Effectiveness Measurement of Digital Library in Higher Education

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Abstract
The purpose of this research is to fill the gap between the student expectation and service provided by the digital library in terms of the service quality offering in the library. The user satisfaction of digital library was measured quantitatively through online questionnaire and analysed to establish relationship between the user satisfaction and its antecedents in order to identify critical factors so that suggestions could be made for the Chief Information Officers to enhance the user satisfaction.
Keywords: Technology acceptance model, Perceived ease of use, Perceived usefulness, Intention to use, User satisfaction, Digital library.

INTRODUCTION

Technology Acceptance Model (TAM) (Davis, 1989) was proposed is late 80s and since then it has been integrated with other models as well as extended to fit into many different contexts of technology usage which includes online shopping (Klopping & McKinney, 2004), E-commerce Valencia et al., (2019), E-payments (Ardiansah et al., 2020), mobile libraries (Rafique et al., 2020), ride-sharing services (Wang et al., 2020). Since its inception the TAM has been integrated with other models which include: Theory of Planned Behaviour (TRA) (Ajzen, 2015); Diffusion of Innovations Theory (Dearing & Cox, 2018); Uses and Gratification Theory (Korhan & Ersoy, 2016), Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2016), This process of integration and extension of TAM is still on as various newer technologies are emerging out in the ever changing global scenario and accordingly newer variables are being added.

There is also evidence for the application of TAM in educational context in terms of various technologies. Fathema et al., (2015) investigated factors that affect faculty members' Learning Management System (LMS) usage behaviour, focusing on user related variables and their pivotal role in determining faculty attitudes toward LMSs. Data were obtained from 560 faculty members (from two universities) and analysed using Structural Equation Modelling (SEM). The study results revealed that the three proposed external variables: system quality; perceived self-efficacy and facilitations conditions were significant predictors of faculty attitude towards LMSs. Similar to prior research findings, the study results further confirmed the validity of the extended TAM in determining users' technology acceptance behaviour.

Chintalapati & Daruri (2017) tested the relationship between the user attitude, perceived usefulness, perceived ease of use, and behavioural intention in the context of YouTube usage for learning purposes in higher education. The sample size was 200 with 142 respondents were from management studies, 33 from science and technology and remaining from humanities and social sciences. The study indicated that all the variables considered had a significant and positive relationship with the behavioural intention to use the technology.

Martín‐García et al., (2019) tested the TAM in the context of adoption of blended learning in higher education by application of data mining techniques. The sample included 980 active academic staff from 43 Spanish public universities. The results indicated that the intention to use blended learning was the most important

predictor variable, the relationship between higher frequency of use and experience in digital educational environments with higher stages of implementation was verified, however, socio-demographic variables had marginal effect on TAM variables.

While all these aforementioned theoretical models and specific studies in the context of higher education have added immensely to the body of knowledge in the integration of technology component and human element component in learning, a gap still lies in the accounting for the *quality* and *user acceptance* aspects of the TAM, which are quintessential in the context of testing the effectiveness of technology used in digital library. To fill the observed gap in the literature, this research considers the integration of the three quality components as the antecedents to the TAM, namely - *information quality, system quality* and *service quality*, and also, *user satisfaction* as the outcome. The conceptualized model needs to be empirically validated and the following are the objectives of research:

- Theorize an Extended Technology Acceptance Model (ETAM) in the context of digital library technology in higher education.
- Empirically test the ETAM for the significance of interrelationships between its dimensions.
- Draw theoretical and practical implications for the benefit of Chief Information Managers of multimedia-based learning in enhancing the effectiveness of learning.
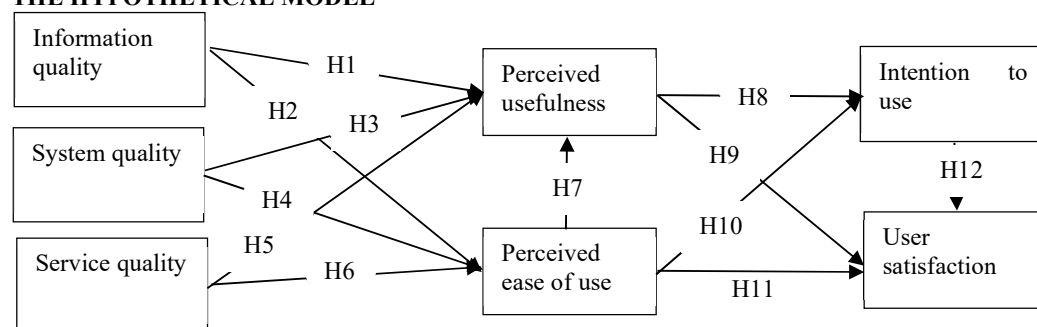
THE HYPOTHETICAL MODEL

Figure 1: The Hypothetical Model

The Integrated Technology Acceptance Model (ITAM) (Figure 1) has been hypothesized using the research findings of several researchers in various technological contexts such as e-learning, online purchase, mobile banking, e-medicine, virtual-learning, social networking etc. The main missing element in the ITAM is the *quality dimensions* and *user satisfaction*, as discusses in the previous section, and integrating these two with TAM would be of great significance, particularly in the context of digital library in HE. There are several research studies which have formed the basis for the building of the ITAM and are discussed in the following sections.

Linkage of Information Quality with Perceived Ease of Use and Perceived Usefulness

Several researchers have linked the *information quality* (INF) to *perceived ease-of-use* (PEU) (e.g., Almahamid et al., 2010; Pitafi et al., 2020; Rahmi, 2018; Venkatesh, 2010) and *perceived usefulness* (PRU) (e.g., Fadelelmoula, 2018; Kang & Namkung, 2019; Oliveira et al., 2020). These studies are in various contexts of technology use such as educational technology, multi-media technology, online technology etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H$_1$: There is a positive significant impact of *information quality* on *perceived usefulness* of the digital library usage in higher education.

H$_2$: There is a positive significant impact of *information quality* on *perceived ease-of-use* of the digital library usage in higher education.

Linkage of System Quality with Perceived Ease of Use and Perceived Usefulness

Several researchers have linked the *system quality* (SYQ) to *perceived ease-of-use* (PEU) (e.g., Keni, 2020; Saadé & Bahli, 2005; Tahar et al., 2020) and *perceived usefulness* (PRU) (e.g., Andarwati et al., 2020; Mican et al., 2020; Normelindasari & Solichin, 2020;). These studies are in various contexts of technology use such as marketing technology, mobile-library technology, ERP technology etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H$_3$: There is a positive significant impact of *system quality* on *perceived usefulness* of the digital library usage in higher education.

H$_4$: There is a positive significant impact of *system quality* on *perceived ease-of-use* of the digital library usage in higher education.

Linkage of Service Quality with Perceived Ease-of-use and Perceived Usefulness

Several researchers have linked the *service quality* (SVQ) to *perceived ease-of-use* (PEU) (e.g., Arta & Azizah, 2020; Daryanto, 2019; Keni, 2020) and *perceived usefulness* (PRU) (e.g., Keni, 2020; Chen & Aklikokou, 2020; Kurniasari et al., 2020). These studies are in various contexts of technology use such as e-governance technology, ICT usage, mobile health technology etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H_5: There is a positive significant impact of *service quality* on *perceived usefulness* of the digital library usage in higher education.

H_6: There is a positive significant impact of *service quality* on *perceived ease-of-use* of the digital library usage in higher education.

Linkage of Perceived Ease-of-use with Perceived usefulness

Several researchers have linked the *PEU* to *PRU* (e.g., Caffaro et al., 2020; Chen & Aklikokou, 2020; Iriani & Andjarwati, 2020; Winata et al., 2020). These studies are in various contexts of technology use such as e-commerce technology, augmented reality technology, educational technology etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H_7: There is a positive significant impact of *perceived ease-of-use* on *perceived usefulness* of the digital library usage in higher education.

Linkage of Intention to use and User satisfaction

Several researchers have linked the *PRU* with *intention to use (INU)* (e.g.,) and *user satisfaction* (USS) (e.g., Keni, 2020; Chen & Aklikokou, 2020; Kim & Lee, 2014; Kurniasari et al., 2020). These studies are in various contexts of technology use such as e-governance technology, ICT usage, mobile health technology etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H_8: There is a positive significant impact of *perceived ease-of-use* on intention to use the digital library usage in higher education.

H_9: There is a positive significant impact of *service quality* on *perceived ease-of-use* of the digital library usage in higher education.

Linkage of Perceived ease of use with Intention to use and User satisfaction

Several researchers have linked the *PEU* with *intention to use (INU)* (e.g., Almahamid et al., 2010; Fagan et al., 2008; Rawashdeh, 2021). There are also research studies which have linked PEU to *user satisfaction* (USS) (e.g., Bradley & Lee, 2007; Calisir & Calisir, 2014; Rawashdeh, 2021). These studies are in various contexts of technology use such as training, education, tourism, hospitality etc. There are not many studies which have explored the significance of relationship between these variables in the context of digital library usage and hence the following hypotheses have been postulated.

H_{10}: There is a positive significant impact of *perceived ease-of-use* on *intention to use* the digital library usage in higher education.

H_{11}: There is a positive significant impact of *perceived ease-of-use* on *user satisfaction* of the digital library usage in higher education.

RESEARCH METHODOLOGY

Research Design

This research is based on positivist paradigm with quantitative approach and the type of study is exploratory in nature. Questionnaire survey is the method used in the research design. The sample frame comprises the students in higher education in The Public Authority for Applied Education and Training in Kuwait. Ethical permission for the survey was taken from the Heads of the institutes. Voluntary participation of the respondents in the survey through Google Forms has been administered and confidentiality statement in the questionnaire has ensured the unbiased response to the questions. Google Forms were available both in English and Arabic language to the respondents to suit to their convenience. Convenience sampling has been used as the sampling method. Structural Equation Modelling (SEM) technique has been adopted to carry out the quantitative analysis of the data. SEM has been specifically chosen as it can perform both regression and factor analysis simultaneously.

Sample Design

The *convenience sampling* which is a non-probability based sampling technique is widely used in this kind of research and the recommendation is to use at least five times the manifest variables of study to make the sample adequate (Tjiu & Purwanto, 2017). As each of the seven manifest variable had three items a sample size of 211 stands justified. The sample frame is the students in Public Authority in Applied Education and Training and Kuwait university both located in Kuwait. These two colleges have been specifically chosen as they represent the students using digital library in Kuwait. Students were emailed the link of the Google form having the self-administered questionnaire and 211 usable filled questionnaires were obtained (response rate 38%).

Questionnaire Development

The self-administered questionnaire was consisted of two parts: 1. the demographic information of the respondents (gender, age, and qualification), and 2. the quantitative data collection items on the Likert 5-point scale (5- strongly agree; 1- Strongly disagree). The items used in the questionnaire were derivatives of standard scales developed by researchers and were used by researchers in many different contexts such as educational technology, mobile-learning, healthcare technologies, online purchase, etc. These scales had proved validity and reliability; however, as they were modified to suit to the context of digital library some of the items were slightly modified. To ensure that these modifications do not affect reliability and validity measures, Confirmatory Factor Analysis (CFA) has been carried out using a pilot sample of 40 students who were not the part of primary data collection. The dimensions, contributing authors, description and the sample item are given in the Table 1. The questionnaire used in this research is attached in Appendix 1.

Table 1: Dimension, contributing authors, description, sample item

Dimension	Contributing authors	Explanation	Sample item
1. **Information quality**	Hanjaya et al., (2019); Kang & Namkung (2019); Kim et al., (2004); Rita et al., (2019); Wang & Li, (2019).	It is the degree to which the system/technology communicates effectively to provide clear information for its use.	The information on the digital library usage portal is pretty much what I need to carry out my tasks in searching for the articles/books/conference proceedings.
2. **System quality**	Hanjaya et al., (2019); Lee et al., (2019); Liu & Napitupulu, (2020); McKinney et al., (2002).	It is the degree to which a technology provides a better usage experience.	Digital library systems are reliable in terms of my usage.
3. **Service quality**	Boyer & Frohlich, (2009); Hanjaya et al., (2019); Chi (2018); Al-Fraihat et al., (2020)	It is the degree to which the technology provides the desired assistance during and post usage.	My service needs in terms of digital library usage is well understood.
4. **Perceived ease of use**	Akar (2019); Al-Okaily et al., (2020); Wang & Li, (2019); Ameen et al., (2019); Lavidas et al., (2019); Lee & Kim, (2009); Lin, (2006); Suki et al., (2011)	It is the degree to which the use of the system is considered to be effortless.	Learning to operate the multimedia used in the education system would be easy for me.
5. **Perceived usefulness**	Alsabawy et al., (2016); Danurdoro & Wulandari, (2016); Dobricki et al., (2021); Elkaseh et al., (2016); Hamid et al., (2016); Ismail (2016); Ruggieri et al., (2021).	It is the degree to which learning a system/technology would enhance the task performance.	Using multimedia in learning will improve my academic performance.
6. **Intention to use**	Abdullah et al., (2016); Al-Okaily et al., (2020); Pozón-López et al., (2020); Wan & Shen, (2015); Wicaksono & Maharani, (2020).	It is the strength of the desire to use a system/technology.	I intend to use multimedia in learning.
7. **User satisfaction**	Walsh & Beatty (2007); Rita et al., (2019); Japutra et al., (2021); Alyoussef (2021); Kim et al., (2004)	It is the degree to which the user is satisfied with the system/ technology.	I am satisfied with the services offered by digital library.

ANALYSIS AND DISCUSSION

Measurement Model

In Structural Equation Modelling (SEM) the measurement model (Figure 2) deals with the reliability and validity aspects of the model. The Cronbach's alpha (coefficient), which is the measure of reliability of the data, has the acceptable value ranging from 0.6 to 0.9 (Table 2), except one manifest variable which has a factor loading of 0.4. According to the principles of SEM only 2 manifest variables are adequate to perform the analysis and the remaining two have a factor loading of 0.7 ad 0.8 indicating a high level of internal consistency (Cut off = 0.6; Ahmad, Zulkurnain & Khairushalimi, 2016). This indicator has been retained intentionally as it was an important measure (Item - The information on the digital library usage portal is pretty much what I need to carry out my

tasks in searching for the articles/books/conference proceedings). Another widely used measurement of reliability is the composite reliability estimate which is ranging from 0.8 to 0.9 indicating moderate to high reliability values (Munir, 2018). The factor loading gives the convergent validity and the values above 0.6 indicate an acceptable effect of the factors (Hair, Ringle & Sarstedt, 2012) on the dimensions they represent (Table 3). The final test is the discriminant validity, which is a measure of validity of the instrument used for measurement, and to ensure this the square root of average variance extracted (AVE) of a construct was compared with the correlation of the construct with the remaining constructs. It is found that all square roots of AVE of all the constructs are greater than the correlation values of the construct with the other constructs; hence, ensures that the instrument has the desired validity (Table 4). Further, the R^2 values of the endogenous variables is a measure of the goodness of the model fit. In the present case the R^2 values range from 0.4 to 0.7, which indicates that the endogenous variables explain 40 to 70% of the variances observed in the analysis. In other words, 40-70% of the influences of the independent variables on the dependent variables is explained through the model. Cut-off value of R^2 value is 0.1 (Bolt et al., 2018), and hence the model fit is adequate.

Table 2: Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
INFQ	0.85	0.93	0.91	0.77
INU	0.82	0.83	0.89	0.74
PEU	0.85	0.87	0.91	0.77
PRU	0.67	0.67	0.82	0.60
SVQ	0.83	0.85	0.90	0.74
SYQ	0.62	0.67	0.80	0.58
USS	0.86	0.87	0.92	0.79

Legend:
INF = Information Quality; INU = Intention to Use; PEU = Perceived Ease of Use
PRU = Perceived Usefulness; SVQ = Service Quality; SYQ = System Quality
USS = User Satisfaction

Table 3: Factor Loadings

	INFQ	INU	PEU	PRU	SVQ	SYQ	USS
INF1	0.39						
INF2	0.69						
INF3	0.76						
INU1		0.73					
INU2		0.81					
INU3		0.80					
PEU1			0.90				
PEU2			0.81				
PEU3			0.88				
PRU1				0.76			
PRU2				0.69			
PRU3				0.71			
SVQ1					0.90		
SVQ2					0.91		
SVQ3					0.87		
SYQ1						0.73	
SYQ2						0.85	
SYQ3						0.80	
USS1							0.85
USS2							0.89
USS3							0.91

Table 4: Discriminant validity

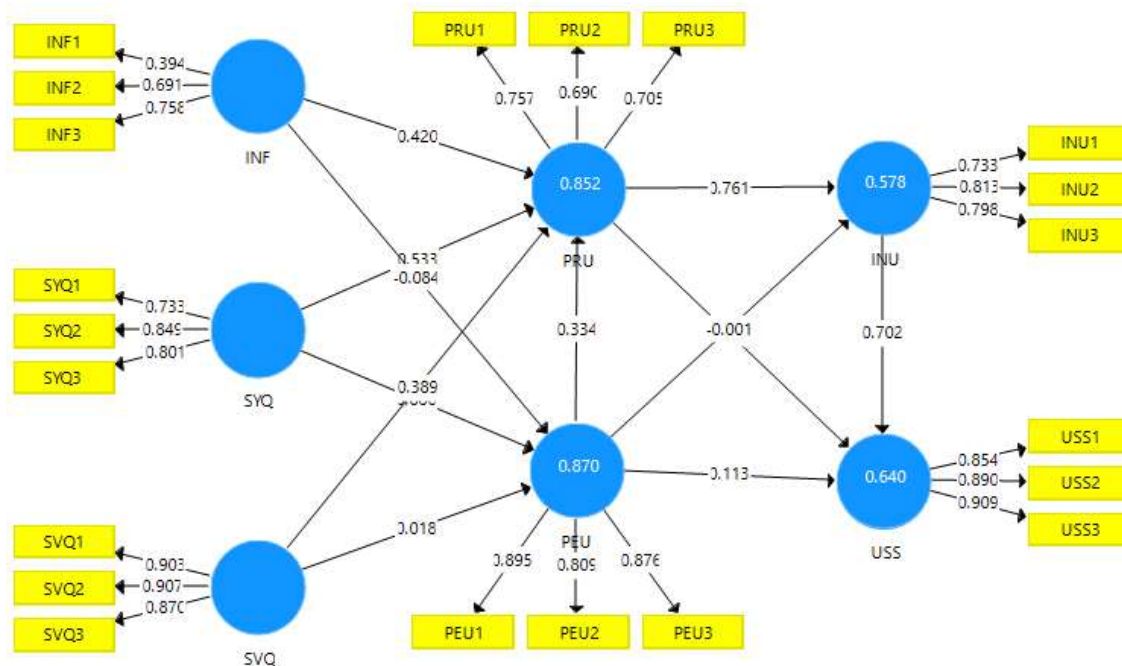|	INFQ	INU	PEU	PRU	SVQ	SYQ	USS
INFQ	**0.88**						
INU	0.48	**0.86**					
PEU	0.62	0.66	**0.88**				
PRU	0.49	0.58	0.79	**0.78**			
SVQ	0.48	0.45	0.48	0.61	**0.86**		
SYQ	0.71	0.47	0.70	0.72	0.64	**0.76**	
USS	0.51	0.76	0.73	0.69	0.60	0.67	**0.89**

Figure 2: Measurement Model

Legend:
INF = Information Quality; INU = Intention to Use; PEU = Perceived Ease of Use
PRU = Perceived Usefulness; SVQ = Service Quality; SYQ = System Quality
USS = User Satisfaction

Structural Model
The structural model (Figure 3) provides the results of the hypothesis testing (Table 5). In this research there were 12 direct hypotheses, which were tested with respect to the user satisfaction with the digital library in Higher Education. Among the 12 hypotheses being tested, six were supported and the rest were rejected. Following are the hypotheses which have been supported.
H_1: There is a positive significant impact of *information quality* on *perceived usefulness* of the digital library usage in higher education.
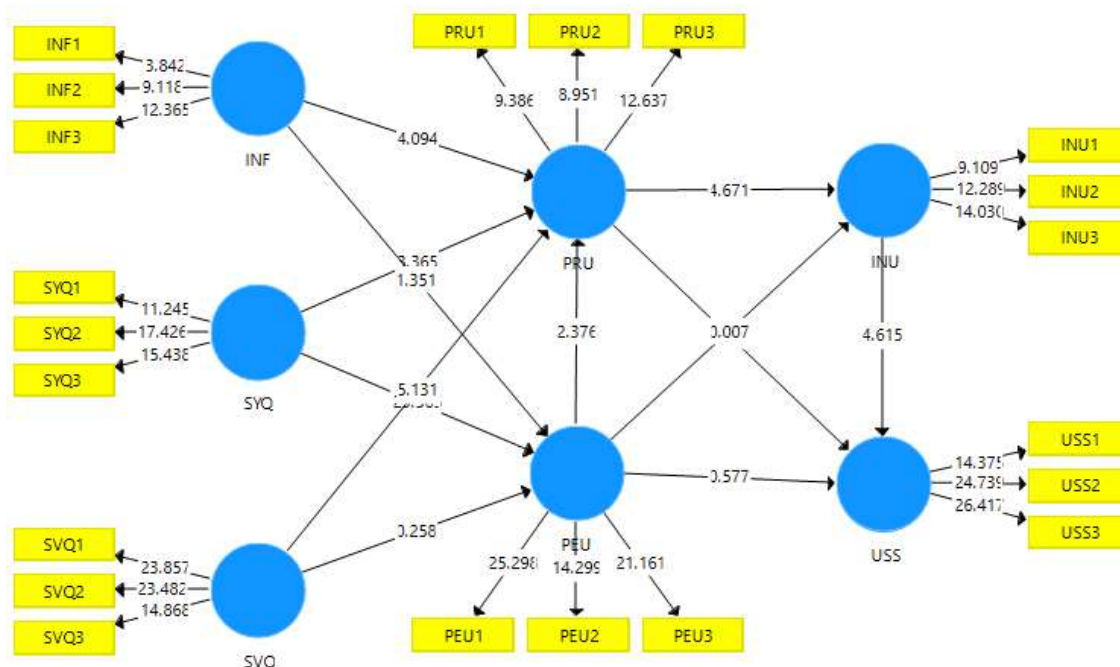
Figure 3: Structural Model

Table 5: Results of Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Hypothesis
INF -> PEU	-0.08	-0.08	0.06	1.35	0.18	Not supported
INF -> PRU	0.42	0.42	0.10	4.09	0.00	**Supported**
INU -> USS	0.70	0.69	0.15	4.62	0.00	**Supported**
PEU -> INU	0.00	-0.01	0.19	0.01	1.00	Not supported
PEU -> PRU	0.33	0.33	0.14	2.38	0.02	**Supported**
PEU -> USS	0.11	0.14	0.20	0.58	0.56	Not supported
PRU -> INU	0.76	0.77	0.16	4.67	0.00	**Supported**
PRU -> USS	0.03	0.01	0.26	0.12	0.90	Not supported
SVQ -> PEU	0.02	0.03	0.07	0.26	0.80	Not supported
SVQ -> PRU	0.39	0.40	0.08	5.13	0.00	**Supported**
SYQ -> PEU	0.89	0.88	0.04	23.57	0.00	**Supported**
SYQ -> PRU	0.53	0.54	0.16	3.37	0.00	**Supported**

FINDINGS AND DISCUSSIONS

The findings have led to implications in the form of suggestions to the technology managers of the digital library in Higher Education in general, and to the technology managers of Higher Education in Kuwait in particular.

1. This research has mainly focussed on dimensions which can be integrated to the Technology Acceptance Model (TAM) in the context of digital library adoption in higher education. The literature review had clearly indicated that the important integration to TAM was through the dimensions - information quality, system quality and service quality. The information quality becomes a significant dimension in the acceptance of technology used in the digital library, as they depend to a great deal on the quality information that is available which facilitated their search and screening of the articles they are looking for through their search strings and key words. System quality also plays a vital role as there should be effective systems which are well integrated with each other and facilitate the operational ease and save

time to the students while they seek information on a topic of their interest. Service quality is the third important dimension which is necessary for the success of any technology specifically in terms of the stated and implied needs of the customers.

2. Hypothesis testing has revealed that the *intention to use* (INU) the system has significant positive influence on *user satisfaction* (USS). This result corroborates well with earlier research studies in various our contexts of technology usage (e.g., Keni, 2020; Chen & Aklikokou, 2020; Kim & Lee, 2014; Kurniasari et al., 2020). This indicates that in the context of digital library to enhance the user satisfaction it is necessary to promote the intention to use the technological system of the digital library.

3. The *perceived ease of use* (PEU) has a positive significant relationship with *perceived usefulness* (PRU), which in turn has a significant relationship with intention to use (INU) of the technology used in digital library; however, PEU has no significant impact on the user satisfaction (USS). These findings are in alignment with that of a group of earlier researchers (e.g., Caffaro et al., 2020; Chen & Aklikokou, 2020; Iriani & Andjarwati, 2020; Winata et al., 2020), but are in contradiction to the findings of another group of researchers (Danurdoro & Wulandari, 2016; Hamid et al., 2016). One of the reasons for this could be that these studies were in different contexts of technology usage as well as on different geographic locations. It is important to note that even though PEU has no significant relationship with USS, it does have and a relationship with PRU, which in turn has a relationship with INU, and further INU has a significant positive relationship with the USS, and hence, the PEU cannot be ignored, as it indirectly contributes to the USS through the PRU despite the fact that it has no influence on USS.

4. The research revealed that among the three quality dimensions chosen in this research, the system quality has been considered to be the most important dimension by the students of Higher Education as it has a significant positive relationship with both PEU and PRU. Despite the fact that PRU has no significant relationship with the INU, it does affect both the components of TAM. The theoretical model also indicates that INQ has a significant positive relationship with the PRU and SVQ on the PEU as observed by other researchers in many different contexts (e.g., Almahamid et al., 2010; Pitafi et al., 2020; Rahmi, 2018; Kang & Namkung, 2019; Oliveira et al., 2020).

5. On the overall basis, the critical path of relationship flows from system quality – perceived ease of use – intention to use – user satisfaction. This relationships has been endorsed by several researchers in many different contexts(e.g., Almahamid et al., 2010; Pitafi et al., 2020; Rahmi, 2018; Venkatesh, 2010; Fagan et al., 2008; Rawashdeh, 2021; Kim & Lee, 2014; Kurniasari et al., 2020). Thus, among the three antecedents to TAM the INQ and SYQ can be considered to be the two critical dimensions of quality in the case of digital library, because they can lead to user satisfaction.

THEORETICAL IMPLICATIONS

The Technology Acceptance Model (TAM) has been severely criticised for its over emphasis on cognitive aspects and lack in consideration towards the emotional, social, human, and psychological aspects of behaviour (Kulviwat et al., 2007; Read et al., 2011). This research has integrated the quality aspects to the TAM for the use in the context of digital library. Based on the empirical analysis a theoretical model is developed (Figure 4), which is specific to the context of technology use in digital library in the Higher Education. This model can be used by the academicians and practitioners to in the field to theorize the antecedents of *user satisfaction* of the students of Higher Education in connection to the technology usage in digital library. It opens up immense scope for further testing, validating and developing the model in other contexts of geographical locations.
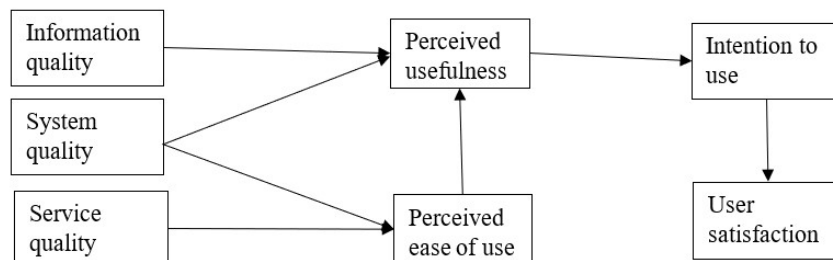

Figure 4: Extended Technology Acceptance Model (ETAM)

PRACTICAL IMPLICATIONS

Identification of the Antecedents of *user satisfaction* in the technology adopted in digital library in higher education play a significant role in drawing implications to the technology managers to fine-tune the critical factors in order to make the technology usage more effective. The theoretical model developed in this research through empirical validation based on real-time data has immense practical value which is discussed in the following

paragraphs.

First of all, it has been found through the hypothesis testing that among the three quality components integrated to the TAM dimensions, the *system quality* has emerged out to be critical in terms of *user satisfaction* as it has a significant positive relationship with both the *perceived ease of use* and *perceived usefulness.* The *perceived ease of use* is found to have a significant positive relationship with *intention to use* the digital library, which in turn impacts the *user satisfaction;* thus, it is evident that *system quality* has to be at its best to enhance *user satisfaction*. Several researchers have commented on the practical value of system quality and suggested measures to improve it. System quality of the technology used in digital library is mainly the IT system quality and this calls for the Chief Information Officers (CIOs) to devise strategies which can enhance the capabilities of the information systems. In the context of the digital libraries the most important aspect which the CIOs should focus on strategizing is the systems that can identify the large chunk of old, irrelevant and outdated information which may pop-up while the students access the digital library. Process Capability Maturity Model (PCMM) (Gorla et al., 2010) has been very successfully used in the software industries but is yet to be implemented in universities and a move in this direction is strongly recommended.

The hypothesis testing has revealed that *information quality* has a significant positive relationship with *perceived usefulness*. Even though the perceived usefulness has no significant relationship with either *intention to use* or *user satisfaction*, it has an indirect relationship with the *intention to use* through the *perceived usefulness* about the digital library so it is important on the part of the students as unless they find it useful they may not use the library frequently. So, the CIOs must also look into the measures to improve information quality (i.e., quality of reports and information in the online screen), which is mainly in terms of keeping the digital content free from data errors, interface issues, fragmented software module etc. The CIOs must also take special care to showcase the internal resources of the universities in the digital library which would be of special interest to the students. The most critical aspect in the enhancement of information quality is the efficiency and effectiveness of the applications which are available in the digital library which are related to information and knowledge tracing, identifying, sorting, retrieving, and storing. A special attention may be required to these aspects to ensure that the information quality of the digital library meets the customer expectations.

Service quality is found to have a positive and significant relationship with *perceived ease of use* of the digital library technology as per the results of the hypothesis testing. However, it has no relationship with either *intention to use* or *usefulness*. Again, as in the previous case even though the service quality does not have a direct relationship either with *intention to use* of *user satisfaction* with the digital library, the *perceived ease of use* becomes important, as it is mediated through the *perceived usefulness* to the *intention to use*. It is important that the CIOs take measures to improve the responsiveness, tangibility, and reliability aspects of the applications in the digital library.

CONCLUSION

This research is very timely in the sense that digital libraries have replaced the conventional hard-copy type of libraries in the modern universities and there is a need to elicit information about the acceptance of this mode of library access by the students so that policy decisions may be made by the technology managers to enhance its effectiveness. Kuwait is one of the GCC countries which has invested a huge amount of money and human resources in multimedia-based learning with digital libraries at the higher educational level (Aljazzaf, 2020; Hammad et al., 2020). So, all the stakeholders in the higher education are keen on the effectiveness of the digital libraries.

In this research, an attempt has been made to extend the Technology Acceptance Model by considering the impact of three components of quality: information quality, system quality, and service quality, which was the missing element in the model. The proposed model was tested using a sample obtained from the students of higher education in Kuwait for the testing of 11 hypotheses. The result was the Extended Technology Acceptance Model (ETAM) which has empirically proved that *system quality* is the most critical among the three components considered as its impact is on both the *perceived ease of use* as well as *perceived usefulness* and this has been the basis for drawing the practical implications. The ETAM can act as the basic model to test the effectiveness of technology used in the digital library in the university. Even though it has been developed in the context of Kuwait, it may be tested in other countries with little or no modification.

In this research the data collection is through convenience sampling, and hence, the generalization has its limitations. Nevertheless, the systematic research methodology adopted in this research and the effective use of bootstrapping to extrapolate the data has taken the measure to compensate for this limitation to the extent possible. Future researchers may adopt the probability based sampling methods to make this research more robust and the ETAM can be tested further and newer variables may be added if they are relevant. This research is purely quantitative as it is basically an empirical study and there is scope to extend the research further by adopting mixed methods approach. Finally, all the generalizations are based on the data collected in Kuwait and the model may have to be tested across the different countries to make it more robust.

If the students make productive use of the digital library system, its purpose stands fulfilled. The ETAM provides the linkages of the user satisfaction with the digital library, while theoretical implications add to the body of knowledge, the practical implications can be made use of by the CIOs of digital libraries. In a country like Kuwait, the use of digital library learning is relatively new in comparison to the western countries and a research of this nature may pave the way to success of innovative pedagogies.

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Appendix 1: Questionnaire used in Extended Technology Acceptance Model

Digital library User Satisfaction in Higher Education
Personal Data (Optional)
Name: Institution: Email: Contact number:
About this Research Dear Respondent, Thank you for taking part in this research. This questionnaire contains questions about your experience with using digital library as an add-on to your learning. Kindly share your experiences in using the digital library. The information is quite valuable to us and it will be used for research purposes and the recommendations we make will help improve the user satisfaction. **Confidentiality Statement** The data in the questionnaire shall be used solely for academic research purpose. You don't have to disclose your identity and even if disclosed it will not be used anywhere.
Questions
If you require assistance in completing this questionnaire or have any questions regarding the survey, please contact: **Dr. Rabab Dawoud Alsaffar** *PhD (University of York, UK)* The Public Authority for Applied Education & Training, Ph: +965 9955 1007; rd.alsaffar@paaet.edu.kw

Demographic Details						
Gender	Male		Female			
Age	16-20 years	20-30 years	30-40 years			
	40 years					
Degree (pursuing)	Bachelor's	Master's	PhD			
Place Tick mark (√) on ONE response for each item based on your experiences with the hotel you are currently employed.						
5-Strongly Agree ▸ **1–Strongly Disagree**			**5**	**4**	**3**	**2**	**1**

	1. Information quality	5	4	3	2	1
PEU1	Digital library platforms promptly update the information about products.					
PEU2	Digital library platforms provide information that can be easily understood.					
PEU3	Digital library platforms provide users with clear information regarding the products.					
PEU4	Digital library platforms have information which is adequate.					
PEU5	Digital library platforms have all aspects necessary to carry our my library related needs.					
	2. System quality					
SYQ1	Digital library understands my service needs related to library usage.					
SYQ2	Digital library service providers are competent in providing the expected service related to library.					
SYQ3	Digital library platforms are sensitive to the providing of the required services related to library.					
SYQ4	Digital library platform loads all the texts and graphics that you need.					
SYQ5	Digital library portal is well-designed and visually interactive.					
	3. Service quality					
SVQ1	Digital library is reliable in terms of my information needs.					
SVQ2	Digital library platform is appealing in terms of the audio-visuals.					
SVQ3	Digital library platform is responsive to my library related needs.					

SVQ4	Digital library platform is managed by a reputed service provider.					
SVQ5	Digital library platform is meeting all my service quality requirements.					
4. Perceived ease of use						
PEU1	Learning to operate the digital library application would be easy for me.					
PEU2	I would find it easy get through the digital library to learn what I want learn.					
PEU3	My interaction with the digital library in relation to learning is clear and understandable.					
PEU4	I find digital library usage in learning to be flexible to interact.					
PEU5	It is easy for me to become skilful at using digital library application for learning purposes.					
5. Perceived usefulness						
PRU1	Digital library used in learning will enable me to get the information and knowledge I am looking for.					
PRU2	Digital library helps me to learn even from outside of the classroom.					
PRU3	Digital library based education system is useful in the rapid retrieval of information related to learning.					
PRU4	Digital library based education system will save the time in learning.					
PRU5	Digital library in learning will improve my academic performance.					
6. Intention to use						
INU1	I intend to use digital library in learning.					
INU2	I have plans to use digital library even in the future for learning purposes.					
INU3	I will recommend the use of digital library in learning.					
INU4	Use of digital library in learning must be encouraged.					
INU5	digital library usage in learning is going to remain and be a part of education system.					
7. User satisfaction						
ASU1	Digital library meets my learning needs.					
ASU2	Digital library has all the necessary information I need in my subject.					
ASU3	I am happy digital library is there to meet my library needs.					
ASU4	I find my digital library usage experience very rewarding.					
ASU5	I will be happy to recommend digital library to others as a satisfied customer.					

Thank you for your participation.

Dr. Rabab Dawoud Alsaffar