facilitators and inhibitors for the strategic use of Information Technology," Information & Management, vol. 27, pp. 71-87, 1994.
- [16] G. Whyte, and A. Bytheway, "Factors affecting information systems' success," International Journal of Service Industry Management, vol. 7(1), pp. 74-93, 1996.
- [17] P.P. Tallon, K. L. Kraemer, and V. Gurbaxani, "Executives' perceptions of the business value of information technology: A process-oriented approach," Journal of Management Information Systems, vol. 16(4), pp. 145-173, 2000.
- [18] C.L. Ang, M.A. Davies, P.N. Finlay, "An empirical Model of IT usage in the Malaysian Public Sector," Journal of Strategic Information Systems, vol. 10, pp. 159-174, 2001.
- [19] C.S. Saunders and J.W. Jones, "Measuring performance of the information systems function," Journal of Management Information Systems, vol. 8(4), pp. 63-73, 1992.
- [20] B. Allen, and A.C. Boynton, "Information architecture in search of efficient Flexibility," MIS Quarterly, vol. 15, pp. 435-445, 1991.
- [21] D.L. Amoroso, "Organizational issues of end-user computing," Database, vol. 19(3), pp. 49-58, 1988.
- [22] J. Iivari, "An empirical test of DeLone-McLean model of information systems success," The Data Base for Advances in Information Systems, vol. 36(2), pp. 8–27, 2005.
- [23] M. Gelderman, "Task difficulty, task variability and satisfaction with management support systems," Information & Management, vol. 39(7), pp. 593–604, 2002.
- [24] U.R. Kulkarni, S. Ravindran, and R. Freeze, "A knowledge management success model: theoretical development and empirical validation," Journal of Management Information Systems, vol. 23(3), pp. 309–347, 2006.
- [25] J. H. Wu and Y. M. Wang, "Measuring KMS success: a respecification of the DeLone and McLean model," Information & Management, vol. 43(6), pp. 728–739, 2006.
- [26] L.A., Halawi, R. V. McCarthy and J. E. Aronson, "An empirical investigation of knowledge-management systems' success," The Journal of Computer Information Systems, vol. 48(2), pp. 121–135, 2007.
- [27] J. Kim, J. Lee, K. Han and M. Lee, "Business as buildings: metrics for the architectural quality of internet businesses," Information Systems Research, vol. 13(3), pp. 239–254, 2002.
- [28] J. Palmer, Web site usability, design and performance metrics. Information Systems Research, vol. 13(1), pp. 151–167, 2002.
- [29] P. Seddon and S. K. Yip, "An empirical evaluation of user information satisfaction (UIS) measures for use with general ledger accounting software," Journal of Information Systems, vol. 6(1), pp. 75–98, 1992.
- [30] Y. Yoon, T. Guimaraes, and Q. O'Neai, "Exploring the factors associated with expert system success. MIS Quarterly, vol. 19(1), pp. 83–106, 1995.
- [31] T. Guimaraes, Y. Yoon, and A. Clevenson, "Factors important to expert system success: a field test. Information & Management, vol. 30 (3), pp. 119–130, 1996.
- [32] A. Rai, S. S. Lang, and R. B. Welker, "Assessing the validity of IS success models: an empirical test and theoretical analysis," Information Systems Research, vol. 13(1), pp. 50-69, 2002.
- [33] T. McGill, V. Hobbs, and J. Globa, "User-developed applications and information systems success: a test of DeLone and McLean's model," Information Resources Management Journal, vol. 16(1), pp. 24-45, 2003.
- [34] H. Almutairi and G. H. Subramanian, "An empirical application of the DeLone and McLean model in the Kuwaiti private sector," Journal of Computer Information Systems, vol. 45(3), pp. 113–122, 2005.
- [35] T. J. McGill and J. E. Klobas, "The role of spreadsheet knowledge in user-developed application success," Decision Support Systems, vol. 39(3), pp. 355–369, 2005.
- [36] B.H. Wixom and P. A. Todd, "A theoretical integration of user satisfaction and technology acceptance," Information Systems Research, vol. 16(1), pp. 85–102, 2005.
- [37] C. M. Chiu, C. S. Chiu, and H. C. Chang, "Examining the integrated influence of fairness and quality on learners' satisfaction and Web-based learning continuance intention," Information Systems Journal, vol. 17(3), pp. 271–287, 2007.
- [38] R. P. Marble, "A system implementation study: management commitment to project management," Information & Management, vol. 41(1), pp. 111–123, 2003.
- [39] J. M. Choe, "The relationships among performance of accounting information systems, influence factors, and evolution level of information systems," Journal of Management Information Systems, vol. 12(4), pp. 215–239, 1996.

- [40] D. Leonard-Barton and D. K. Sinha, "Developer–user interaction and user satisfaction in internal technology transfer," *Academy of Management Journal*, vol. 36(5), pp. 1125–1139, 1993.
- [41] A. Leclercq, "The perceptual evaluation of information systems using the construct of user satisfaction: case study of a large French group," *The DATABASE for Advances in Information Systems*, vol. 38(2), pp. 27–60, 2007.
- [42] A. G. Cahill, J. M. Stevens and J. M. LaPlante, "The utilization of information systems technology and its impact on organizational decision-making," *Knowledge: Creation, Diffusion, Utilization*, vol. 12 (1), pp. 53-79, 1990.
- [43] S. L. Caudle, W. L. Gorr, and K. E. Newcomer, "Key Information Management Issues for the public sector," *MIS Quarterly*, vol. 15(2), pp. 171-188, 1991.
- [44] T. A. Byrd, V. Sambamurthy, and R. W. Zmud, "An examination of IT planning in a large, diversified public organization," *Decision Sciences*, vol. 26(1), pp. 49-73, 1995.
- [45] K. Zhu, K. Kraemer and S. Xu, "E-Business Adoption by European Firms: A Cross-Country Assessment of the Facilitators and Inhibitors," *European Journal of Information Systems (EJIS)*, vol. 12 (4), pp. 251-268, 2003.
- [46] T. A. Byrd, and E. D. Turner, "Measuring the flexibility of information technology infrastructure," *Journal of Management Information Systems*, vol. 17(1), pp. 167-208, 2001.
- [47] T. A. Byrd and N. W. Davidson, "Examining possible antecedents of IT impact on the supply chain and its effect on firm performance," *Information Management*, vol. 41(2), pp. 243-255, 2003.
- [48] A. C. Boynton, R. W. Zmud, and G. C. Jacobs, "Whose responsibility is IT Management," *Sloan Management Review*, vol. 33(4), pp. 32-38, 1992.
- [49] D. L. Amoroso and P. H. Cheney, "Testing a causal model of end-user application effectiveness," *Journal of Management Information Systems*, vol. 8(1), pp. 63-89, 1991.
- [50] M. D. Buyukkurt, and E. C. Vass, "Investigation of factors contributing to satisfaction with end-user computing process," *Canadian Journal of Administration Sciences*, vol. 10(3), pp. 212-228, 1993.
- [51] M. Igbaria, N. Zinatelli, P. Cragg, and A. Cavaye, "Personal Computing acceptance factors on small firms," *MIS Quarterly*, vol. 21 (3), pp. 279-302, 1997.
- [52] R. Mirani, and W. R. King, "Impacts of end-user and information center characteristics on end-user computing," *Journal of Management Information Systems*, vol. 11(1), pp.141-166, 1994.
- [53] B.S. Vijayaraman, and H. V. Ramakrishna, "A comparative analysis of successful and unsuccessful information centers," *Information & Management*, 19(3), pp. 199-209, 1990.
- [54] F. Bergeron, S. Rivard, and L. DeSerre, "Investigating the support role of the information center," *MIS Quarterly*, vol. 14(1), pp. 247-260, 1990.
- [55] S. Petter, W. DeLone, and E. McLean, "Measuring information systems success models, dimensions, measures and interrelationships," *European Journal of Information System*, vol. 17, pp. 236-263, 2008.
- [56] S. Devaraj, M. Fan, and R. Kohli, "Antecedents of B2C channel satisfaction and preference: validating e-commerce metrics," *Information Systems Research*, vol. 13(3), pp.316–333, 2002.
- [57] G. Premkumar, K. Ramamurthy, and S. Nilakanta, "Implementation of electronic data interchange: an innovation diffusion perspective," *Journal of Management Information Systems*, vol. 11(2), pp.157, 1994.
- [58] C. R. Coombs, N. F. Doherty and J. Loan-Clarke, "The importance of user ownership and positive user attitudes in the successful adoption of community information systems," *Journal of End User Computing* vol. 13(4), pp. 5–16, 2001.
- [59] R. Scheepers, H. Scheepers and O. K. Ngwenyama, "Contextual influences on user satisfaction with mobile computing: findings from two healthcare organizations," *European Journal of Information Systems*, vol. 15(3), pp. 261–268, 2006.
- [60] T.S.M Teo, and I. Wong, "An empirical study of the performance impact of computerization in the retail industry," *Omega*, vol. 26(5), pp. 611–621, 1998.
- [61] W. J. Kettinger and C. C. Lee, "Perceived service quality and user satisfaction with the information services function," *Decision Sciences* vol. 25(5), pp. 737–766, 1994.
- [62] B. Wixom, and H. Watson, "An empirical investigation of the factors affecting data warehousing success," *MIS Quarterly*, vol. 25(1), pp. 17-32, 2001.