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Integration of Information System Success Model (ISSM) and Technology Acceptance Model (TAM): Proposing Students' Satisfaction with University Web Portal Model

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Paper Type:

Theoretical Review

Abstract

Background of the study: The web portal is a tool that has been adopted by universities to manage data and information of students and faculty. The portal is an information system as it is driven by information.

Purpose: The study proposes a model of students' satisfaction with Web portal for the integration of Information System Success Model ISSM and Davis' Technology Acceptance Model (TAM).

Method: The methodology adopted for this study is the critical review of literature that borders on the constructs and/or variables embedded in ISSM and TAM.

Findings: The study theorizes that information quality, service quality and system quality and perceived usefulness individually determine students' satisfaction of a Web portal. The study also predicts that all of these variables compositely determine the students' satisfaction of university Web.

Conclusion: The study established that the "mandatory use" of Web portal does not primarily translate to students' satisfaction with the portal. This is because whether users are satisfied or not, the onus is still on them to come back to use the portal.

Keywords: *Web portal, students' satisfaction, information quality, service quality, system quality, perceived usefulness*

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Introduction

Web portal has been adopted by different organization to manage the data and information of their clients, employees and / or consultants. The portal was created to basically cater for various academic activities in a university setting. According to Sekeran and Bougie (2010), the theoretical framework is the basis of the hypothetical-deductive research and involves explaining the relationships among the variables in the study being investigated. This study seeks to propose a model to explain the relationships that exist between variables in Information System Success Model by DeLone and McLean; and the Technology Acceptance Model by Davis. It has been observed from the literature that the most acceptable measurement dimension is determined by students' satisfaction. However, ISSM's dependent variable is a net benefit as against user's satisfaction.

According to Sugianto and Tojib (2006), user satisfaction has developed with the changes in Information System (IS) environment. They defined users' satisfaction as the degree to which users consider that the use of an IS meets their requirements. Also, Au, Ngai, and Cheng (2008) described users' satisfaction as the overall affective and cognitive evaluation of the pleasurable consumption related fulfillment experienced with Information System. User satisfaction, from the perspective of needs realization, can be construed to mean the degree to which an individual's IS usage experience satisfy his/her needs. This implies that the experience an individual has with an information system is what mold his/her satisfaction with the system. More crucially, there have been discussions on how mandatory and voluntary use does not determine user satisfaction. However, it is a mandatory use in the case of student use of the portal.

Many models have been formulated by researchers in the past to investigate and evaluate the success of IS (Manchanda & Mukerjee, 2014). Some of these models include Davis' Technology Acceptance Model (TAM), Gable, Sedera and Chan's Information System (IS) success or impact model, and DeLone and McLean's Information System Success Model (ISSM). Essentially, it is difficult to categorically state that a particular model is the best for all purposes. This is because any of these models can be adopted depending upon the requirements of the study. TAM of Davis

proposed in 1989 primarily deals with acceptance, which is not tantamount to success. In other words, TAM is often used to study the willingness of the information technology users towards accepting the technology. ISSM adopts net benefits as its dependent variable. Gable *et al.* (2008) measure the holistic view of information system and success using system, information, individual, and organization dimensions.

Rabaa'i (2009) observed that ISSM is the most widely used models for IS a success measure. Therefore, as this study seeks to examine users' satisfaction of the students' Web portal, which is on an individual scale, DeLone and McLean's ISSM constructs shall be adapted to determine users' satisfaction as it is deem appropriate and the best model for determining IS success. Also, several studies (Tella & Bashorun, 2012; Ajoye & Nwagwu, 2014) have used the model to examine users' satisfaction of Web portal. Nonetheless, it is noteworthy that this study proposes to determine students' satisfaction with university Web portal and not holistic view of the elements involved in the development and use of the portal.

ISSM was initially proposed by DeLone and McLean in 1992. Rabaa'i (2009) noted that the model was formulated based on the work of Shannon and Weaver of 1963 and Mason of 1978. The proposed model mirrored previously reported success measures by different IS scholars. The first proposition contains six constructs, which include system quality, information quality, use, user satisfaction, individual impact, and organizational impact. The dependent variables among these constructs are individual impact and organizational impact. It is noteworthy that the variables that are constituents of ISSM are not independent but interdependent. The model explained that both information quality and system quality can affect both use and user satisfaction whether individually or in unison.

In a while, after the model was proposed, there was a barrage of criticisms from different

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scholars. Most notably, Seddon and Kiew (1996) carried out a study to partially develop the model, and found that information quality, system quality, and usefulness explained three-quarter of the variance in the overall measure of user satisfaction. They found and support the use of "usefulness" as a measure in IS success as they inferred that the essential success element that DeLone and McLean have been trying to address is the usefulness of IS. In their assessment, the adopted construct "usefulness" was equivalent to the idea of perceived usefulness in TAM by Davis (1989). Hence, this study adopts "usefulness" as against "use" which is a construct in ISSM, simply because "use" has been subsumed by "user satisfaction" owing to the fact that users' satisfaction can only be preceded by the "use" of a system. Other criticisms like the nature of use (mandatory or voluntary) and combination of process variance interpretation of the model were also raised, where it was debated that the nature of use cannot determine system usefulness.

After a myriad of criticisms, DeLone and McLean updated the ISSM in 2003. Based on the new update, the model constructs retained six constructs with two new additions to the first proposition of 1992. The six constructs include system quality, service quality, information quality, user satisfaction, use/intention to use, and net benefit. The dependent variables in the first proposed model were compressed into just one i.e. net benefit. In this proposed adjustment to the model, system quality, service quality and information quality can affect use/intention to use and user satisfaction. It was also proposed that use/intention to use and user satisfaction can cause net benefits. It was explained further that net benefit can also affect use/intention to use and user satisfaction. There is also a causal relationship between use/intention to use and user satisfaction.

This study discarded the DeLone and McLean's ISSM construct of "use" and adopts the "net benefit" but only on an individual level of analysis as this study primarily deals with the individual (students) making use of the Web portal. Petter, DeLone, and McLean (2008) described net benefit as the extent to which information systems are contributing to the success of individuals, groups, organizations, industries, and nations. Examples of which include improved decision-making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development. Perceived usefulness of the Web portal by the students was adopted as this study is based on individual level of analysis.

There is abundance of methods to measure net benefits at both the individual and organizational level of analysis. The earliest theorists Seddon and Kiew (1996) carried out a study on a segment of DeLone and McLean's ISSM by evaluating system quality, information quality, use, and user satisfaction. The study revealed that the there is a need for the revision of the "use" construct as they speculate that the fundamental success researchers have been attempting to examine is "usefulness" and not "use". They argued that the model is confusing because of the combination of process and variance in the same model. Seddon and Kiew's concept of usefulness is equivalent to the idea of perceived usefulness in Davis' TAM which was proposed in 1989. Hence, perceived usefulness is adapted in this study as against "use", and contextualized as Davis' TAM construct. Petter *et al.* (2008) supported that perceived usefulness or job impact is the most common measure of the individual level of analysis to examine the net benefit of an IS.

Petter *et al.* (2008) observed that the acceptance of IS has been centered on voluntary use situations, that is, scenarios whereby the user has judgment in making a decision in either to accept or reject the system. In mandatory use settings, users ordinarily have no judgment in either to accept or reject the system because it is compulsory on every user. Therefore, the behavior of "actual use" may not be a good measure of users' perceptions of the system. This is the scenario the students find themselves as the "use" of the Web portal is mandated for all registered students. In such event, Sharma, Shakya and Kharel (2014) argued that user satisfaction is a more fitting indication of users' overall fulfillment with the system. This has motivated scholars (e.g. Miyamoto, Kudo, & Iizuka, 2012; Chen, 2012; Sharma, Shakya, & Kharel, 2014; Danila & Abdullah, 2014) to integrate TAM and user satisfaction to exploit the full benefits of both realm of research.

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Seddon and Kiew (1996) added a new variable 'system important' to DeLone and McLean's model to explain the variation between 'usefulness' and 'user satisfaction'. The study argued that 'usefulness' causes 'user satisfaction' and not vice-versa. The study concluded that further study should consider 'task importance' whenever they measure 'usefulness' of an IS because systems that perform more important task are perceived as more useful irrespective of the quality of the actual system. Petter *et al.* (2008) found that there is strong support for the relationship between the perceived usefulness (i.e. net benefits) and user satisfaction. It has been found in different studies (Kulkarni, Ravindran, & Freeze, 2006; Hsieh & Wang, 2007) that positive, significant relationships exist between perceived usefulness (i.e. net benefits) and user satisfaction. Leclercq (2007) examined the relationship between perceived usefulness and user satisfaction of an IS using a qualitative approach. The study found a strong positive correlation between perceived usefulness and user satisfaction. Ohk, Park, and Hong (2015) observed that the term perceived usefulness is interpreted as the belief to high performance by using a certain system. They noted that perceived usefulness can be obtained when users find a system easy to use. Perceived usefulness is an individual's point of view that using a system will improve his or her job performance (Zhu, Lee, Gwendolyn, & Chen, 2008).

Mukherjee (2013) described perceived usefulness as the degree at which an individual believes that using a particular information system or information technology would enhance his or her job. The perceived usefulness of an information system is understood as the extent to which a person believes that using the system will contribute to meeting his/her information needs or solving a problem (Matusiak, 2012). Akinde and Adetimirin (2017) described perceived usefulness as the ability of people to see, conceive, realize or come to the understanding of the value, relevance, usefulness and impact (or otherwise) of ICTs in enhancing instructional preparation and delivery. They observed that perceived usefulness in relation to the use of ICTs has been universally recognized as an important factor in the success of ICT integration in a process. Perceived usefulness is regarded as a term for the individual impacts such as improving individual productivity and performance (Saeed & Abdinnour-Helm, 2008). Sanusi, Sanjaya, and Sylvana (2017) described perceived usefulness as the benefit from which an individual obtains during the technology use. Above all, perceived usefulness is simply the overall impact of the Information System on the user's needs. Perceived usefulness is a continuation on the two ends of positive and negative, which is determined by the impact of the system. It is posited that the positive end is as a result of positive impact and vice-versa.

Klein (2007) measured net benefits on an individual level of analysis, using perceived usefulness as the metric, and found the relationship between perceived usefulness and user satisfaction. Abugabah, Sanzogni, and Alfarraj (2010) proposed a model to evaluate the impact of information systems on end-user performance. They identified items of usefulness, which include being helpful for performance, aids in the accomplishment of task, facilitate attaining the overall goal/desire, and system easier to perform a task. The respondents numbered 387 Enterprise Resource Planning (ERP) users in total from various functional areas in different organizations. Data was collected from the ERP users by means of a questionnaire. The study found that system support of overall goal/desire has the most significant impact on user satisfaction while system aid in the accomplishment of tasks is the least significantly related to user satisfaction. Hsieh and Wang (2007) found that the impact of IS on the user's job directly affects user satisfaction.

Research Method

This study integrates DeLone and McLeans' Information System Success Model (ISSM) and Davis' Technology Acceptance Model (TAM) to propose a model that predicts students' satisfaction with the university Web portal. Therefore, the method adopted in this study was a critical review of literature that borders on the variables and constructs of ISSM and TAM that is applied in the development of the proposed model. Series of literature were collected from the Internet, library and various databases. Subsequently, the relevant documents were filtered from the plethora of literature.

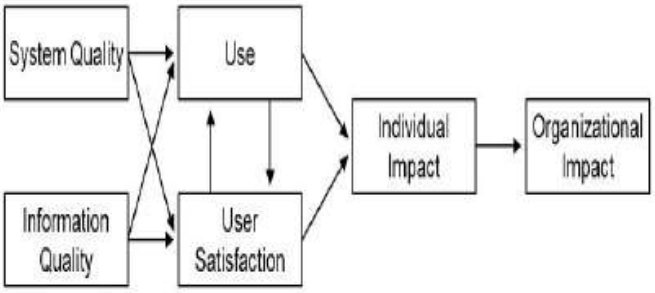
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Information System Success Model

In 1992, DeLone and McLean proposed, but did not empirically test, a model for IS success (Petter, DeLone, & McLean, 2008). DeLone and McLone carried out an extensive survey on IS success, based on past literature. The basic purpose of DeLone and McLean's article published in Information Systems Research was to synthesize previous research that is concerned with Management Information System (MIS) success into a more logical body of knowledge and to provide a beacon to future researchers. The DeLone and McLean's ISSM is a comprehensive, multidimensional model of IS success which was postulated from a study of communication research of Shannon and Weaver in 1949 and the information "influence theory" of Mason in 1978, as well as empirical MIS research studies from 1981-1987 (DeLone & McLean, 2016).

Petter *et al.* (2008) reported that DeLone and McLean reviewed 180 studies which empirically and conceptually discussed IS success. From the review, they found over 100 measures used to evaluate IS success. They established that it is difficult to make comparisons of IS research results because researchers in IS have identified and tackled different parts of the information system success evaluation. The findings of DeLone and McLean identified six (6) variables of IS success measures. The six variables identified are system quality, information quality, use, user satisfaction, individual impact, and organizational impact. DeLone and McLean (2016) stressed that these variables are not independent, but multidimensional and interdependent variables. They did not provide empirical validation of the model, and in fact, seek further improvement and corroboration of the taxonomy.

Roses (2011) noted that DeLone and McLean suggested taxonomy of ISSM variables to include; the interdependence among these variables; and the time sequence or causal relationship among these constructs. It was stated further that DeLone and McLean IS-success model proposed that system quality and information quality singularly and mutually affect system use and user satisfaction variables. There is a two-way relationship between system use and user satisfaction. These are causal and process relationship. The process relationship predicts that the amount of system use can affect the extent of user satisfaction either positively or negatively. The causal relationship between the two variables predicts that extent of user satisfaction also affects system use. Also, system use and user satisfaction are direct precursory to individual impact. Lastly, the individual impact should eventually have some influence on the organizational impact (Rabaa'i, 2009).



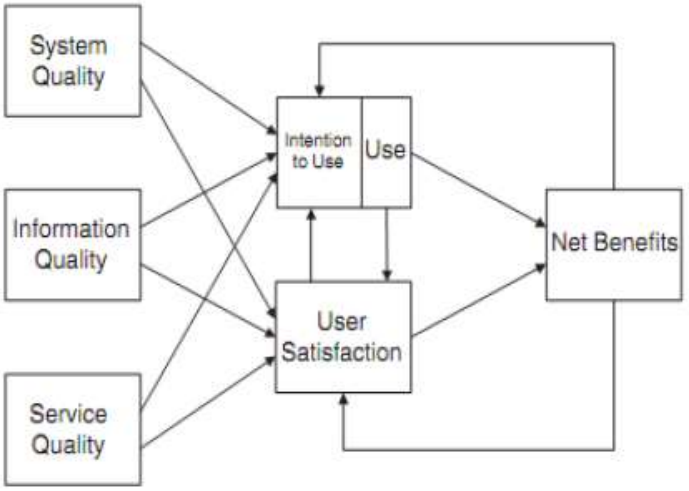
Source: Petter, DeLone, and McLean (2008)

Figure 1: Information System Success Model (1992)

Shortly after the publication of DeLone and McLean's ISSM, in a cause to heed to authors' suggestions for 'further development and validation', several authors criticized and attempted modification of ISSM. Based on the development and validation of the first proposition by DeLone and McLean, they reformulated the original successful model in the year 2003. Petter *et al.* (2008) noted that the new proposition of DeLone and McLean's ISSM identified that the quality has three major dimensions which include information quality, systems quality, and service quality. They reported that DeLone and McLean expressed that each should be measured or controlled separately,

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because singularly or mutually, they will affect 'use' and 'user satisfaction'. Having known the intricacies involved in explaining the multidimensional aspects of 'use' – mandatory versus voluntary, informed versus uninformed, effective versus ineffective, etc., it was suggested that 'intention to use' may be a worthwhile alternative measure (DeLone & McLean, 2016). DeLone and McLean see 'intention to use' as an attitude and see 'use' as a behavior. They believe that replacing 'intention to use' with 'users' may address some of the process versus causal concerns raised by Seddon in 1997. However, attitudes, and their links with behavior, are notoriously difficult to measure; and many researchers may choose to stay with 'use', but hopefully with a more informed understanding of it (DeLone & McLean, 2003).



Source: Petter, DeLone, and McLean (2008)
Figure 2: Information System Success Model (2003)

As it was in the DeLone and McLean's initial proposition, 'use' and 'user satisfaction' are closely interrelated. They proposed 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. In the same vein, increased 'user satisfaction' will lead to increased 'intention to use' and subsequently 'use'. As a result of the relationship between 'use' and 'user satisfaction', they proposed 'net benefits' as the final outcome. The 'net benefits' can be from the perspective of individuals, workgroups, industries, and societies. DeLone and McLean (2003) advised that researcher is to define clearly and carefully the stakeholders and context in which 'net benefits' are to be measured. This study deals with individual's net benefit with the university Web portal. Hence, the 'net benefit' will be measured on an individual unit of analysis using perceived usefulness as proposed by Davis in TAM.

It is worthy of note that the theory adopt 'net benefits' as its dependent variables which is an outcome of the two-way causal relationships between 'use' and 'user satisfaction. Meanwhile, the theory explained that 'use' and 'user satisfaction' are outcomes of service quality, system quality, and information quality. However, in this study, 'user satisfaction' is adopted as the dependent variables while service quality, system quality, information quality, and perceived usefulness (i.e. net benefits). ISSM is adopted for this study because it addresses the determinants of user satisfaction using variables such as system quality, service quality, and information quality. The theory is deemed appropriate for the study as it explained the relationships among some of the variables under study.

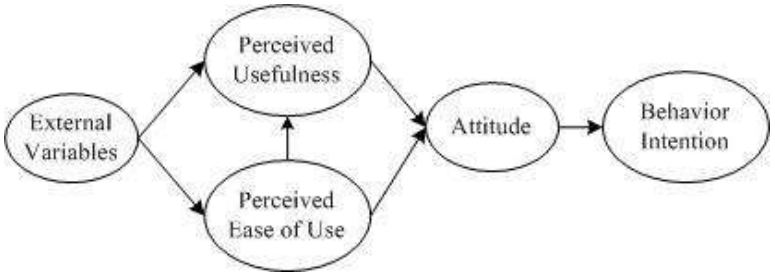
Technology Acceptance Model (TAM)

The other theory used to underpin this study is Technology Acceptance Model (TAM) of Davis

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proposed in the year 1989, which emphasized the use of the Theory of Reasoned Action (TRA). Theory of Reasoned Action, according to Davis, assumed that attitude of a person towards a system is controlled by his/her belief in that system (Olaniran, Duma, & Nzima, 2017). This belief will mold the perceptions of the users of the system. Adeyemo, Adedoja, and Adelore (2013) observed that TAM is concerned with the suitability of an IS and how it can be applied to establish the level of acceptability of the system. Furthermore, the model theorizes that an individual's attitude towards a system is not the only factor that influences him/her to use the system, the effect that the system will have on the person's performance is another significant factor that determines the level of acceptance.

Moreover, TAM postulates that the level of acceptability or actual use of a system is determined by two factors which include perceived usefulness and perceived ease of use. These factors mediate the effects that external variables have on usage intention (Tao, 2008). Khan and Siang (2014) noted that TAM explained that the acceptance of a system is determined by the behavioral intention to use the system. Additionally, perceived ease of use also influences perceived usefulness. The external variables, which include information quality and system quality, influences perceived usefulness and perceived ease of use.

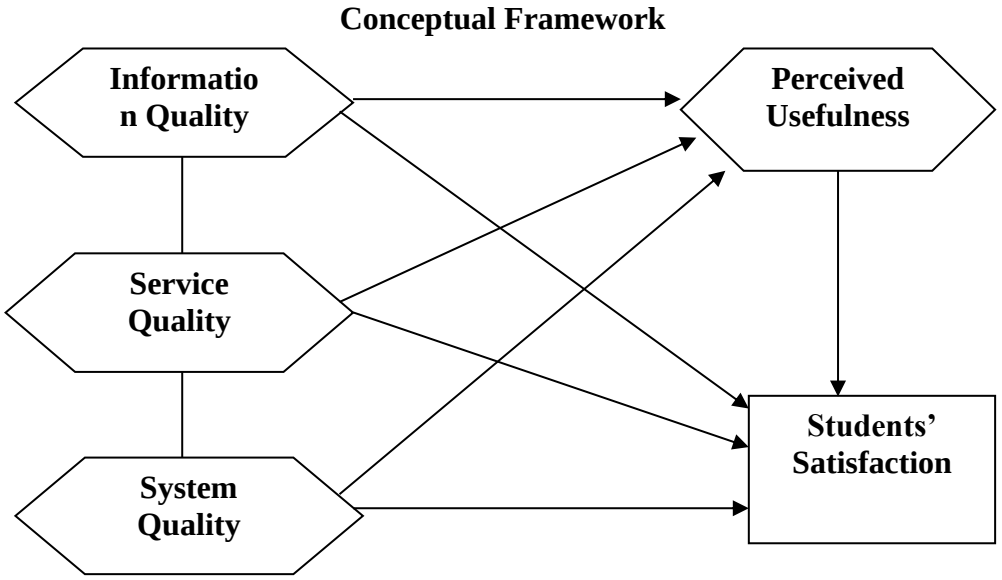


Source: Tao (2008)
Figure 3: Technology Acceptance Model by Fred Davis

It has been established by different scholars that Technology Acceptance Model (TAM) to be effective for investigating technology acceptance and they have been using it for different tasks and tools (Schroff, Deneen, & Ng, 2011; Aypay, Celik, Aypay, & Sever, 2012). Davis (1989) referred to perceived usefulness as the degree to which a person believes that using a particular system will enhance his or her performance. The perceived usefulness of a system can be described as the level to which an individual believes that using the new technology or system will boost his/her performance (Bhatti, 2015). The perceived usefulness and perceived ease of use influences users' intention to use a system. Both factors have significantly influenced users' interaction with IS (Wu, Lin, Li, & Lin, 2010).

Perceived ease of use is defined as the extent to which a person believes that using a particular system would be free of effort. Previous studies (Amin, 2007; Al-Somali, Gholami, & Clegg, 2009) have found that perceived ease of use has a positive effect on perceived usefulness. Perceived ease of use refers to the extent to which a person believes that making use of a particular system or technology to perform a task will be easier or require little effort (Lu, Lu, Yu, & Yao, 2014). According to TAM, intention to use an information system is the behavior intention (BI) construct and is a function of two concrete behavior, beliefs which include perceived usefulness (USE) and perceived ease of use (EoU). Information quality (IQ), service quality (ServQual) and system quality (SysQual) represent three aspects of Web portal characteristics by serving as external variables that indirectly affect behavioral intention of influencing perceived usefulness and subsequently the users' satisfaction (Tao, 2008).

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Source: Author-designed (2019)
Figure 4: University Web Portal Students' Satisfaction Model

It can be observed in Figure 4 that the model presupposes that system quality, service quality, and information quality are variables which are inherent characteristics of Web portal can influence the students' perceived usefulness of the portal. The model predicts that perceived usefulness has a significant direct influence on users' satisfaction. Similarly, the framework explains that information quality, system quality, and service quality can singularly or jointly affect users' satisfaction of a Web portal. This framework, on one hand, proposes that students' satisfaction with the Web portal can be determined directly by systematic quality, service quality, and information quality, either singularly or collectively. On the other hand, students' perceived usefulness of the Web portal can determine their satisfaction. This framework is different from Davis' TAM for the reason that it highlights how the qualities (system quality, service quality, and information quality) of the Web portal can predict users' satisfaction as against TAM's proposition that attitude and behaviour can predict users' acceptance of an IS.

In the proposition of Davis, TAM predicts users' acceptance of an IS with perceived ease of use and usefulness of the IS, while this framework predicts users' satisfaction using constructs, which include system quality, service quality, information quality, and perceived usefulness. Also, the difference between this framework and ISSM is that, while DeLone and McLean's ISSM proposed that it is used/intention-to-use that predicts user satisfaction, this model proposes that system quality, service quality, information quality, and perceived usefulness is what determine user satisfaction with Web portal and that there exist a one-way relationship between perceived usefulness and user satisfaction where perceived usefulness predicts user satisfaction. This is so because the mandatory use of the Web portal means, whether the students are satisfied with the Web portal or not, they will continue to use the portal as long as they are still registered students of the university. Hence, perceived usefulness is what determines user satisfaction in such context and not the use of the Web portal. Scholars should endeavor to empirically test the mutually dependent relationships that exist among the constructs as we have in this model.

Implications for Practice

The implications of this study for practice are itemized below:

a. This study adopts students' satisfaction as the dependent variable to predict the performance of mandatory usage of a university Web portal.

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b. The model proposed that perceived usefulness (net benefit) should be a metric to determine user's satisfaction of an information system in mandatory usage.
c. Intention to use/use of a mandatory information system does not determine user's satisfaction because users will still use the system even when he/she is not satisfied.

Conclusion

This study established that information quality should be the key consideration for a university that is seeking to develop and implement a Web portal that would be satisfactory to the students. It also proposes that information quality, system quality and service quality may determine perceived usefulness of Web portal in mandatory use. Moreover, in mandatory use, it dispels that the "use" of Web portal does not primarily translate to that the users are satisfied with the portal. This is because whether users are satisfied or not, the onus is still on them to come back to the use of the portal since it is mandatory. Hence, the "perceived usefulness" should be instead adopted to determine the students' satisfaction of the university Web portal. This study provides the following recommendations:

a. It is essential for universities to consider and pay due attention to the quality of information provided on their Web portal.
b. The IT professionals in charge of universities Web portals should be sympathetic and professional in handling students' complaints about portals.
c. Universities should develop and implement their Web portal in such that it will be useful to the academic activities of their students.
d. Universities managements should ensure qualitative design of their Web portals.
e. Further studies should empirically test the interdependent relationships that exist among the variables of the proposed model.

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