

The Effectiveness of E-Learning: the Influence of Librarians

*Khalid Abdul Wahid**, Mohd Akmal Faiz, Abdul Rashid Zakaria and Huda Hamidon.

Faculty of Information Management, Universiti Teknologi MARA, Kelantan branch, Malaysia.

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Abstract: E-Learning has become a crucial component of teaching in universities as it has become a common style of providing educational materials in every part of the world as it believed to improve performance, develop skills, provide ease of access, reduce costs and increase levels of motivation. E-learning is a learning technology that uses web browsers as a tool for interaction with learners and other systems. However, people believe that only teachers or lecturers play a role in the effectiveness of e-learning. The role of librarians has been neglected. This study investigates the role of librarians in enhancing the effectiveness of e-learning. The sample of this study was 155 UiTM students from various programs of studies. The data were analyzed using SmartPLS version 3.8.2. The findings show that librarians positively influence the effectiveness of e-learning through content quality, service quality and system quality. PLS predict was employed to analyse the power of the model. The result shows that the model has a predictive relevance.

Keywords: E-learning, Librarian, Content quality, Service quality, System quality.

1 Introduction

According to Laurillard [1] the richest mode of learning is when the student's is learning through exploring, yet this should require continuous interactive support from professional involvement of a lecturer. Driven by this theory, e-learning has been widely used at national and international platform, particularly in education sector [2]. In this modern era of teaching and learning, self-driven online learning to encourage student to discover and engage with the content has been largely used to support the traditional classroom learning. This is a clear opportunity for Malaysian academician and universities to deliver education in best possible way in line with the growth of internet access and mobile usage among university students in Malaysia. However, apart from being the richest form of education it is also the most expensive [1]. Therefore, universities should carefully implement e-learning by considering the factors that affect the effectiveness of e-learning to reap the most benefit for students, lecturers and universities. Ozkan and Koseler [3] found that there are six factors that affect the effectiveness of e-learning comprising both social and technical entity namely system quality, service quality, content quality, learner's perspective, instructor attitudes, and supportive issues. While there are researchers such as Islas, Pérez, Rodriguez and Paredes [4] only focused on technological factors. Apart from that, some researchers are only focusing on human related factors. However, through extensive and exhaustive literature review on e-learning framework, it is found out that role of librarians is neglected towards enhancing e-learning. Information professional such as Librarian in universities could play a key role in enhancing e-learning among students [5]. The objective of this paper is to propose comprehensive model consisting technological factors which includes system quality, service quality, and content quality followed by human factor which includes skills and attitudes of students and instructors as well as role of librarian in enhancing e-learning as mediating variable. From the comprehensive model, instrument to measure role of librarian in enhancing e-learning have been developed and pilot test been conducted.

2 Theoretical Developments

2.1 E-Learning

* Corresponding author e-mail: Awkhalied@uitm.edu.my

Within the domain of educational studies, the terms such as “electronic learning”, “online learning”, “learning portal”, “Massive Online Courses”, “I-Learn” or “E-learning” have been used interchangeably by different authors. Despite the variety of terminologies, the term “E-learning” is considered the most popular and widely used. Kaplan-Leiserson [6] defined e-learning as to the use of electronic devices for learning, including the delivery of content via electronic media such as Internet, audio or video, satellite broadcast, interactive TV, CD-ROM, and so on. According to Technology Standard Committee, e-learning is a learning technology that uses web browsers as a tool for interaction with learners and other systems. Ferdousi [7] defines e-learning as a system that works as a platform to assist teachers and learners. E-Learning has become a crucial component of teaching in universities as it is become a common style of providing educational materials in every part of the world as it believed to improve performance, develop skills, provide ease of access, reduce costs and increase levels of motivation [8].

2.2 Role of Librarians

According to Franklin [9], librarians integrate information literacy into learning and teaching process in universities. Farber [10] stated that not only librarians enhance student’s information literacy skills, but also help in understanding specific subjects to find and evaluate information. Referring to Scripps-Hoekstra and Hamilton model [5], librarians played three roles in enhancing students learning which are Librarian-as-Reference, Librarian-as-Consultant, and Librarian-as-Instructor. Librarian-as-Reference means that librarians in the university serve as reference for faculty or students outside class meetings such as helping faculty or students onsite at the library or through electronic communication. This is because the library provides increasing number of multimodal resources that should be used by students [11]. Hence, the increasing number of library resources via online reflects another important role for librarian to assist student in navigating and accessing the resources given librarians’ knowledge of subject areas and their abilities to locate, and access content [12]. In their roles of supporting specific student learning for a course, Librarian-as-Consultant includes librarian consult students regarding library resources available to complete the course assignment as well to support course content. The ever-increasing volume of digital information and the constant development of tools to generate and access information requires librarian to operate as information consultants [5]. Julien and Genuis [13] stated that librarian should take a leading role in developing and promoting student’s information literacy. This is to keep up with the demands of emerging information literacy programs for active participation in the society and lifelong learning [14]. This is in line with Thurston [15], who called on librarians to move beyond reticence to take on more active roles by working alongside education faculty, doing so as a consultant. Frank, Raschke, Wood and Yang [16] said that librarian’s role as a consultant includes providing multiple information literacy programs. While [16] described the role of a librarian as consultant who strengthens graduate students’ information literacy by teaching them how to use printed and electronic research sources. In line with Bewick and Corral [17], which they said librarian’s role as consultant in enhancing information literacy could be in the form of short presentations to small user groups instead of one-off session at the start of semester for all students. Librarian-as-Instructor includes librarian instructing or co-instructing during scheduled class sessions via online or face to face. Thompson [12] highlighted the importance of librarian as instructor in using the available information resources otherwise it is a failure. Scripps-Hoekstra and Hamilton [5] added the instruction given by librarian should objectively equip students the skills necessary to locate, understand and use the information. The content of library instruction should cater relevant skills in using computer technology to locate relevant resources [18]. According to Fulton [11], this instruction could affect the student’s lifelong learning skills. A study by Floyd, Colvin and Bodur [19] reported an increase in the use of scholarly sources by education students following an instructional session facilitated by an education librarian.

2.3 Accessing the Effectiveness of E-Learning

Methods of assessing the effectiveness of e-learning systems are a critical issue in both practice and research. Agrawal, Agrawal, and Agarwal [20] suggest the success of the e-learning systems can be measured by using the six factors from Ozkan and Koseler model [3] which consists of system quality, content quality, service quality, instructor attitudes, learner perspective and supportive issues. From their research, all six factors have positive effect. The effectiveness of e-learning is measured by the user satisfaction [3]. While some researchers measure its effectiveness using user motivation [21]. Liaw, Huang and Chen [22] measured effectiveness of e-learning by measuring learner’s attitudes.

2.4 System Quality

System quality refers to the quality of the functionality of the information system itself [23]. Supportive factors, system quality, learner’s perspective, instructor perspective, information quality, and service quality are the factors pointed out by [20] that have significant effect on e-learning in their study in Universities in India. While Fleming, Becker, and Newton [24] stressed out that low-complexity, authenticity and technical support were found to be useful predictors for future use intention and satisfaction. Meanwhile, [21] investigated a Course Management System by using [23] information system

success model to analyze the success of e-learning. System quality, information quality and instructional quality positively influence user satisfaction hence increase the e-learning benefits. From this point of view, the e-learning system itself is one of the most important factors and should be in the highest quality in terms of ease of use, ease of access, flexibility therefore the student would love to engage on it. Farid, Ahmad, Niaz, Arif and Shamshirband [25] explained the barriers in e-learning in 5 dimensions and one of the dimensions was quality of the software. This can be said that lack of system quality would prove to be difficult for student to interact with lecturers hence affecting their e-learning.

2.5 Service Quality

Quality is an important criterion for a service-oriented organization. Samsudin, Nor Azila and Al-Momani [26] defined service quality as "...judgement of a service that Perceptions on Service Quality and Ease-of-Use 101 contributes to customer satisfaction." Where quality is concerned, a user does not have any physical product that he/she can hold, feel and assess. Therefore, experience in interacting or accessing the services will play a vital role in ascertaining the level of quality. Specifically, in an e-learning context, distance learners access their learning materials through a web portal also known as a Learning Management System (LMS). Their experience with the LMS will act as a representation of the service quality of the education institution they are currently registered with. Furthermore, service quality will enhance satisfaction [27].

Easy navigation, easy to find required information and available help information are important aspects of service quality in encouraging learner's habit [3]. The user interface is an area where a high level of interaction took place, well designed and user-friendly interface becomes one of the most critical factors in determining user satisfaction [23]. Mason and Rennie [28] stated interactivity of student depends a lot on this service quality. The quality of the service provided by the e-learning systems could improve student interactivity hence could increase the willingness to explore the content. Once the students have the willingness to explore and interact within the system, it would be interesting to find out whether service quality has a positive effect towards effectiveness of e-learning or not.

2.6 Content Quality

Content quality is also known as information quality. It refers to the perceived output produced by the system. The common characteristics of information quality include accuracy, relevance, timeliness, sufficiency, completeness, understandability, format and accessibility [29,30]. In the e-learning context, Roca, Chiu and Martínez [31] measured information quality by indicators related to relevance, timeliness, sufficiency, accuracy clarity and format, and proved that information quality directly significant on learner's satisfaction and indirectly on perceived usefulness. Likewise, Lee [32] found content quality was significant on learners' perceived usefulness. In the Middle East, Al-Busaidi [33], in an exploratory study in Oman, indicated that information quality (sufficiency, accuracy, relevance, timeliness, and understandability) to some extent was cited as a determinant of learners' LMS use.

Harrandi [34] found that carefully designed course content has a positive effect on student motivation towards e-learning. Previous model such as [23] include instructional quality as factor that effects e-learning and [21] found out that instructional quality has positive effect on course management system. Content of the course should be carefully designed by instructor so that it will give an impact on the effectiveness of e-learning in which students are willing to explore the quality content for their learning. Making the students exploring the contents by themselves is one of the main objectives for an effective e-learning. The theoretical framework from the above discussion is in figure 1 below.

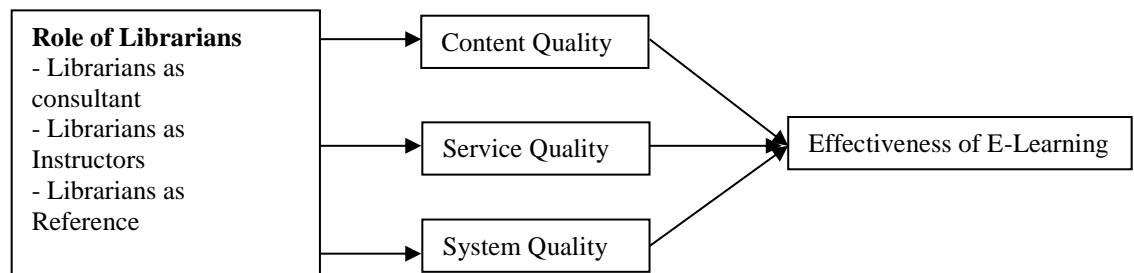


Fig. 1: The Theoretical Framework

The hypotheses in the figure are:

- H1. Role of Librarians has positively influenced Content Quality.
- H2. Role of Librarians has positively influenced Service Quality.
- H3. Role of Librarians has positively influenced System Quality.

H4. Service Quality has positively influenced Effectiveness of e-Learning.

H5. System Quality has positively influenced Effectiveness of e-Learning.

H6. Content Quality has positively influenced Effectiveness of e-Learning.

3 Research Methodology

This study utilized survey research using questionnaire for data collection. A corresponding 7 Likert scale was deployed (1 for “Extremely Disagree”; 2 for “Strongly Disagree”; 3 for “Disagree”; 4 for “Neither Agree nor Disagree”; 5 for “Agree”; 6 for “Strongly Agree” and 7 for “Extremely Agree”). Prior to pilot testing and main data collection, the questionnaire was pre-tested with several experts in the field and also several students who constitute potential respondents. The questionnaires were pilot tested with 50 UiTM students. Using the SPSS, the responses of these 50 students were analyzed for assessing the reliability of the measurements. The recorded Cronbach Alpha for all variables employing multi-items estimated range from 0.80– 0.97 (role of librarians = 0.94, service Quality = 0.81, system quality = 0.80, content quality = 0.93 and effectiveness of e-learning = 0.97) which suggests that the questionnaires were reliable [35].

The sample of the study were 170 students. There were 159 students responded. However, only 155 questionnaires were valid for the data analysis. The remaining 155 were analyzed using Partial Least Square (SmartPLS version 3.8.2). This study first developed and assessed the measurement model and followed by the development and assessment of the structural model. Previous studies have indicated a sample threshold of as little as 100 samples for PLS-SEM [36]. Alternatively, one can revert to the more restrictive minimum sample size recommended based on statistical power [37]. The study used G*power to calculate the minimum sample size based on statistical power [38]. The software suggests that we needed a sample size of 77 for a statistical power of 0.80 for model testing. Since, our sample size exceeded 77, the power value in this study was 0.801 which also exceeded 0.80. Moreover, the minimum power required in social and behavioral science research is typically 0.80. Therefore, in both cases, it can be concluded that sample size was acceptable for the purposes of this study.

4 Results and Discussion

4.1 Common Method Variance (CMV)

Common method variance is a phenomenon that is caused by the measurement method used in a SEM study and not by the network of causes and effects in the model being studied. For example, the instructions at the top of a questionnaire may influence the answers provided by different respondents in the same general direction, causing the indicators to share a certain amount of common variation. Another possible cause of common method variance is the implicit social desirability associated with answering questions in a questionnaire in a certain way, again causing the indicators to share a certain amount of common variation [39].

Common method variance could be a severe issue in the study when a researcher adopts the single-source data [40]. To overcome this issue, the study was utilised a statistical method which is full collinearity test. Kock and Lynn [41] proposed the full collinearity test as comprehensive procedure for the simultaneous assessment of both vertical and lateral collinearity. Through this procedure variance inflation factors (VIFs) are generated for all latent variables in a model. The occurrence of a VIF greater than 3.3 is proposed as an indication of pathological collinearity, and also as an indication that a model may be contaminated by common method variance. Therefore, if all VIFs resulting from a full collinearity test are equal to or lower than 3.3, the model can be considered free from common method variance. Table 1 shows the VIFs obtained for all the latent variables in the model, based on a full collinearity test. The latent variables in the model with VIF are less than 3.3. Therefore, the model is free from the common method variance as proposed by [41] based on the full collinearity test procedure.

Table 1: Full Collinearity VIFs.

CMV	RoL	SQ	SyQ	CQ	EeL
VIFs	1.964	1.787	2.484	1.380	1.775

4.2 Assessment of Measurement

To examine the research model Partial Least Square (PLS) analysis technique was employed by using the SmartPLS 3 software version 3.2.8 [42]. In an effort to refine all structural equation models two stage analytical procedure was employed, where researchers tested the measurement model and structural model recommended by Hair, Sarstedt, Hopkins and Kuppelwieser [43]. Prior to structural model, the study has to assess the measurement model of latent constructs for their dimensionality, validity, and reliability. Cronbach’s (α) and composite reliability were also tested as recommended by

Henseler, Ringle and Sarstedt [44].

The measurement model used in this study included five constructs: role of librarians (RoL), service quality (SQ), system quality (SyQ), content quality (CQ), and effectiveness of e-learning (EeL). In assessing a model’s reliability, the loading of each indicator on its associated latent variable must be calculated and compared to a threshold. Generally, the loading should be higher than 0.5 for indicator reliability to be considered acceptable [45]. A loading lower than 0.4 indicates that an item should be considered for removal, and items with a loading of 0.4–0.5 should be considered for removal if they decrease the composite reliability (CR) and Average Variance Extracted (AVE) above the threshold [45]. Table 2 indicates that most of the indicator loadings on their corresponding latent variables for the respondents were higher than 0.5.

4.3 Validity Assessment

4.3.1 Assessment of Measurement Model

Validity was assessed in terms of convergent validity and discriminant validity. Convergent validity is the extent to which the scale correlates positively with other measures of the same constructs. Convergent validity of measurement model is usually ascertained by examining the factor loading, average variance extracted (AVE) and composite reliability (CR) [43]. All the values were above 0.5, which shows the convergent validity of the model. Convergent validity can be evaluated by examining the loading ≥ 0.5 , AVE ≥ 0.5 , and CR ≥ 0.7 [45]. Each item’s coefficients on its underlying construct were observed. A test of each item’s coefficient was used to assess convergent validity. All values fulfil the required standard, indicating high convergent validity. Table 2 shows the results of factor loadings threshold level of 0.5 as recommended by [45].

Table 2: Factor loading, C.R. and AVE.

Constructs	Loading	C.R.	AVE
First Order			
Content Quality (CQ)	0.930	0.945	0.742
Effectiveness of E-Learning (EeL)	0.962	0.970	0.842
Librarian as Consultant (LC)	0.877	0.924	0.802
Librarian as Instructor (LI)	0.915	0.959	0.921
Librarian as Reference (LR)	0.820	0.892	0.734
Service Quality (SQ)	0.655	0.814	0.604
System Quality (SyQ)	0.805	0.883	0.716
Second Order			
Role of Librarian	0.721	0.904	0.760

Besides assessing the convergent validity, the study also evaluated the discriminant validity. Discriminant validity can be evaluated by examining Heterotrait-Monotrait Ratio (HTMT) [44]. Assessing HTMT as a criterion involves comparing it to a predefined threshold. If the value of HTMT is higher than this threshold, one can conclude that there is a lack of discriminant validity. Some authors suggest a threshold of ≤ 0.85 [45], whereas others propose a value of ≤ 0.90 [46]. Table 3 shows the result of the discriminant validity assessment of the measurement model using HTMT ratio which indicates that the models possess acceptable discriminant validity.

Table 3: Heterotrait-Monotrait Ratio (HTMT).

CQ	EeL	LC	LI	LR	SQ	SyQ
0.619						
0.383	0.462					
0.576	0.606	0.885				
0.731	0.673	0.735	0.863			
0.483	0.605	0.474	0.492	0.412		
0.585	0.756	0.434	0.449	0.585	0.637	

4.3.2 Assessment of Structural Model

The study performed bootstrapping involved 500 samples whilst our actual sample stood at 155. The SEM results are presented in Table 4. It can be observed that R² values for CQ is 0.324, SQ is 0.156, SyQ is 0.231 and EeL is 0.563

suggesting that 32.4% of the variance in CQ is explained by RoL, 15.6% of the variance in SQ is explained by RoL, 23.1% of the variance in SyQ is explained by RoL. Meanwhile the CQ, SQ and SyQ constructs in turn contribute to 56.3% of the variance in effectiveness of e-learning (EeL), Table 4 shows that all beta path coefficients were positive and in the expected direction and were statistically significant. To elaborate role of librarian (RoL) ($\beta = 0.561, p < 0.05$), ($\beta = 0.393, p < 0.05$), ($\beta = 0.475, p < 0.05$) was found to have significant effect on CQ, SQ and SyQ respectively. Meanwhile, service quality (SQ) ($\beta = 0.170, p < 0.05$), system quality (SyQ) ($\beta = 0.454, p < 0.05$) and content quality (CQ) ($\beta = 0.293, p < 0.05$) were found having a significant effect on effectiveness of e-learning (EeL). Thus H1, H2, H3, H4, H5 and H6 were supported.

Table 4: Path coefficient and hypotheses testing.

Hypotheses	β	S.E.	t value	p value	R ²	VIF	Decision	f ²
H1. RoL -> CQ	0.561	0.107	5.261	0.000	0.324	1.423	supported	
H2. RoL -> SQ	0.393	0.091	4.310	0.000	0.156	1.301	supported	
H3. RoL -> SyQ	0.475	0.164	2.890	0.002	0.231	1.487	supported	
H4. SQ -> EeL	0.170	0.093	1.823	0.034	0.563	1.000	supported	0.051
H5. SyQ -> EeL	0.454	0.145	3.126	0.001			supported	0.317
H6. CQ -> EeL	0.293	0.155	1.884	0.030			supported	0.138

The study evaluated for multicollinearity among the variables in the model and did not find any cause for concern using the criteria of variance inflation factor (VIF), which is (Table 4) the suggested value of 3.3 [43]. As proposed by literature, besides the blindfolding procedure, it also beneficial to run the PLS predict [47,48]. The model assumes to have less error in predicting performance if the RMSE, MAE and MAPE values in the PLS model has lower values compared to the Linear Model (LM) and the Q² value for PLS is higher than LM [47,48]. As shown in Table 5, most of the values fulfill the requirements, hence indication that theoretically establishes a path model improves the predictive performance of the available indicator data.

Table 5: PLS Predict.

Items	RMSE	MAE	MAPE	Q ² _predict
CQ1	-0.111	-0.071	-1.266	0.219
CQ2	-0.043	-0.061	-0.926	0.078
CQ3	0.015	-0.022	0.175	-0.023
CQ4	-0.025	-0.011	-0.320	0.037
CQ5	-0.037	-0.023	-0.302	0.061
CQ6	-0.024	-0.049	-0.683	0.038
EeL1	-0.034	-0.045	1.811	0.041
EeL2	0.020	0.000	3.345	-0.026
EeL3	-0.192	-0.057	-3.530	0.258
EeL4	-0.074	-0.032	1.038	0.097
EeL5	-0.063	-0.065	-0.861	0.082
EeL6	-0.127	-0.040	0.245	0.166
LC2	0.722	0.536	16.112	-0.279
LC1	1.130	0.759	21.876	-0.607
LC3	0.596	0.401	10.449	-0.229
LI1	0.578	0.440	11.429	-0.191
LI2	0.616	0.427	11.286	-0.216
LR1	0.731	0.537	15.349	-0.293
LR2	0.876	0.622	15.445	-0.493
LR3	1.023	0.776	19.523	-0.584
SQ2	-0.430	-0.192	-10.638	0.722
SQ1	-0.064	-0.008	-3.139	0.092
SQ3	-0.110	-0.094	-1.813	0.195

SyQ1	-0.064	-0.026	-0.543	0.137
SyQ2	-0.082	-0.083	-1.366	0.164
SyQ3	-0.052	-0.053	1.595	0.070

5 Conclusions

This study shows that the roles of librarians, content quality, service quality, system quality are important elements for effective learning. The study shows that the role of librarians significantly affects the process of e-learning. However, the impact of librarian on e-learning can be seen in the form of content quality of knowledge and information. Besides the content quality, library should have good service quality and excellent system quality in facilitating e-learning. These facilities can increase the effectiveness of teaching and learning.

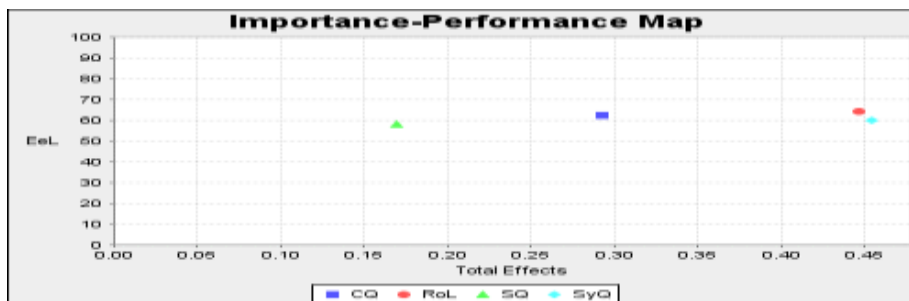


Fig. 2: Importance Performance Matrix Analysis (IPMA).

Based on the analysis of Importance-Performance Matrix Analysis (IPMA) in Figure 1 shows that the role of library, system quality and content quality are the most important and high-performance factors for the effectiveness of e-learning. Nevertheless, service quality becomes a less important variable compared to system quality and content quality, but it also contributes to the high performance of e-learning in terms of providing content quality. Hence, librarian has an important role in improving e-learning. The enhancement of e-learning can be achieved by having adequate service quality and system quality in a library.

Researchers identified some limitations in this study. Firstly, the study used a cross sectional research design rather than a longitudinal study. Thus, it is not able to examine the effectiveness of e-learning over a period of time. The longitudinal study can cope with the long-term nature of learning process. Secondly, this research concerns the sample drawn from only one public university which is UiTM. Therefore, the findings from this study still cannot be generalized in the context of public universities in Malaysia. Researchers would like to suggest few recommendations in future research. The model should be tested further using samples from other public universities in Malaysia to further generalize the results of the study. Lastly, this study should compare the effectiveness of e-learning among students before and after the involvement of librarians.

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Khalid Abdul Wahid, he gained his Ph.D. from Kasetsart University, Thailand. His dissertation is in new knowledge creation. Currently he is a senior lecturer in the Department of Information System Management, Faculty of Information Management at Universiti Teknologi MARA, Kelantan branch, Malaysia. His research interests are knowledge creation, social innovation and e-learning.



Mohd Akmal Faiz Osman, he is a lecturer in the Department of Information System Management, Faculty of Information Management at Universiti Teknologi MARA, Kelantan branch, Malaysia. His research interests are e-learning and instructional technology.



Abdul Rashid Zakaria. Currently he is working as lecturer in the Department of Information Management at University Technology MARA, Kelantan branch, Malaysia. His research interests include library management, organization of information, cataloguing and classification and e-learning. Previously he worked as librarian at the same university.



Huda Hamidon, she received her Master of Science in Information Management from the Faculty of Information Management at Universiti Teknologi MARA (UiTM), Malaysia. Currently, she works as a lecturer in UiTM Kelantan branch, Malaysia. Her research interest includes cybersafety and information systems management.