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Predictors of Digital Library Usage by Undergraduate Students at a Namibian University: Perspectives Based on Technology Acceptance Model

Lucy Kiana, Martin Mabeifam Ujakpa
International University of Management, Namibia
l.kiana@ium.edu.na
m.ujakpa@ium.edu.na

Gloria Ejehiohen Iyawa, Jude Odiakaosa Osakwe
Namibia University of Science and Technology
gloria.iyawa@gmail.com
jdosakwe@gmail.com

and

Kathandika Iguna
Graduate University of Southern Africa, Namibia
kiguna72@gmail.com

Abstract

This paper aimed at exploring predictors of digital library (DL) usage by undergraduate students at a Namibian University. Applying a quantitative research approach through which copies of a survey questionnaire were self-administered, data was collected from 194 students and the study hypotheses tested by performing Pearson Chi-Square. The study found that a significant association exists between library training and use of digital library; library training and perceived usefulness of digital library; library training and perceived ease of use (PEOU) of digital library; perceived usefulness and actual usage of a digital library and gender and PEOU. Additionally, the study found no evidence to suggest an association between computer efficacy of a user and perceived ease of use of digital library; between PEOU of digital library and perceived usefulness of digital library and between age and PEOU. The study recommends training of library users on digital library so as to achieve optimal use of the DL resources and services.

Keywords: Digital Library, Technology Acceptance Model, Undergraduate Students, Digital Resources

Introduction

Rapid technological development in the 21st Century has increased societal dependence on Information and Communication Technologies (ICT) (Farahat, 2012); development that Al-Adwan, Al-Adwan and Smedley (2013) believe has presented rich opportunities to embed technological innovations within the learning environment. As claimed by Egberongbe (2011), technology is the Century's most significant development affecting scholarly communication and has propelled tremendous shift in institutions of higher learning around the world. Learning process has evolved from conventional face-to-face to e-learning (and blended learning) due to continuous growth of technological innovations and the internet – a mode of study that has become popular in institutions of higher learning (Al-Adwan, Al-Adwan, and Smedley, 2013).

To sufficiently support the teaching, learning and research needs of their host institutions, academic libraries have not been left behind by this tide. Every sphere of their activity has radically been taken over by Information and Communication Technologies (ICT) in order to cope with the shift in the scholarly communication and users' continual sophisticated

information requirements. This has left academic libraries with no option but to embrace technological advancement (Emezie and Nwaohiri, 2013; Ankara and Atuase, 2018); and hence the emergence of Digital Libraries (DL).

Prior research has pointed out how resources in digital libraries are underused due to poor usability (Carlock and Perry, 2008; Chu, 2003). According to Jeong (2011) system utilisation is enhanced through the study of determinants that influence users towards use, acceptance and rejection of an information system (such as a DL). In affirmation to this, Zha, Zhang and Yang (2015) noted that the adoption of digital libraries is significantly affected by students' behavioural intentions. In the same vein, Park et al. (2009) observed that, lack of research on the user side of information system adoption is in part responsible for the underutilisation of information systems (like DL) implemented in developing countries. It is therefore imperative to understand factors that drive acceptance or rejection of a technology by the users as failure to do so may result to implementing a technology that is not willingly accepted and used by users which may result to depletion of resources and time (Cowen, 2009; Isah, Serema and Mutshewa, 2014).

To achieve its mission of providing library users with quality and authentic information resources to support high quality education that promotes excellence in scholarship and research, the International University of Management (IUM) library has a collection that is rich in scope; covering almost all spheres of knowledge including physical and electronic materials. Through the Sirs Mandarin software, the IUM library is automated and hence has a digital section from where students or library users can access digital resources and services. In addition, the library provides access to online databases, ejournals and ebooks to its users (IUM, 2020). The digital section of the IUM library has been in existence for six years. Since its inception, less research has been carried out on the predicting factors that determine the adoption of the digital section of the library so as to aid in strengthening the digital library and overcome its weaknesses, if any. In view of this, this study aimed at exploring the predictors of digital library usage by undergraduate students in Namibia from the perspective of Technological Acceptance Model (TAM). The findings of this study contribute to the ongoing research on the digital transformation of academic libraries and predicting factors for adoption among students in higher learning institutions.

Literature Review and Theoretical Framework

The term digital library as defined by the *Online Dictionary of Library and Information Science* (2020) refers to a library in which a significant proportion of the resources are available in machine-readable format (as opposed to print or microform), accessible by means of computers, and its digital content may be held locally or accessed remotely via computer networks. Expanding on this definition Verma and Verma (2014) argue that a DL is a later stage of electronic library adding that the holdings of a DL are in digital form and easily accessible through the Internet. In contrast to an electronic library, Verma and Verma note that, in digital libraries, high speed data transfer takes place and data is communicated through networks or the Internet. In addition, DL provides an extensive range of Internet based services and it contains multi format information.

To Zha, Xiao and Zhang (2014) DLs are distributed systems with the capability to store various electronic resources and provide convenient access for end users via networks. Similar view of the term was expressed by Rosenberg (2006) who noted a DL as one where users access resources by electronic means and where information is delivered to users electronically. Khiste, Avinash and Deshmukh, (2018) define it as electronic information collections containing large and diverse repositories of digital objects, which can be accessed by a large number of geographically distributed users. Whilst according to Candela, Castelli and Pagano (2012) the term digital library indicates the digital counterpart of a traditional library.

A DL may not occupy a physical space or contain conventional print information resources, but its collection comprises electronic books, journals and newspapers (Mutula and Ojedokun (2008) as cited by Magoi and Gani, 2014) accessible over the Internet and its resources are either born digital (i.e. resources that are created and managed in digital); or digitised resources (resources that are converted

into digital format or in electronic format with the help of appropriate hardware and software) (Verma and Vema, 2014).

Magoi and Gani (2014) opined that there is no single definition for DLs because the definition evolves as research progresses. According to Magoi and Gani (2014), digital libraries, defined in the context of libraries, may be viewed as technical services performed electronically with an entirely electronic application.

Even though varying words are used to define the term digital library, a general consensus derived from existing literature agrees that the term digital library is more appropriate when describing a library whose collections and services are available electronically – normally over the Internet.

Digital libraries have increasingly become a gateway for users to access library resources and services (Lui and Luo, 2011). Agreeing to this, Raza, Mahmood and Warraich (2019) opine that accessibility of information has been made more productive and effective by DLs. Nonetheless, development of digital libraries has not only been uneven in Africa (Zirra, Ibrahim and Abdulganiyyi, 2019), their adoption among university students in some developing countries is low. A study by Mawere and Sai (2018) confirmed this as the study found that there was a low adoption rate of digital libraries among students in many Zimbabwean academic institutions. Similar findings were revealed by Urhiewhu and Emojorho (2015). In Urhiewhu and Emojorho study, there was low usage of library resources in institutions of higher learning in Delta and Edo States of Nigeria. Lack of training, skills and non-availability of online databases were cited as some of the contributing factors to low adoption. To understand and interpret the predictors of digital library adoption by undergraduate students at a Namibian University, this study applied the Technology Acceptance Model (TAM) as its framework. A framework is simply the structure of the idea or concept and how it is put together or rather a model of how one theorises or makes logical sense of the relationships among several factors that have been identified as important to the problem (Sekaran, 2001 as cited in Chibini, 2011).

TAM was adopted because it is a widely used and accepted model that has been tested in different conditions (Mille and Khera, 2010). Empirical evidence and research across prior studies strongly allude that TAM is a valid framework and reliable predictor of IT adoption (Agrawal and Pradas, 1999; Davis, Bagozzi, and Warshaw, 1989; Hu, Chau, Sheng, and Tam, 1999; Venkatesh, 2000). TAM was initially proposed by Davis (1986) with the aim of providing an explanation of the determination of computer acceptance, capable of explaining user behaviour across a wide range of end-users, computing technologies and user populations, while at the same time being both "parsimonious and theoretically justified" (Davis, 1989). The model theorises that a person's intention to adopt a particular system is influenced by two beliefs – Perceived Ease of Use (PEOU) and Perceived Usefulness (PU).

PEOU is "the degree to which a person believes that using a particular system would be free of effort" while PU is "the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989).

A study by Thong, Hong and Tam (2004) alleged that an application perceived to be easier to use is more likely to be accepted by users. In other words, the easier it is for a user to interact with a system, the more likely he or she will find it useful. A study by Park, Roman, Lee and Chung (2009) found PEOU of the library system to have had a significant impact on PU, which ultimately led to behavioural intention to use. A later study by Alharbi and Drew (2014) validates the relationship between PEOU, PU, and overall impact on behavioral intention to use.

Figure 1 is an illustration of the Technology Acceptance Model (TAM) as formulated by Venkatesh and Davis (1996).

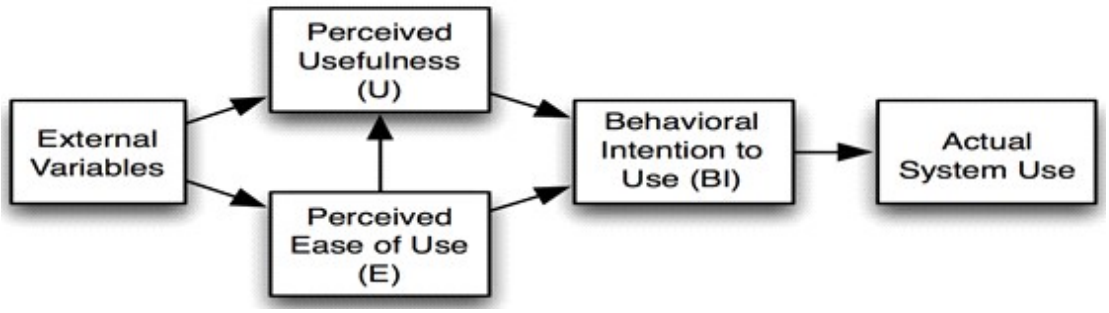

Figure 1: Technology Acceptance Model (TAM) **(Source: Venkatesh and Davis, 1996)**

Application of TAM Model in the Current Study

This study was based on the Technology Acceptance Model by Venkatesh and Davis (1996), albeit some modification. Applying the TAM theory in a DL context; for a student to make better use of the DL he/she should find it easy to use, and for the DL to be used by the students it should be of some relevance to them (PU). As noted in figure 1 above, PEOU and PU are directly influenced by external variables. This study predicted computer efficacy, library training, age and gender as external variables influencing PEOU and PU. The study further predicts that, Computer efficacy, age and gender would influence PEOU while library training would influence both perceived PU and PEOU.

For the purpose of this study computer efficacy was referred to as the proficiency or know-how required to use technological applications effectively while library training referred to the information skills imparted to the user by the library staff so as to enable him/her use the DL resources and services efficiently and effectively to meet his/her information needs.

Figure 2 illustrates the proposed model for this study to understand predictors of DL adoption by undergraduate students.

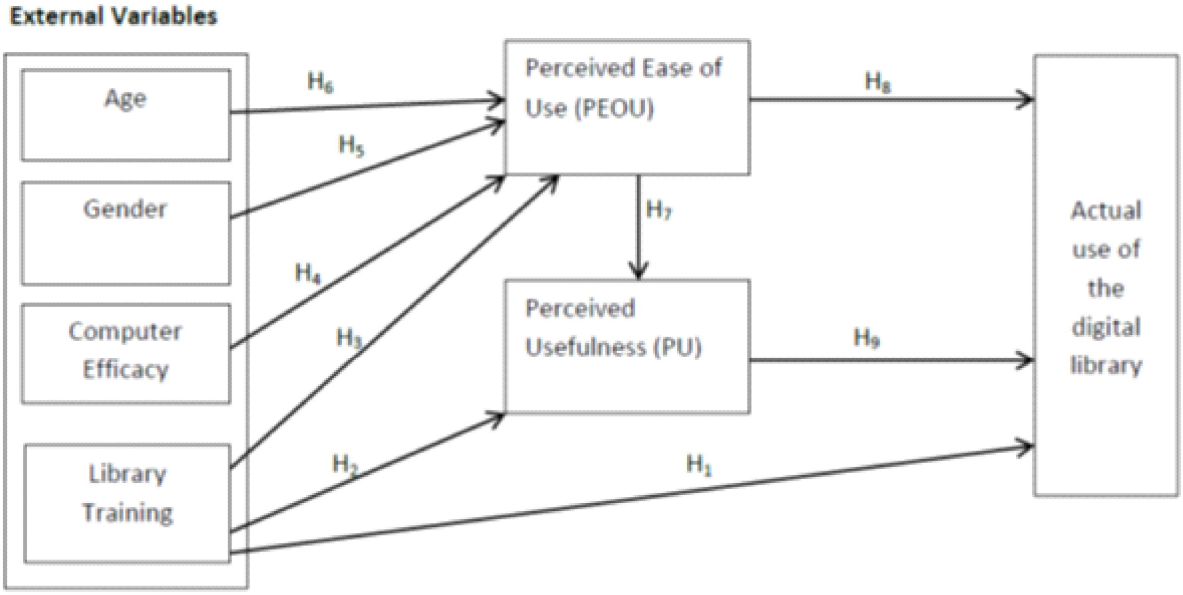

Figure 2: Proposed Research Model

Hypotheses

Based on above modified TAM the following was hypothesized:

H_1: Library training significantly influences the use of a DL

H_2: Library training significantly influences PU of a DL

H_3: Library training significantly influences PEOU of a DL

H_4: User computer efficacy significantly influences PEOU of a DL

H_5: User's gender significantly influences PEOU of a DL

H_6: User's age significantly influences PEOU of a DL

H_7: PEOU of a DL significantly influences its PU

H_8: PEOU of a DL significantly influences actual use of the DL

H_9: Perceived usefulness of a DL significantly influences its actual use

Methodology

Using a quantitative research method, the study used survey questionnaire as the instrument to collect Data. The quantitative research method was applied so as to enable the researchers to collect further data on variables that had been identified from literature. Applying convenience sampling, the researchers self-administered the questionnaire to 286 undergraduate students (older than 18 years) who were given a period of two weeks to complete and return the questionnaire. As part of the convenience sampling, the researchers stationed themselves in the university library and selected faculty classrooms for four days, where they self-administered the questionnaire to students as they walked into the said library and faculty classrooms. As a non-probabilistic sampling technique, the convenience sampling was applied in this research as it enabled the researchers to purposively reach the target research sample. After three weeks, one hundred and ninety four (194) completed questionnaire were returned and hence giving a 67.8% response rate which is representative enough of the sample.

Using the Statistical Package for Social Sciences (SPSS) software, the data was analysed and Pearson chi-square test performed to test the hypotheses. As part of the Pearson chi-square test, the collected data was entered onto the SPSS base module and analyses undertaken descriptive statistics, specifically, crosstab - Chi-Square. The significance level 0.05 was applied to interpret the Pearson chi-square test results.

Results

Tables 1 to 9 presents crosstabulation and chi-square test of the hypotheses as postulated in section above.

H_1: Library Training Significantly Influences Use of a DL

The crosstabulation and chi-square test results of library training*frequency of use of a DL in Table 1 resulted in P-value (0.020). Since the P-value is less than 0.05, the null hypothesis is rejected and hence indicating an association between library training and use of a DL ($\times^2$ (1) = 5.453, P < .020).

Table 1: Hypothesis 1: Library Training Significantly Influence use of a DL

	frequency of use categories		Total	Chi-square	df	p-value
	Acceptable use	not acceptable use				
Library training						
Trained	93(73.2%)	34(26.8%)	127(100.0%)	5.453[a]	1	0.020
Not trained	38(56.7%)	29(43.3%)	67(100.0%)			

H_2: Library training Significantly Influences PU of a DL

With a P-value (0.0005) less than the significant level (a = 0.05) as in Table 2, the null hypothesis is rejected and hence indicating that a significant association between library user training and PU of a DL ($\times^2$ (3) = 34.010, P < .0005).

Table 2: Hypothesis 2: Library Training Significantly Influences PU of a DL

		usefulness of the online library				Total	Chi-square	df	p-value
		Very useful	Useful	Fairly useful	Not useful				
Respondents trained on how to use the online library	Yes	40(31.5%)	66(52.0%)	18(14.2%)	3(2.4%)	127(100.0%)	34.010[a]	3	0.0005
	No	6(9.0%)	25(37.3%)	25(37.3%)	11(16.4%)	67(100.0%)			

H_3: Library training significantly influences PEOU of a DL

Table 3: Hypothesis 3: Library Training Significantly Influences PEOU of a DL

		Perceived Ease of use of the online library interface				Total	Chi-square	df	p-value
		Very easy to use	Easy to use	Fairly easy to use	Not easy to use				
Respondents trained on how to use the DL	Yes	46.5%	37.8%	14.2%	1.6%	100.0%	37.260[a]	3	0.001
	No	9.0%	49.3%	25.4%	16.4%	100.0%			

As in *Table 3*, the crosstabulation and chi-square test results indicate a P-value (0.001) less than the significant level (a = 0.05). As a result, the null hypothesis is rejected and indicating a significant association between library training and PEOU of a DL ($\times^2$ (3) = 37.260, P < .001).

H_4: Computer Efficacy of a User Significantly Influences PEOU of Use of a DL

In *Table 4*, the resulting P-value (.078) is greater than the significance level (0.05); thus the null hypothesis is accepted and hence indicating insufficient evidence to suggest an association between computer efficacy and PEOU of a DL (×2 (3) > = 6.821, P = 0 .078).

Table 4: Hypothesis 4: Computer Efficacy of a User Significantly Influence PEOU of Use of a DL

		Perceived ease of use of the DL interface				Total	Chi-square	df	p-value
		Very easy to use	Easy to use	Fairly easy to use	Not easy to use				
Computer efficacy of a user	Good skills	36.5%	42.1%	15.1%	6.3%	100.0%	6.821[a]	3	0.078
	No good skills	20.0%	40.0%	31.4%	8.6%	100.0%			

H5: User's Gender Significantly Influences PEOU of a DL

The P-value in Table 5 is 0.020 which is less than 0.05 and hence the null hypothesis is rejected. This is an indication that there is a significant association between gender and PEOU of a DL ($\times^2$ (1) = 5.453, p < 0.020).

Table 5: Hypothesis 5: User's gender significantly influence PEOU of a DL

Gender	Frequency	Percentage	Chi-square	df	p-value
Male	104	53.6%	5.453[a]	1	0.020
Female	90	46.4%			

H6: User's age significantly influences PEOU of a DL

The P-value of 0.280 in Table 6 is greater than significant level of 0.05 and hence the null hypothesis is accepted: indicating lack of sufficient evidence on the association between age and PEOU of a DL ($\times^2$ (1) = 3.829, P = 0.280).

Table 6: Hypothesis 6: User's age significantly influence PEOU of a DL

Age	Frequency	Percentage	Chi-square	p-value
18 - 25	55	28.4%	3.829[a]	0.280
26 - 35	97	50.0%		
36 - 45	27	13.9%		
46 - 60	15	7.7%		

H_7: PEOU of a DL Significantly Influences its PU

The P-value (0.001) in Table 7 is less than the significant level (0.05), indicating that the null hypothesis be rejected and hence an indication of a significant association between PEOU of the DL and its PU ($\times^2$ (9) = 163.042, P < 0.001).

Table 7: Hypothesis 7: PEOU of a DL Significantly Influence its PU

		Perceived usefulness of the digital library				Total	Chi-square	df	p-value
		Very useful	Useful	Fairly useful	Not useful				
Ease of use of the DL interface	Very easy to use	38(58.5%)	24(36.9%)	3(4.6%)	0(0.0%)	65(100.0%)	163.042[a]	9	0.001
	Easy to use	5(6.2%)	58(71.6%)	15(18.5%)	3(3.7%)	81(100.0%)			
	Fairly easy to use	2(5.7%)	9(25.7%)	21(60.0%)	3(8.6%)	35(100.0%)			
	Not easy to use	1(7.7%)	0(0.0%)	4(30.8%)	8(61.5%)	13(100.0%)			

H_8: PEOU of a DL Significantly Influences Its Actual Use

Table 8: Hypothesis 8: PEOU of a DL significantly influence its actual use

	frequency of use categories		Total	Chi-square	df	p-value
	Acceptable use	not acceptable use				
Perceived ease of use						
Very easy to use	47(72.3%)	18(27.7%)	65(100.0%)			
Easy to use	56(69.1%)	25(30.9%)	81(100.0%)	3.829[a]	3	0.280
Fairly easy to use	22(62.9%)	13(37.1%)	35(100.0%)			
Not easy to use	6(46.2%)	7(53.8%)	13(100.0%)			

Test results in Table 8 show a P-value (0.280), greater than the significant level (0.05). Therefore null hypothesis is accepted and hence suggesting insufficient evidence of an association between PEOU of a DL and its actual use (($\times^2$ (3)> = 3.829, P = 0.280).

H_9: PU of a DL Significantly Influences Its Actual Use

The P-value (0.015) of the crosstabulation and chi-square test results of PU and actual use of the DL in Table 9, is less than the significant level (0.05); indicating that the null hypothesis is rejected and hence the alternative hypothesis that PU influence use of the digital library is thus accepted. This shows an association between PU and actual use of the digital library (($\times^2$(3) = 10.510, P < 0.015).

Table 9: Hypothesis 9: PU of a DL significantly influence its actual use

	frequency of use categories		Total	Chi-square	df	p-value
	Acceptable use	Not acceptable use				
Perceived usefulness						
Very useful	47(72.3%)	18(27.7%)	65(100.0%)			
Useful	56(69.1%)	25(30.9%)	81(100.0%)	10.510[a]	3	0.015
Fairly useful	22(62.9%)	13(37.1%)	35(100.0%)			
Not useful	6(46.2%)	7(53.8%)	13(100.0%)			

Discussion

As shown in tables 1-9 above, six of the nine hypotheses are supported. However the significance level varied. For instance, the study established a very strong association (p<0.0005) between library training and PU of the DL. Again, a significant association between library training and actual use of the DL (p<0.020) and between library training and PEOU (p<0.001) was established. These findings signify the importance of library training for it is through it that users discover how their information needs could be met and this impacts how they perceive the DL. Again training equips them with the required skills to use the system (DL) which leads to perceiving it easy to use. This ultimately leads to optimal use of the DL. There is need therefore for librarians to equip library users with intensive training on information searching skills to

increase usage of the DL. These findings are in line with those of Khan and Qutab (2016) whose study identified user training as a significant indicator of digital library usage.

On the other hand, the study found insufficient evidence to suggest an association between computer efficacy and PEOU ($p<0.078$). These findings do not agree with Salloum et al. (2019) whose study found computer self-efficacy as one of the external factors that have a significant impact on PEOU. However the findings agree with the findings of Zainab et al. (2017) whose study found no association between computer self-efficacy and PEOU. Based on this then, it can be deduced that being able to use a computer and its applications does not translate to finding a DL easy to use. This may be because using a DL requires more skills to navigate the platform than merely having the ability to use a computer.

In addition, this study sought to find out whether there was any association between PEOU of a DL and its actual use. No association was established ($p=0.280$). However a significant association ($p<0.001$) between PEOU and PU was established. Therefore the influence of PEOU on actual use of the DL as observed in this study is only through PU. Similar findings were reported in a recent study by Rafique et al. (2020). Other study findings consistent with the results of this study are those of Xu and Du (2018) and Salloum et al. (2019) whose studies found PEOU had significant effect on PU and not on actual use or intention to use. This implies that users may perceive the DL easy to use but fail to use if they deem it not useful to address their information need - perhaps due to lack of relevant information resources. It can also be deduced that a system that requires no effort to navigate (easy to use) would be found useful since users can easily search for and access information materials and services. If a DL is easy to use and has relevant resources/ services then probability of users making use of it is high. Librarians should therefore not only ensure a rich DL collection and good services but they should also ensure that DL interface is easy to navigate.

Again, while a significant association (0.020) between gender and PEOU of a DL was established, there was lack of sufficient evidence on the association between age and PEOU of a DL ($P = 0.280$). These findings agree with Alexandrakis et al. (2020) whose findings indicated that age has no statistically significant effect on PEOU.

Finally, the study established a significant association between PU and actual use of the DL (0.015). These findings were in line with those of Ding et al. (2019) and Chaloeyprach and Ketmuni (2021). This suggests that students are more likely to accept and use the DL if it has positive perceived effect on their studies. Therefore, if the DL is well resourced with adequate information materials that address students information needs, then they are likely to perceive it useful and consequently make use of it. DL should thus be resourced with a rich and relevant collection and services that adequately support learning and research needs of the students. et al.

Conclusion

This paper aimed at exploring predictors of online library usage by undergraduate students with perspectives based on TAM. The study tested nine hypotheses out of which six alternative hypotheses were accepted while three null hypotheses were accepted. Library training was found to have direct influence on both PU and PEOU, and as a result, library training has also a direct impact on actual DL usage. The study also found that while gender has a direct impact on PEOU, age has no impact on PEOU. Additionally, the study revealed that computer efficacy has no impact on PEOU. Moreover, this study established that PU of a DL has significant influence on its usage and that PEOU has no significant effect on DL usage. The study also observed that the influence of PEOU on actual use of the DL is only through PU. In addition no enough evidence to suggest an association between computer efficacy of a user and PEOU of the digital library; also, no association was observed between PEOU of the digital library and PU of the digital library.

Based on the above, this study concludes that user training is an important exercise that librarians should never ignore as it is evident that ease of using a digital library and its usefulness thereof are linked to training. Additionally, students would find a DL useful if it is meeting their information needs. Librarians have a role therefore to ensure seamless

access to library resources; ensure the DL has a balance collection that is up-to-date and relevant to the information needs of the students.

Recommendations

This study recommends that a digital library collection should be dynamic and capable of meeting the information needs of students. Hence, a DL collection should be live, balanced and up-to-date on subject context, covering all areas of disciplines offered by the host university so as to be perceived as useful and subsequently utilized by the students.

The study also recommends training of library users so as to achieve optimal use of the DL resources and services. Training should be customised to suit individual needs and also to meet users' personalised needs. Furthermore it is important to pay attention to the different genders undertaking the training to ensure that it doesn't affect the desired overall expected output of the training.

The study further recommends that librarians should embrace online assist applications such as 'ask a librarian' to assist users who may have problems using the DL.

Implications of the Study

Cognisant that technology is here to stay and the fact that most institutions of higher learning are bended towards e-learning, this study has provided some insight for academic librarians to understand some of the factors that may influence utilisation of the digital library – especially in the shift of e-learning and the expectation that they should adequately support teaching, learning and research needs of their user community. The research has pointed out key elements that may influence usage of DL, and therefore librarians should take heed. For instance, they can develop user training programmes such as user information retrieval training courses. This will not only enable the students to learn to use the DL, but help them find it easy to use and also help them understand its usefulness in their learning process.

The study has also addressed the knowledge gap that existed on IUMs digital library user behaviour and has added significant clarification of external variables that could influence perceived usefulness (PU) and perceived ease of use (PEOU) in an academic digital library context. Prior to this study, no research had been carried out to ascertain some of these factors that could play role in DL usage.

Therefore the management of IUM library may use these findings to improve on their DL usage. Future research on DL adoption should explore further about other external variables that could influence PU and PEOU of a DL. The scope of focus can also be broadened by future research to include other category of DL users like the faculty and the postgraduate students.

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