

Determinants and Impacts of Digital Library Engagement: Evidence from Research-Based Universities in Malaysia

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Abstract

Over the years, libraries spent million to subscribe to digital library resources. However, recent studies show that the usage of digital library resources is underutilized. Subsequently, the negative feedback on digital library engagement can be associated with the issue of user deterrence from engaging themselves with the online resources provided by their local university libraries. Therefore, this study attempted to investigate digital library engagement concerning its determinants and impacts. A theoretical model consisting of 14 variables was proposed and categorized into 5-second order constructs. This study adopted a quantitative research methodology to answer the research problem. Data were collected among university students in peninsular Malaysia, specifically postgraduate students from Malaysian research-based universities. We received 492 valid responses and analyzed them based on descriptive and inferential using Partial Least Square Structural Equation Modelling (PLS-SEM). The study's conclusion provides solid evidence of the interrelationship between the constructs; the determinants (technological, individual, and contextual) influenced digital library engagement positively, and subsequent digital library engagement was also found to predict perceived benefits. The study also found that contextual, individual, and technological factors are important but not good enough to increase Perceived Benefits. Thus, there is a compelling need to improve the Contextual, Individual, and Technological Factors within Malaysian research universities.

Keywords: Contextual Factors, Digital Library Engagement, Individual Factors, Perceived Benefits, Technological Factors, Malaysia.

Introduction

Recent developments in government policy show more encouragement toward developing digital libraries. Malaysia is currently adapting its culture towards a digital culture, adopting the Industrial Revolution 4.0 (IR4) (Nainy, 2017). IR4.0 is the fusion between the utilization of technologies and the impact of human interaction that can surpass physical, digital, and

biological domains (BRICS Development Working Group, 2016; Nainy, 2017). Government agencies have taken an initiatives towards IR4 by introducing several strategic planning such as the Public Sector ICT Strategic Plan 2016-2020, the National Library of Malaysia Strategic Plan 2014-2018, and Malaysia Education Blueprint 2015-2025 (Higher Education).

As a result, it can be assumed that the next generation of library users will heavily depend on the digital information product or digital library. Over the past few decades, researchers attempted to redefine the concept of utilizing digital technology in a library. Terms such as "virtual library", "electronic library", "electronic resources", "web digital library", "digital library", "online library", and "digital repository" were among the popular conception given by previous researchers in the field of Library and Information Science (LIS). Masrek and Samadi (2017) argue that the digital library collection concept as the Digital Library (DL) is the most used concept among previous researchers. Therefore, the DL is defined as a digital collection of organized objects and services for this study. These include various resources such as electronic books, online journals, online databases, and multimedia elements such as videos, text, and sounds.

On the other hand, the usage of DL is very common in the context of Malaysian educational institutions (Ramayah & Aafaqi, 2004; Rahman, Jamaludin & Mahmud, 2011; Sahak & Masrek, 2014; Kiing, Lim, Wong, Chiong & Ler, 2016; Masrek & Samadi 2017). Yet, educational institutions have a hard time justifying their investment in DL due to the lack of utilization of DL among students. Studies by Masrek and Samadi (2017) and Rosman, Ismail and Masrek (2019) indicate that insufficient knowledge of DL engagement causes user deterrence from assessing and promoting the use of DL. This led to several problems, such as low usage of online databases, poor publication quality, fewer academic publications, and inaccurate findings due to reliance on non-DL resources.

According to O'Brien and Toms (2010), the concept of user engagement goes beyond the regular conception of usage as it can include multiple dimensions, such as affective, behavioral, and cognitive domains. A glance into DL literature shows that DL researchers utilize a narrow understanding of the concept of usage; by focusing only on the behavioral perspective and neglecting other domains, such as affective and cognitive. Thus, this study defines DL engagement as the facets of multiple domains that involves cognitive, affective, and behavioral domain. It involves user capabilities to utilize the DL for a longer period, some features utilized to reduce the complexity of usage, and deep interaction with the DL through continuous usage and promotion. This study extends the previous study by developing a revised conceptualization of user engagement by incorporating the elements of focus attention, felt involvement, aesthetic, and novelty; instead of regular conceptualization of usage based on cumulative usage and extent of usage.

A previous study indicates that the improvement in user engagement on DL leads to higher satisfaction, as well as recommending the usage of DL to others (Masrek & Samadi, 2017). Yet, gaps still exist concerning the scarcity of study on the determinant and impact of DL engagement and a lack of valid instruments and empirical evidence on the new conceptualization of DL engagement, especially from the context of postgraduate students in Research-Based Universities in Malaysia. Previous studies investigating DL usage focused on a narrow conceptualization of usages, such as cumulative usage and the extent of usage. Therefore, to address this gap, this study investigates DL engagement's determinants and potential impacts.

Literature Review

A structured literature review (SLR) technique was adopted to gain insight into DL engagement. Given that DL engagement originated from the concept of usage, the literature on DL usage from the four-domain of the study was observed. Literature was selected from LIS, Information Systems (IS), e-commerce, and psychology. SLR search based on Webster and Watson (2002) was performed. The search starts with leading journals in LIS and IS and the top search engine. These papers were screened based on MacDonald, Cairns, Angus and Andrade's (2013) rejection criteria. First, the paper must relate to the concept of DL. Second, the study only focuses on papers with good empirical contributions, and third, any study that does not relate to DL usage was also exempted. Then, a backward and forward search was conducted on the literature. In total, 135 publication was selected and found to be related to the topic under investigation.

Determinants of Digital Library Engagement

A study by Thong, Hong and Tam (2002) utilizing Technology Acceptance Model (TAM) shows that three constructs influence DL Engagement: interface characteristics, organizational context, and individual differences. In similar work, Hong, Thong, Wong and Tam (2002) refined the study by focusing on two predictors, individual differences and system characteristics. The studies concluded that the predictors were significant toward DL engagement. In another work, Ramayah and Afaqi (2004) utilize the TAM to investigate the influence of self-efficacy in the usage of DL. The study reported that the construct of self-efficacy significantly influences perceived ease of use in predicting DL engagement. On the other hand, Masrek, Jamaludin and Awang Mukhtar (2010) also study DL engagement by focusing on technological factors and utilizing the model of DeLone and McLean's (2003) Information System Success Model (ISSM). The findings indicate that all three elements of ISSM (service quality, system quality, and information quality) positively and significantly influence DL engagement.

Overall, the determinants of DL engagement can be categorized into several dimensions, such as technological, individual, contextual, organizational, and socio-economical. The grouping variables will focus on technological, individual, and contextual dimensions for the study. Other categories will not be included in this study due to (1) a lack of knowledge of organizational dimensions among respondents and (2) time and geographical limitations due to the respondent's nature of the study.

Digital Library Engagement

Following the previous discussion, DL engagement is defined as the extent of usage involving long-time usage of DL services from multiple facets; affective, cognitive, and behavioral. Instead of the traditional conceptualization of usage, DL engagement evaluates usage based on multiple dimensions, as suggested by Masrek and Samadi (2017) and Rosman et al. (2019). DL engagement can prevent user deterrence and promote user retention, subsequently encouraging the promotion of the DL to others (O'Brien & Toms, 2010; Masrek & Samadi, 2017). The concept of DL engagement in this study originated from the field of e-commerce, as the work of O'Brien and Toms (2010) laid the foundation for further study. The authors introduce the concept of user engagement in assessing the usage of e-commerce in

managing a business. Following the work, Masrek and Samadi (2017) adopted the instrument into the context of DL. Both studies identify six interrelated factors that constitute engagement; focus attention, novelty, perceived usability, endurability, aesthetic, and felt involvement. On the other hand, assessing the impacts of DL engagement is often considered a difficult task because of several issues, such as the physical location of the application system, the state of the technology, as well as considering the interest and contexts of the users (Chowdhury, 2006). It is important to assess the impact of DL engagement due to competition from other information providers on the Internet. Lack of knowledge on the impact of DL engagement cause the under-utilization of DL resources; for example, students and researchers prefer to utilize non-library resources as their main point of reference (Griffiths & Brophy, 2005; Kiran & Diljit, 2012; Ross & Sennyey, 2008). Several researchers have conducted a study on the impacts of DL engagement, such as the work of Madle, Kostkova, Mani-Saada and Weinberg (2003), Borgman et al. (2004), Kiran and Diljit (2012), Baharuddin and Rosman (2020), Rosman, Baharuddin, Aziz and Rahman (2020), Rosman, Arshad, Saleh, Abdullah, Fadzil, and Zawawi (2021), and Asad and Saima (2016).

Perceived Benefits

Assessing the outcome of DL engagement with the organization (especially the library) is a crucial factor in ensuring the success of the DL. It is always a difficult task to determine the effectiveness, efficiency, and success related to information systems due to several factors, such as the characteristic of the technology, the nature of the technology, the user's context, and location-based of the DL (Chowdhury, 2006). Within the context of DL, several researchers have investigated the potential impacts of interaction with the DL. Kiran and Diljit (2012), and Fassnacht and Koese (2006), measure the quality of DL based on three criteria: outcome, delivery, and environment. DeLone and McLean (2003) measure impact in terms of net benefits (either positive or negative outcomes of user satisfaction). Samadi, Masrek & Yatin (2014) measures impact from the perspective of individual performance.

Based on the issues mentioned above, several gaps exist in the literature. First, the knowledge of digital library engagement is limited concerning its determinants and factors. Second, the determinants from similar studies focus on technological, organizational, and individual factors. Knowledge of the effect of contextual factors is still limited, especially in Library and Information Science (LIS), as well as e-Commerce and Psychology. Third, knowledge of the outcome of digital library engagement is also limited to cumulative usage and extent of usage. The impact of digital library engagement on performance and benefits is still limited and warrants further exploration.

Research Model

The research model of study consists of five second-order constructs, namely technological factors, individual factors, contextual factors, individual factors, and perceived benefits, as shown in the following Figure 1. A second-order hypothesis was developed as follows:

H₁: DL engagement has a significant and positive relationship with perceived benefits.

H₂: Technological factors has a significant and positive relationship with DL engagement.

H₃: Individual factors have a significant and positive relationship with DL engagement.

H₄: Contextual factors has a significant and positive relationship with DL engagement.

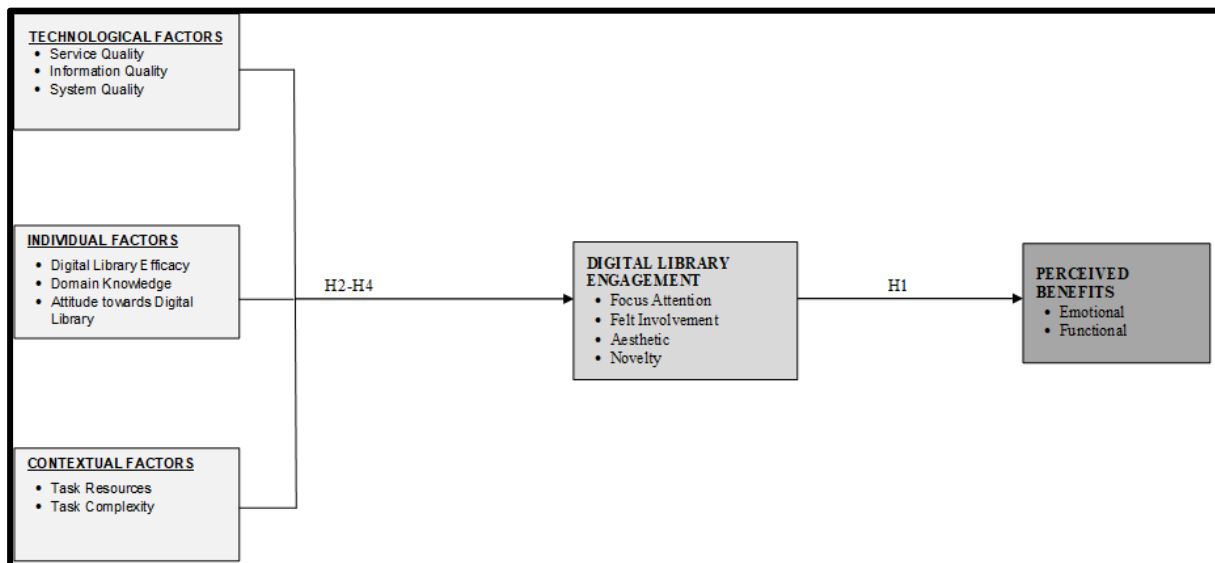


Figure 1: Research Model

The study proposes a positive and significant relationship between technological factors and DL engagement. The relationship between the construct is based on the theoretical lens of Goodhue and Thompson's (1995) Task Technology Fit and ISSM. The theories posit that improvement of work quality based on technological aspect influence the quality of attitude, work design, action, and results. Moreover, these technological forces drive an individual's perception, attitude, and behavior on a certain outcome (i.e., engagement). On top of that, findings from similar studies also indicate a positive relationship between technological factors and DL engagement (Hong et al., 2002; Thong et al., 2002; Asad & Saima, 2016; Xu & Du, 2018). In this study, the technological factors will use three variables: systems, service, and information quality. The reason for choosing this variable is based on analysis of previous literature, the expert review process, and sorting by several occurrences of the variables in the previous research.

On the other hand, the theory of individual differences of Motowilo, Borman and Schmit (1997) was used as the theoretical lens for justifying the relationship between individual factors and DL engagement. The theory posits that individual differences or personalities are associated with behavior, attitude, and performance changes. An individual tends to stay within an environment that matches their personality traits. Moreover, individual differences lead to flexibility or inconsistency of individual behavior, especially in the context of skills, knowledge, and habits, and subsequently influence task and contextual performance. An individual will perform certain behavior or attitude if they think that the behavior or attitude will increase the likelihood of achieving better performance, demonstrating the concept of user engagement. Moreover, previous research by Isiyaku, Ayub and AbdulKadir (2018), Masrek, Karim and Hussein (2007), and Pembee (2014) also outlined and provided empirical evidence on the relationship between individual factors and DL engagement.

Subsequently, this study looks into the theoretical lens of Bandura's (1986) Social Cognitive Theory (SCT) and the Job Characteristic Model (JCM) of Hackman and Oldham (1975) to establish the relationship between contextual factors and DL Engagement. The theoretical foundation indicates that when there is contact between the current environment and

user behaviors, the environment's essence can influence the individual's behavior as a result of their perception of the environment. Moreover, performing a specific task involves a critical psychological state that subsequently influences the achievement of individual performance. Besides, the JCM theory also posits that individuals with high growth needs (i.e., postgraduate students) are more likely to experience a critical psychological state with more motivation than those with weaker growth needs. Henceforth, several studies also reported a positive relationship between contextual factors with DL Engagement (DePietro, Wiarda & Fleischer, 1990; Jiang, Chen & Lai, 2010; Masrek et al., 2007; Pembee, 2014). In this study, the contextual factors will use two variables: task resources and task complexity. The reason for choosing this variable is based on analysis of previous literature, the expert review process, and sorting by several occurrences of the variables in the previous research.

The relationship between DL Engagement with Perceived Benefits is based on ISSM and JCM. The theories posit that performance or benefits rely on the influence or attitude of an individual, such as engagement. An engaged individual will do everything to satisfy and meet the need of the work (Bakker & Demerouti, 2008). Moreover, both theories also mention the importance of the supporting factors (such as technological, individual, and contextual) to fit the individual task characteristic – and subsequently influence the performance of an information system. In this study, users will engage and use the information system only if all determinants fit their preferences, and the previous study also showed a positive interrelationship between the construct (Masrek, Razali, Ramli & Andromeda, 2018). Variables selected for DL Engagement are focus attention, aesthetic, novelty, and felt involvement, adapted from the work of Masrek and Samadi (2017).

Materials and Methods

The study's conduct is quantitative, starting with the development of a research instrument. The items of instruments were adopted from similar studies within the field of LIS, IS, e-commerce, and psychology. The questionnaire consists of 6 sections. Section A collects information regarding the respondent demographic profiles. Section B until Section F meanwhile collect the data about the variables of the study, namely technological factors (Service quality, information quality, and system quality), individual factors (Digital library efficacy, domain knowledge, and attitude towards DL), contextual factors (task resources and task complexity), digital library engagement (Focus attention, felt involvement, aesthetic, and novelty), and Perceived Benefits (Emotional benefits and functional benefits). There are a total of 64 items in the study in total.

The instrument was then pre-test and sent for an experts' reviews process. Following the expert review process, the amendment was made to the instrument before pilot testing. A total of 100 respondents were invited to participate, in which only a total of 85 respondents returned the questionnaires – indicating a response rate of 85%. Next, the instrument was assessed for reliability using Cronbach's Alpha coefficient. As a result, the instrument recorded the lowest value of 0.763 and the highest value of 0.940, indicating a sufficient result to confirm the instrument's reliability, as asserted by Nunnally (1978) and Kaplan and Saccuzzo (1982).

Concerning population and sampling, the study population was selected from postgraduate students at 5 Malaysian research-based universities in Peninsular Malaysia. The selection of this population is due to (1) research-based universities being the best in Malaysia, (2) postgraduate students in these universities must publish a paper to graduate, and (3) a large sum

of investment in DL resources provided by the management of each university. An attempt to perform a random sampling technique failed to be materialized due to the confidentiality of student's details and rejection from 3 out of 5 universities. Thus, the research adopted convenience sampling as a result. An online questionnaire was developed using Google Forms. Data collection took approximately 4 weeks after the approval of the ethics application. The data was analyzed using Partial Least Square Structural Equation Modelling (PLS-SEM) using SmartPLS software version 3.2.8. The PLS-SEM method requires confirmation of the model based on the measurement and structural model. With the help of an assistant registrar from each university, this study recorded a total valid sample of 492 respondents – indicating a sufficient sample size for PLS-SEM. The following section shows the finding of the study.

Results

Demographics

Table 1 illustrates respondent demographic profiles. Most respondents are female, with 307 respondents, while 185 respondents represent males. The age of respondents most of the respondent is between 25-30 years old, while the least represented age is 51 to 65 years old (n=8). Most students enrolled for the full-time course (78.9% or n=388) compared to part-time (21.1% or n=104). In terms of the level of study, most respondents enrolled for a master's (53.7% or n=264) instead of a Ph.D. (46.3% or n=228).

Table 1
Demographic

Item	Sub-Items	Frequency	Percentage
Gender	Male	185	37.6
	Female	307	62.4
Age	Under 25	30	6.1
	25 -30	202	41.1
	31- 35	121	24.6
	36 - 50	131	26.6
	51 -65	8	1.6
Study Mode	Full-time student	388	78.9
	Part-time student	104	21.1
Education	PhD	228	46.3
	Master	264	53.7

Normality and Common Method Bias

Next, the study's normality and common method bias (CMB) were assessed. The normality test shows that the result of Mardia's multivariate skewness ($\beta = 4.684806$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 51.868790$, $p < 0.01$), indicating that the data of the study is slightly not normal, thus warrant the selection of Smart PLS software in this study. About CMB, all constructs meet the acceptable VIF level of below 5.5, indicating no CMB issues for the study.

Convergence Validity Assessment

The first step in PLS-SEM analysis is to assess the measurement model. Table 2 shows the final assessment of convergence assessment. Two-run was conducted on SmartPLS software

before finally reaching convergence validity. One indicator was removed (1.6%) due to low factor loading (0.295). The following shows the revised measurement model in terms of indicators and AVE – results show that all indicators meet the expected threshold (factor loading ≥ 0.5 , AVE ≥ 0.5 , CR ≥ 0.7) as recommended by Hair, Sarstedt, Hopkins & Kuppelwieser (2014). Therefore, it is assumed that convergence validity has been ascertained.

Table 2
Convergence validity

Second-order construct	Factor Loading		AVE	CR
Perceived Benefits (PEB)			0.649	0.948
	EMB1	0.751	0.805	0.954
	EMB2	0.832		
	EMB3	0.866		
	EMB4	0.800		
	EMB5	0.869		
	FUB1	0.826	0.756	0.939
	FUB2	0.795		
	FUB3	0.754		
	FUB4	0.779		
FUB5	0.770			
Digital Library Engagement (DLE)			0.553	0.951
	FAT1	0.570	0.825	0.950
	FAT2	0.604		
	FAT3	0.551		
	FAT4	0.548		
	FIV1	0.791	0.735	0.917
	FIV2	0.791		
	FIV3	0.820		
	FIV4	0.629		
	AES1	0.824	0.855	0.959
	AES2	0.828		
	AES3	0.810		
	AES4	0.807		
	NOV1	0.789	0.813	0.945
	NOV2	0.829		
	NOV3	0.827		
NOV4	0.754			
Technological Factors (TEC)			0.567	0.944
	SEQ1	0.781	0.713	0.908
	SEQ2	0.775		
	SEQ3	0.762		
	SEQ4	0.646		
	INF1	0.776	0.731	0.931
	INF2	0.784		
	INF3	0.755		
INF4	0.811			

Second-order construct	Factor Loading		AVE	CR
	INF5	0.788	0.659	0.885
	SYQ1	0.787		
	SYQ2	0.770		
	SYQ3	0.624		
	SYQ4	0.704		
Individual Factors (IND)			0.505	0.929
	DLE1	0.718	0.639	0.872
	DLE2	0.679		
	DLE3	0.730		
	DLE4	0.412		
	DOK1	0.726	0.748	0.922
	DOK2	0.735		
	DOK3	0.590		
	DOK4	0.678		
	ADL1	0.760	0.795	0.951
	ADL2	0.764		
	ADL3	0.791		
	ADL4	0.757		
	ADL5	0.807		
Contextual Factors (CON)			0.506	0.900
	TRE1	0.477	0.548	0.855
	TRE2	0.704		
	TRE3	0.619		
	TRE4	0.747		
	TRE5	0.758	0.703	0.904
	TCO1	0.815		
	TCO2	0.821		
	TCO3	0.744		
TCO4	0.649			

Discriminant Validity Assessment

Following the success of convergence validity, the next subsequent step is to confirm the discriminant validity. Instead of Fornell-Larcker Criterion, Henseler, Ringle & Sarstedt (2014) recommended that the researcher should adopt Heterotrait-Monotrait Ratio (HTMT) test to confirm the discriminant validity. The result in Table 3 indicates that no construct has a value above 0.9, indicating that the discriminant validity has been achieved and measurement model analysis has been completed.

Table 3
Discriminant validity

	CON	DLE	IND	PEB	TEC
CON					
DLE	0.460				
IND	0.399	0.661			
PEB	0.390	0.794	0.792		

	CON	DLE	IND	PEB	TEC
TEC	0.352	0.645	0.810	0.745	

Structural Model Analysis

Following the success of the measurement model analysis, a structural model analysis was conducted. Table 4 shows the final result of the structural model analysis. Four hypotheses were developed for the study. The result shows that all hypotheses were accepted; DEL \rightarrow PEB, TEC \rightarrow DLE, IND \rightarrow DLE, and CON \rightarrow DLE. First, the construct of DL engagement shows a significant relationship with the perceived benefit construct (H1: Supported, $t=34.852$, $p<0.000$). Second, all determinants consisting of TEC, IND, and CON were also found to have a significant impact on the DL engagement construct (H2: Supported, $t=4.438$, $p<0.000$; H3: Supported, $t=5.265$, $p<0.000$; H4: Supported, $t=4.284$, $p<0.000$).

Table 4

Final assessment of the structural model

Hypothesis	Std. Beta	Std. Error	t	p	Result
H1	0.763	0.022	34.852**	0.000	Supported
H2	0.296	0.067	4.438**	0.000	Supported
H3	0.349	0.066	5.265**	0.000	Supported
H4	0.194	0.045	4.284**	0.000	Supported

Result of Coefficient of Determination Score

Next, the model is assessed for the result of R^2 . The test was conducted to determine the impact of exogenous variables on the endogenous variable. Table 5 shows the result of R^2 for the study. Following the suggestion of Wherry (1931), this study used the adjusted R Square value instead of regular R^2 . The R Square analysis shows that the first exogenous variables (technological factors, individual factors, and contextual factors) can explain 48.4% (moderate) of the variation. In comparison, the second exogenous variable (DL engagement) is capable of 58.2% (moderate) of the variation, based on the criteria outlined by Hair et al. (2014).

Table 5

Result of Coefficient of Determination Score

Construct	R Square	R Square Adjusted	Decision
Digital Library Engagement	0.488	0.484	Moderate
Perceived Benefits	0.583	0.582	Moderate

Measuring effect size (f^2)

Table 6 shows the effect size (f^2) of the study. Cohen (1988) suggests that the f^2 values of 0.35 (large), 0.15 (moderate), and 0.02 (small). Based on the findings, the study shows a level of effect size ranging from small (0.063) to large (1.397).

Table 6

Measuring effect size (f^2)

Hypothesis	f^2	Result
CON → DLE	0.063	Small
DLE → PEB	1.397	Large
IND → DLE	0.098	Small
TEC → DLE	0.073	Small

Assessment of Predictive Relevance (Q^2)

Table 7 shows the result of the PLS prediction of the study. Based on the table, it can be ascertained that both endogenous constructs fulfill the requirements of PLS prediction, indicating that the model can predict. Subsequently, Figure 2 illustrates the final structural model of the study.

Table 7

Assessment of Predictive Relevance (Q^2)

Construct	PLS RMSE	LM RMSE	PLS Q^2 Predict	LM Q^2
Digital Library Engagement				
NOV1	1.126	1.187	0.274	0.192
NOV2	1.106	1.155	0.291	0.227
NOV3	0.935	0.939	0.410	0.404
NOV4	1.187	1.248	0.264	0.187
AES1	1.026	1.020	0.368	0.376
AES2	1.042	1.049	0.363	0.355
AES3	1.111	1.122	0.301	0.287
AES4	1.088	1.102	0.319	0.301
FAT1	1.547	1.556	0.123	0.113
FAT2	1.612	1.625	0.125	0.111
FAT3	1.726	1.709	0.029	0.049
FAT4	1.791	1.769	0.005	0.030
FIV1	1.073	1.118	0.363	0.309
FIV2	1.023	1.046	0.369	0.340
FIV3	1.020	1.018	0.340	0.343
FIV4	1.277	1.336	0.205	0.131
Perceived Benefits				
EMB1	0.912	0.921	0.321	0.308
EMB2	0.912	0.912	0.352	0.352
EMB3	0.859	0.869	0.389	0.374
EMB4	1.002	0.981	0.327	0.355
EMB5	0.879	0.859	0.403	0.430
FUB1	0.931	0.901	0.354	0.396
FUB2	0.917	0.921	0.369	0.364
FUB3	1.025	1.029	0.311	0.306
FUB4	1.030	1.063	0.296	0.251
FUB5	1.057	1.083	0.280	0.245

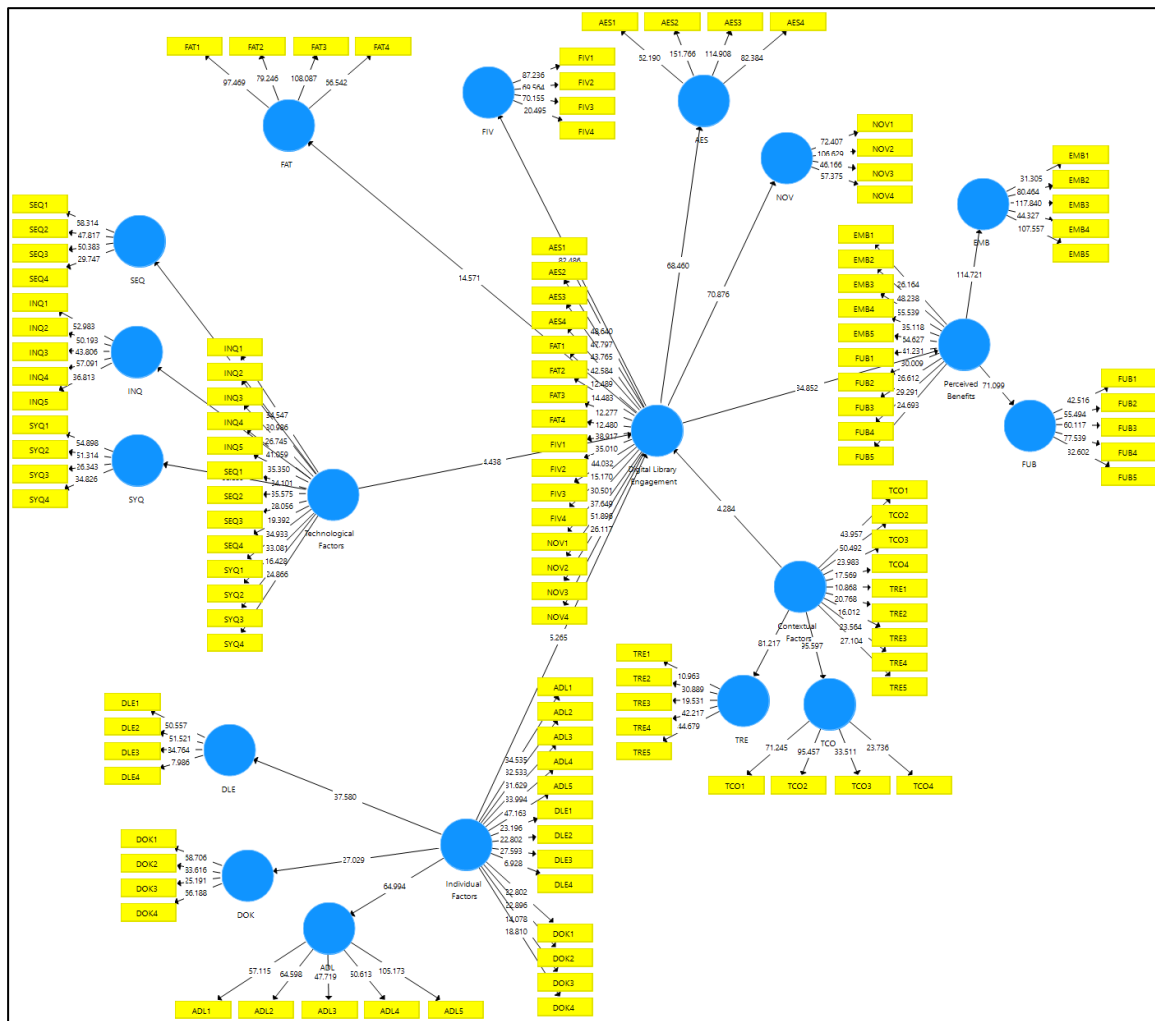


Figure 2: Structural Model

Discussion

The contributions of this study can be summarized in three perspectives: theoretical, empirical, and practical contributions. The main theoretical contribution of this study is the development of an empirically tested and validated model of DL engagement with its determinants and impacts. The resultant research model added to the scarce literature on DL engagement. To the best of the researcher's knowledge, no study has addressed this issue at the time being; thus, the result of this study may be beneficial to the academician, practitioners, and general communities, especially the targeted respondents, postgraduate students, and libraries.

In terms of empirical contribution, this study provides evidence of the significant relationship between the constructs in the context of Malaysia. Researchers specializing in DL may use the results further to improve the effectiveness and efficiency of DL resources. Besides, the result provides minimal evidence and insight into the level of DL engagement among Southeast Asian postgraduate students. From the practical viewpoint, this study developed a validated instrument of DL engagement with its determinants and impacts. The instrument can be improved and adopted into different settings, such as different types of universities or organizations such as libraries, archives, and information centers.

Concerning Importance-Performance Map Analysis (IPMA), DL Engagement is important and increases Perceived Benefits performance among postgraduate students at Malaysian

research universities. Contextual, individual, and technological factors are important but not good enough to increase Perceived Benefits. Therefore, it can be concluded that there is a compelling need to improve the Contextual, Individual, and Technological Factors within Malaysian research universities.

The findings of this study also show that respondents at the participating universities feel more interested in their information tasks when using the DL. This is because the DL provides unique features such as the capability to filter relevant resources, an automatic reminder of relevant articles, and a clean screen design. Moreover, in the context of postgraduate students at participating universities, the main reason for showing interest in the DL in completing information tasks is due to the capability of the DL to provide all sorts of reference materials, including those currently in print. This sort of material is impossible to be obtained by using non-DL resources. Considering the benefits of engaging students with the DL, perhaps there is a need to train and educate individuals to use the DL resources. As asserted by Sahak and Masrek (2014), librarians and educators need to educate the students to use varieties of DL resources that are more reliable, as well as the need to apply appropriate information skills.

Furthermore, the new feature of the DL also plays an important part in encouraging users at participating universities to see its function. Probably postgraduate students at participating universities need all the help they can get to ease their postgraduate journey. New features usually provide an improved function that could simplify one's work and increase the efficiency of information tasks. For example, the emergence of industrial revolution 4.0 requires an intelligent yet effective network for service delivery. Some pillars of this movement are big data, the Internet of Things, cloud technology, and mobile computing. The DL probably needs to think of this issue to move forwards, especially concerning the issue of cloud computing and big data. As Tomer (2017) indicated, cloud computing is relevant to Library and Information Science (LIS) education because more important library applications already rely on cloud-based infrastructure and cloud technology is more flexible and efficient than other solutions.

In the context of the library at the participating universities, focussing promotion activities on the novelty of the DL can provide benefits in the long run for library digital services. The findings of the study show that respondents agree that there are interested in the uniqueness and richness of digital resources provided by the DL. The library may use this element of novelty to encourage the use of DL and encourage others to willingly promote its usage to their family, friends, and colleagues.

Other than that, the demographic profiles of the respondents in this study may provide some insights into the level of user engagement among postgraduate students in Southeast Asia. However, some caution should be taken. This study may provide empirical evidence, leading to a better understanding of DL engagement within the same geographical area. This study can also measure other respondents, such as librarians, information professionals, and analysts. In the context of participating universities, the results provide empirical evidence on the factors influencing user engagement towards DL and its possible impact. The result will help participating universities plan their investment in DL more precisely and cut costs by subscribing only to necessary resources.

The finding of this study is comparable to several similar research on user engagement within the context of LIS and e-commerce, such as the work of O'Brien and Toms (2010), O'Brien, Cairns and Hall (2018), Masrek and Samadi (2017), and Masrek et al. (2018). O'Brien et al. (2018); O'Brien and Toms (2010). O'Brien and Toms (2010) and Masrek and Samadi

(2017) suggested that improving user engagement leads to an individual's retention and promoting its usage to others. The findings of this study are also consistent with the view that DL engagement is a predictor of perceived benefits; higher DL engagement leads to higher perceived benefits measured in terms of functional and emotional benefits. This study extends the previous study by studying the impact of DL engagement based on the four important predictors as mentioned above.

Conclusion

In this paper, a quantitative study was conducted to investigate DL engagement about its determinants and impacts and 14 variables were included in the study, categorized into five dimensions: technological, individual, contextual, digital library engagement, and perceived benefits. The proposed research model was tested using SmartPLS 3.2.8.

The contributions of this paper are as follows: first, it provides empirical evidence on the concept of DL engagement with its determinants and impacts in the context of Malaysia. Second, the paper provides a validated research instrument on DL engagement. Third, this study provides empirical evidence that contextual factors significantly correlate with DL engagement. Fourth, this study added to the body of knowledge on DL engagement.

However, we acknowledge that this study is not without a limitation. First, we acknowledge that the conduct of this study depends on a minimal number of variables. Future studies should consider adopting more variables such as perceived usefulness, perceived ease of use, responsiveness, and subjective norm to improve the resultant research model. Second, this study focuses on the generalization of theory rather than population generalization. Although acceptable, we recommended a widespread survey in the future to gain insight into the diverse demographic profile of respondents. Third, this study focuses on three dimensions as predictors of DL engagement. Future studies can improve the model by integrating other dimensions such as organizational and socio-economic factors.

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