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The Barriers to Adoption of Mobile Learning by HEIs in Malaysia: An Exploratory Study

D. Al-Arabiat[*,a], *W. F. Wan Ahmad*[b], *and A. Sarlan*[c]

Department of Computer and Information Sciences, Universiti Teknologi PETRONAS, Perak, Malaysia.

[a,*]*d.alarabiat@yahoo.com*, [b]*fatimhd@petronas.com.my*, [c]*aliza_sarlan@petronas.com.my*

Abstract – *Mobile learning (M-learning) is considered as a development process of Electronic learning (E-Learning) that used to meet some of issues in E-learning such as wireless environment and accessibility. In spite of having many benefits and advantages for using M-learning, many challenges and issues still facing mobile learning technology to become a part of most of the Higher Education Institutions (HEIs) strategies. This paper aims to examine the barriers to M-learning adoption by HEIs in Malaysia. To do so, a quantitative research methodology was used in data collection. Online questionnaire was distributed by e-mail to 150 respondents in three universities. The result analysis brought out that mobile storage size, limitation of mobile memory and mobile battery life are the main barriers of using mobile in learning process.*

Keywords: Cloud Computing, Mobile Computing, Mobile Learning, M-Learning, Higher Education Institutions, Mobile Challenges, Cloud Computing Benefits.

1.0 INTRODUCTION

With the era of mobile technology (smartphones, tablets, notebooks... etc.) and wireless environment (Wi-Fi, 3G, 4G... etc.), using mobile in learning process offers a range of facilities for both lecturers and students. It allows them to exchange knowledge and materials, share information and ideas (texts, images, audios... etc.), solve questions and quizzes, and access a wide area of learning environment. HEIs have become the appropriate place to integrate student with M-learning. Using mobile devices in learning process will extend the benefits of e-learning systems; in addition it's facilitating the communication and interaction between lecturers and students. M-learning is considered as a development process of E-Learning that used to meet some of issues in E-learning such as wireless environment and accessibility [1]; also it can be considered as an advanced level of distance learning [2].

The main advantage of m-leaning is the accessibility; teaching and learning process can be conducted from anywhere at any time [3]. M-learning can be used to facilitate knowledge transmitted via the mobile phones, tablet PCs, PDAs… etc., and it can reduce physical distance between lecturers and students and enhance communication between them; because M-learning is any time/ anywhere technology, which will support both continues learning and elimination of illiteracy[4].

In spite of having many benefits and advantages for using m-learning, many challenges and issues still facing mobile learning technology. Challenges according to [2] are divided into two categories; Technical challenges and Social and educational challenges. Technical challenges are related to mobile functions and properties such as: limitation of battery life, limitation of memory, processing power, speed and content streaming, storage size and sharing, types of files. While social and educational challenges represented by: Security and privacy issue, Risk of distraction and Demographic boundaries and pedagogical considerations.

However, the main motivation that led to this research is that these scarce resources and challenges of mobile technology are hindering the using of M-learning in efficient manner in HEIs [5-7]. The next sub section will discuss the main problems that face the using of M-learning in HEIs

2.0 MOBILE LEARNING IN MALAYSIA

M-learning plays a significant role in the educational environment especially in developing countries. For example, A survey conducted by the Malaysian Communications and Multimedia Commission (MCMC) in 2007 found that adults (users aged between 20 and 49 years as at last birthday) represent the highest group of mobile phone users (66.8%) followed by pre-teens and teens (users aged up to 19 years old) (20.9%) [8]. Additionally, a study in 2009 conducted by (MCMC) mentioned that their higher penetration rate of mobile phone subscriptions of 106.2 per 100 people in Malaysia [9]. Lim et al.,[10] believe that this development and growth in such technology make inroads into the use of mobile devices for learning among Malaysian distance students. Also, Vitelli, as cited in Caudill [11] supported that “saturation of technology in the target audience would lend a hand in bringing to scale a successful application for m-learning”. Another interesting fact that related to M-learning in Malaysia shown in Ambient Insight Comprehensive Report (2011) is that globally, for the duration of 2010-2015, Malaysia is ranked as the 9th highest Mobile Learning Five-year Growth Rates [12].

3.0 LITERATURE REVIEW

According to [13], mobile storage is a critical issue mainly existed in three domains (contexts): mobile computing, cloud computing and mobile cloud computing. This issue needs to be addressed. Authors in their study presented a survey based on a review of many studies mainly concentrate on Mobile Storage Augmentation in the three mentioned domains. In order to achieve mobile storage augmentation; they discussed and identified many factors and issues facing mobile storage augmentation which were classified under three dimensions: Mobile device issues (Processing Capabilities, Energy Resource, Local Storage, Visualization Capabilities, Data Safety and Security and Privacy); Cloud-based issues (Reliability, Performance, Data lock-in, Security and Data Confidentiality and Service Level Agreement); Converged issues (Heterogeneity, Data Portability and Interoperability, Energy Efficiency and Long WAN Latency). However, there still open issues existed in mobile storage augmentations needs further research in the context of mobile cloud computing, these issues are: data integrity, trust and portability.

Sarrab et al., [14] in their study discussed the expansion evolution of mobile devices and the opportunity to combine them with learning process. Authors debated how mobile learning can enhance learning for both students and lecturers by highlighting the benefits and barriers of

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using mobile devices in learning process. Flexibility, anytime/anywhere access, enhance communication, support distance learning and support personalized learning; were the main benefits discussed. On the other hand, the challenges of mobile learning were basically concentrates on traditional software engineering applications, which are: the user interface of mobile device, the platform of mobile device (operating system) and the different of hardware makers. However, many issues and challenges haven't been discussed in this study such as storage size and processing power of mobile devices.

A quantitative study by [15] conducted on 91 survey samples to explore students' readiness to use mobile in learning from two local universities in Malaysia; University of Technology MARA and Universiti Kebangsaan Malaysia. Results showed that basically respondents are willing to accept the integration of mobile device with learning process but in general m-learning in Malaysia still in its infancy stage. The main benefits of using m-learning were summarized with the following advantages: save learning time, alternative to web based learning and alternative to traditional learning. However, authors didn't take into consideration the technical challenges within mobile devices which are hindering the adopting of m-learning in universities. Moreover, the respondents in the survey were restricted to students while lecturers have main role in adopting such technology.

Although the literatures suggest different advantages of mobile learning that provide different opportunities to encourage and support knowledge sharing and availability, studies neglecting the issue of scarce resources of mobile device that are difficult to be realized without respondents views. Not only this, the investigation of M-learning barriers and how it effects on knowledge availability and sharing in the Malaysian education system (e.g., HEIs) is absent and its theoretical investigation needs more focusing.

4.0 RESEARCH METHODOLOGY

This study aims to examine and explore the barriers to M-learning adoption by HEIs in Malaysia. However, due to the lack of research in this area, an exploratory study was conducted, [15] is referenced and adopted. For data collection, a quantitative research methodology was used.

Online questionnaire was selected as main instrument for data collection form the respondents, the questionnaire was distributed by e-mail to 150 students in three universities. In the online questionnaire, multiple questions were addressed to investigate the following two objectives: (i) to explore the students' opinions of M-Learning technology utilization; as such as (ii) to explore the students' opinions about the possible challenges that facing the use of M-Learning.

The questionnaire instrument contains four sections (see Table 1), which combined between open-end, closed questions and five-point Likert scales. The five-point scale was adopted because it facilitates the process of gathering information, increase accuracy, and the respondents (students) have the right to choose numbers that can be divided by "five" [16], with (1= strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree). Students were required to determine the extent to which each statement from their point of view was important or not important. The data results were analyzed after they were collected using SPSS (Statistical Package for the Social Sciences) software tool.

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Table 1: The Questionnaire Details (Adopted from [15])

Section	Title	No. of Questions
A	Demographic Data	3
B	Devices Ownership	1
C	Utilization and benefits of using mobile in learning	8 (Likert scale 1 to 5 was used)
D	M-learning challenges and obstacles	7 (Likert scale 1 to 5 was used)

5.0 RESULTS ANALYSIS

This section presents the analysis results of quantitative data in respect of the earlier outlined objective in section 4.

A. Demographic Data

Results show that 150 students were involved, where the majority of them were female 59.3% of under-graduate students with ages varies between 17 and 23, with percentage of 79.9%, as shown in Table 2.

Table 2: Demographic Data

	Respondent's Size	Percentage
Gender		
Male	89	40.7%
Female	61	59.3%
Age		
17-23	119	79.9%
24-26	13	8.7%
27-30	11	7.4%
Above 30	7	4.0%
Students Categories		
Under-graduate	125	84.2%
Post-graduate	25	15.8%

B. Device Ownership

Mobile phone, Smart phone (mobile phones with much more advanced hardware and capabilities such as iPhone, Blackberry, Samsung), Personal Digital Assistant (PDA), Tablet or E-book reader (e.g., iPad, Kindle, Slate), Portable Music/Video Player (e.g., iPod, Zune), Notebook or Laptop are the most common mobile devices that can be used for supporting M-learning. As shown in Figure 1, the analysis result brought out that the majority (81.2%) of students own smart phone and notebook or laptop. While, 32.9%, 2.7%, 18.1% and 11.4% of students are own mobile phone, PDA, Tablet or E-book reader, and Portable Music/Video Player respectively. This indicates that some student may have more than one mobile device which will help in supporting mobile learning.

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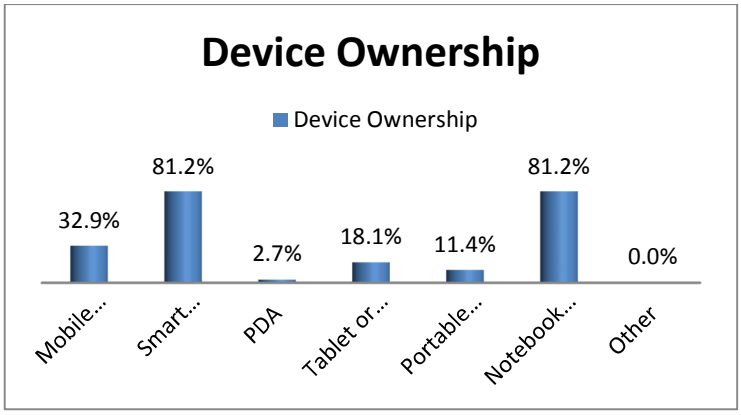

Figure 1: Device Ownership

C. Utilization and Benefits of Using Mobile in Learning

To explore the students' opinions of mobile learning technology utilization, section C focus on the utilization and benefits of using mobile in learning. In Figure 2 the analysis results revealed that 92.0% of respondents are using mobile in the learning process, while 8.0% of them don't use it.

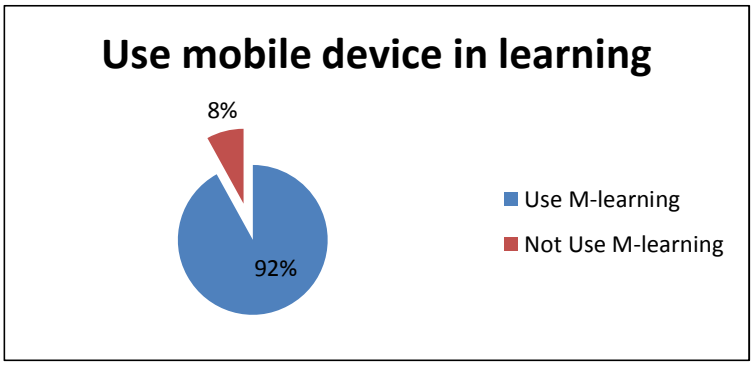

Figure 2: Mobile Usage

In addition, seven elements are used to measure the utilization of mobile for learning purposes. Table 3 shows the overall satisfaction of students in relation with the benefits of using M-learning. For example, the majority of students are agreed and strongly agreed that mobile learning is always available to them when they need it (Mean = 4.3; SD = 0.7).

Table 3: The benefits of using m-learning

Elements	Mean	SD
Increase the quality of the instruction at the university.	3.9	0.8
Always be available to me when it's needed.	4.3	0.7
Make my learning more convenient and easy.	4.2	0.8
Improve my learning time.	4.0	0.9
Encourage me to learn.	3.8	0.9
Enhance communication with my lecturers.	4.1	0.9
Enhance communication with my colleagues.	4.4	0.8

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D. M-learning Challenges and Obstacles

To explore the students' opinions about the possible challenges that facing the use of M-Learning, seven elements related to the mobile infrastructure resources are used to measure the challenges and obstacles of using M-learning. Table 4 shows the overall satisfaction of students in relation with the challenges and obstacles of using M-learning.

In section D, the majority of respondents agreed that there are many technical obstacles within the mobile itself which hindering the completeness of learning process such as limitation of battery life, limitation of memory, processing power, speed and content streaming, storage size and types of files (See Table 4).

Table 4: The challenges of using m-learning

Elements	Mean	SD
Mobile devices have a limited storage sizes.	4.1	0.8
Mobile devices have a limited battery life.	4.4	0.7
Mobile devices have a limited memory size.	4.3	0.7
Processing power, speed and content streaming of material are slow.	3.9	0.9
Connectivity to internet is poor.	4.2	0.9
Not all types of files are supported by all mobile devices as it differs according to operating system.	4.3	0.8
Not all software applications can be installed on the mobile devices.	4.3	0.8

The analysis result brought out that most students are suffering of mobile storage sizes and capabilities (Mean= 4.1; SD=0.8). Such a challenge, learner will not be able to store everything needed. Secondly, the analysis result revealed that mobile battery life is one of the most challenges face students when using mobile in learning process (Mean= 4.4; SD= 0.7). Some battery mobile devices last only for four hours of use, while the battery of smart phone lasts approximately from eight to ten hours. If the battery runs out, learner must recharge it again. Once the learner needs a continuous learning environment, the mobile learning strategy should be changed. Furthermore, the analysis result shows that mobile memory is another challenge when using mobile for leaning (Mean= 4.3; DS=0.7). Limited memory size will lead to cognitive resources overloading. For example, a learner is reading some text, while listening to the same text and viewing some animation related to the text content. Also, mobile Processing power, speed and content streaming of material are another challenge of using mobile for learning (Mean= 3.9; SD= 0.9). This challenge refers to the mobile ability of manipulating data. Two main consumers of processing power are: operating system and applications. Following, connectivity to internet is another challenge (Mean=4.2; SD=0.9); the limitations of wireless bandwidth and the number of learners using the network may lead to internet disconnection. Next challenge is that not all types of files are supported by all mobile devices as it differs according to operating system (Mean= 4.3; SD=0.8), not all software application can be installed on the mobile device. Lastly, not all devices support all types of applications (Mean=4.3; SD=0.8), where it differs according to platform (operating system).

6.0 DISCUSSION

Due to scarce resources of mobile device; knowledge sharing and availability are two of the main factors that present challenging problems to students and lecturers when they use M-learning applications. Despite the growing success and benefits of using M-learning in higher

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education, dealing with large size of learning contents (e.g., design applications, programming applications, books, articles, power points), are hindering and limiting the knowledge sharing and availability of using M-learning in efficient manner. This is because mobile devices are likely to have scarce resources, such as small storage size, battery consumption, little memory, slow CPU speed, which in turn cannot operate and manage this large amount of applications and materials. [17-20], [5,6] and [2] found that there is lack of accessibility and communication to M-learning technology, which it is not utilized repetitively and effectively by most users (e.g., students and lecturers) due to several issues related to scarce resources of mobile device.

Storage size refers to the available storage devices that provide capacities for storing on demand data [21]. However, mobile devices have a limited storage sizes and capabilities. In the case of large amount of applications and materials, knowledge sharing and availability will be limited to the storage sizes and capabilities of mobile device [2] and [9]. In addition, mobile devices being battery powered have limitation on the battery time of the mobile devices (battery consumption). However, some battery mobile devices last only for four hours of use, while the battery of smart phone last approximately from eight to ten hours. If the battery runs out, student must recharge it again. One of the main issue that lead to fast battery consumption is that large amount of traffic and program execution are require a lot of processing which in turn consume battery [22], [19] and [17]. Furthermore, mobile device has a problem of CPU speed and little memory. Little memory of mobile device will lead to cognitive resources overloading. For example, a student is reading some text, while listening to the same text and viewing some animation related to the text content [5] and [19]. Low processing speed and content streaming of mobile device will reduce the ability of manipulating data. In learning environment there are two main consumers of processing power which are operating system and applications [19] and [23]. [22] mentioned that an intensive memory demanding jobs that executed on a mobile device will exhaust device energy.

In addition, risk of damage and destruction is one of the main challenges of using mobile device in learning process. Once the mobile is damaged or destroyed it will be very difficult to retrieve valuable learning contents. From this perspective mobile device is not secure enough to save valuable learning content. However, there are many other barriers that effect badly on the knowledge sharing and availability using m-learning such as (Software application limitations, Types of files, Demographic boundaries and pedagogical considerations).

In his study [6], Park believe that since M-learning application is a part of campus-based e-learning system, it should be designed and developed carefully to be easy to use and insure its usefulness to improve learning process. However, the scarce resources of mobile device will effect badly on the usability of M-learning applications, since the usability of any application is not only influenced by the issues of graphical user interface design of the application, but it can also affected by other issues including the device [24]. Therefore, mobile devices are require to respond to the large size of learning contents and unexpected changes in the education environment in order to support and increase the level of knowledge availability and sharing among users.

7.0 CONCLUSION

The main purpose of this study was to examine and explore the barriers and challenges to adopt M-learning by HEIs in Malaysia. To do so, a questionnaire was developed to measure various aspects of students' opinions of mobile learning technology utilization, and students' opinions about the possible challenges that facing the use of M-Learning. The results indicated that the

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usage of mobile devices among students in learning process is high. In addition, the study brought out that there are many technical challenges due to the scares resources of mobile. Such challenges are hindering the completeness of learning and limiting the knowledge sharing and availability when using mobile for learning. Further research will focus on the implementation of M-learning model that can meet these challenges and make the M-learning more usable and effective.

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