A GUIDELINE FOR BUILDING ACCEPTANCE TO USE M-LEARNING MEDIA

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Nowadays various kinds of information and communication technologies are playing a vital role in every sector of society and economy, including in education. Most education institutions use these innovative technologies in assisting the management and provision of information, supporting instruction as well as facilitating learners in their access to academic sources and other exchanges of knowledge and communication. The purposes of this research are to study the related factors and then to provide guidelines on using M-learning for instructional purposes more effectively than with traditional classroom instruction. Our sample includes 400 students and the key research tool is questionnaire. The research findings point out that the factors affecting the acceptance of M-learning include the perceived ease of use of the application, attractiveness of the lessons contents, and the quality of the Internet connection. It can be concluded that the most important factors motivating this kind of technology acceptance for instructional purposes are the development of attractive contents within the application, and the quality of the applied information technologies, including the Internet system. Together they attract learners to use this application and thus increase their learning achievements.

Keywords: e-learning; m-learning; technology acceptance

Introduction

The increasing popularity of new technologies' implementation in management and provision of information today includes the use of various innovative medias to support the instruction process and to facilitate learning and communication among students, personnel

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and instructors in part of access to data and lessons, and also for various other knowledge exchanging purposes. Nowadays there exists a strong need, due to business competition, to attract customers (who are basically students) to buy the education products (the body of certain knowledge as a form of capital for their future career after their graduation), therefore, it is advantageous for all education institutions to provide innovative tools as supportive factors attracting learners to continue their studies at the university using most advanced technologies rather than those without such technologies.

For example, the e-learning mode enables learners to study by themselves, at anyplace and anytime. This is convenient because students do not have to go to the university (Bowless, 2004). At present, students can also continue and deepen their studies in overseas universities through electronic learning (E-Learning). In this case they can choose the topics of their preference and according to their personal and professional interests. They are also able to study the theoretical contents, do practical exercises and complete tasks via online learning systems while instructors will provide praises or comments for improvement/corrections based on the standard quality measurement and evaluation as it is usually done in offline universities. Noteworthy, these kinds of learning methods are also available at the graduate, postgraduate, doctorate and postdoc levels (Jamonman, 2007).

Continuous changes in technologies are leading to the development of new innovations. This makes it unavoidable for people in the today world to be strongly dependent on information & communication technologies in their daily lives, and education is no exception in this regard. Both students and faculty members thus become dependent on the availability of digital equipment, such as notebooks and tablets, to support more effective learning and instruction. However, the use of such innovative tools and the related equipment to increase the efficiency of the learning process and academic instruction will not be fully beneficial and efficient if users lack skills and good attitudes to learn how to use these new technologies. All these factors are affecting the acceptance of innovations. The study of behaviors and factors affecting the acceptance of m-learning for instructional purposes is therefore much needed.

This study is dedicated to m-learning (mobile learning), with its specific educational purposes in today's world in which learners and other users can use innovative methods and technologies to serve the key goals of the university process — to increase the quality and efficiency of both learning and instruction processes.

Related Research Studies

Definition of M-Learning

Vaetulan, P. (2008) defines m-learning as learning carried out by means of using portable computers connected wirelessly with other information sources. These kinds of computers can be categorized into 3 major groups as follows:

Group 1. PDA (personal digital assistant) is a small portable computer as large as a palm of one's hand, also known as Pocket PC and/or Palm. This group also includes PDA with built-in telephones controlled by a stylus. The group also includes other kinds of small computers, such as laptops, notebooks, and tablet PCs.

Group 2. Smartphones. Smartphone is a handphone with all the functions of PDA, except for a stylus. The key advantages of this kind of a computer include: its small size enabling excellent portability, its electricity saving, and its reasonable pricing options. The

term “handphone” is widely used in the Asia Pacific region while in America the most popular term is “cell phone” deriving from “cellular telephone” is used. In some other countries “mobile phone” is the most frequently used equivalent.

Group 3. iPods and other MP3 players. iPod is a term used for Apple products primarily. While MP3 player is a more general term referring to a portable sound machine which can load data from the computer via USB or receiving signal via bluetooth. In the new MP3 models, the harddisk may have up to 512 GB to allow video and game functions.

Technology Acceptance Model (TAM)

Technology Acceptance Model was developed by Davis back in 1989 (Davis, 1989) through developing and enlarging knowledge and stemming from the Theory of Reasoned Action — TRA.

This model is widely accepted and often used while studying various technology acceptance processes. Davis (1989) introduced TAM which can explain the technology acceptance of every individual.

The goal of TAM is to explain the factors important for the technology acceptance including perceived usefulness, perceived ease of use, the attitude towards using technologies, and behavior intention.

TAM explains only the factors concerning perceived usefulness and the ease of use. At the same time, such factors as flexibility and completeness of information are not in the center of attention according to this model. Moreover, due to the difficulties and complexity of behavioral research, a single concept of technology acceptance cannot actually cover all the things that need to be studied. The Unified Theory of Acceptance and Use of Technology (UTAUT) has been therefore proposed to eliminate such limitations found in the TAM theory.

Unified Theory of Acceptance and Use of Technology: UTAUT

The Unified Theory of Acceptance and Use of Technology has been developed by Venkatesh et al. (2003). These authors have been studying the combination of theories concerning the technology acceptance consisting of 8 models including: the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT). Their study has found that the factors affecting the acceptance and the use of new technologies include: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Moreover, other factors including gender, age, experience, and the willingness to use technology are combined to form the Unified Theory of Acceptance and Use of Technology (UTAUT).

As per the presented above research conceptual framework, eight research hypotheses have been formulated as follows:

Hypothesis 1-8 ($H_{1,...,8}$): Variables 1,...,8 are affecting the acceptance of m-learning.

Research Methodology

1. Planning and identifying the sample by means of using a questionnaire to survey 19,336 students already practising m-learning for instructional purposes. The survey has been conducted at the premises of Suan Sunandha Rajabhat University (Bangkok, Thailand). Taro

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Yamane Sample Size Determination method has been employed with 5 % of discrepancy and Probability Sampling results. 392 samples have been taken from 8 faculties and colleges of the university mentioned above: the Faculty of Education, Faculty of Science and Technology, Faculty of Management Sciences, Faculty of Humanities and Social Sciences, Faculty of Industrial Technologies, Faculty of Fine Arts, College of Nursing, and College of Innovation and Management. According to the Taro Yamane Sample Size Formula, we've got 95% reliability.

Variables affecting the acceptance of m-learning are as follows:

The independent variables can be divided into two groups:

Group 1. Basic information on the learners, including gender, faculty affiliation, academic year, type of equipment used, operative system, frequency of use.

Group 2. Information concerning the factors affecting the acceptance of m-learning, including such factors as skills in using technologies, perceived usefulness, the ease of use, learners' interaction, attractiveness of lessons contents, the support of organization, system security, the quality of the Internet connection.

The dependent variable is the acceptance of m-learning as such.

The research investigation was carried out in December 2018 to April 2019.

Statistics employed to measure the validity of the questionnaire include IOC. Descriptive Statistics employed to analyze quantitative data include frequency, percentage, Mean, and S.D. Statistics employed to test the initial hypotheses and to find the correlation between the independent and dependent variables include multiple linear regression analysis.

2. Research tools included in the questionnaire were divided into two parts. Part 1 covered basic information on the respondents, including gender, faculty, academic year, type of equipment in use, operative system at the moment (Android, IOS, Windows), and the frequency of use. Part 2 included the items measuring the level of opinions, the attitudes to the factors affecting the acceptance of m-learning, namely, eight factors measured with the help of 5-point Likert's scale: highest, high, moderate, low, and lowest.

Further steps have been as follows:

3. Collecting data from the sample.
4. Collecting and analyzing data using SPSS for Windows.
5. Concluding and discussing the research findings.

Expected Outcomes

1. Determination of the key factors affecting the acceptance of m-learning by students.
2. The use of research findings as guidelines for corrections, improvement and support of the m-learning acceptance by university students.
2. The application of our research findings as guidelines for planning the development of suitable IT systems in line with the organizational context to increase the acceptance of m-learning methods.

Research Findings

The total samples of this study included 400 1-4-year full-time students at Suan Sunandha Rajabhat University, Bangkok.

The sample consisted of 245 females (61.30%) and 155 males (38.80%). In terms of faculties and colleges included in our sample the division has been as follows: 108 students (or 27.00%) were from the Faculty of Humanities and Social Sciences, followed by 97 students (or 24.30%) from the Faculty of Management Sciences, 53 students (or 13.30%) were from the Faculty of Science and Technology, 46 students (or 11.50%) — from the Faculty of Education, 36 students (or 9.00%) were representing the Faculty of Industrial Technologies, 32 students (or 8.00%) — the Faculty of Fine Arts, 18 students (or 4.50%) were from College of Innovation and Management, and finally 10 students (or 2.50%) were studying in the College of Nursing and Health.

By the year of studies the total sample was divided as follows: 122 students (30.50%) were in their 2nd year, followed by 103 students (or 25.80%) in their 1st year, 92 students (23.00%) were 4th-year students, and 83 students (20.80%) were in their 3rd year of the university studies.

By the types of equipment, the division was the following: 175 students (43.80%) were using tablets while studying, followed by 127 students (or 30.50%) using various smartphones. Finally, 98 students (or 24.50%) were using notebooks (laptops).

By types of operating systems, the sample was divided in the following way: 133 students (30.30%) were using Windows Phones, followed by 94 students (or 23.50%) using different versions of iOS, 93 students (or 23.30%) were using Windows, and finally 80 students (or 20.00%) were on Android.

In terms of frequency of applications' use the division was as follows: 142 students (35.50%) use the applications in question 6-10 times per week, followed by 134 students (33.50%) using the applications 2-5 times per week. 108 more students (or 27.00%) were using the applications more than 10 times a week, and finally 16 students (or 4% only) used the applications just once a week.

Table 1 - Students' opinions towards the factors affecting the acceptance of m-learning

(Source: made by co-authors)

Factors affecting the acceptance of m-learning	level of opinions		
	Mean	S.D.	level
1. Skills in using technologies	3.47	0.70	high
2. Perceived usefulness	3.92	0.59	high
3. Perceived ease of use	3.47	0.59	high
4. Interactions among learners	3.67	0.73	high
5. Attractiveness of contents in lessons	4.04	0.55	high
6. Organization's support	3.63	0.74	high
7. Security of the system overall	3.35	0.65	moderate
8. Quality of the Internet connection	3.86	0.63	high
TOTAL	3.68	0.65	high

Tab. 1 shows the average level of opinions towards the acceptance of m-learning classified by items as follows:

The average in the sample level of opinions is high level; it includes the factor affecting the acceptance of m-learning in part of skills needed for using such technologies. The mean

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value of this factor is at 3.47. Then, the factor concerning perceived usefulness has the mean at 3.92. The factor concerning the perceived ease of use has the mean at 3.47. The factor concerning interactions among learners has the mean at 3.67. The factor concerning the attractiveness of lesson contents has its mean score at 4.04. The factor concerning university's support has the mean at 3.63. The factor concerning security of using m-learning has been found to be at the moderate level with the mean being at 3.35. Finally, the factor concerning the Internet quality is also at the high level, with the mean at 3.86.

Table 2 - The analysis results for the research model using multiple regression analysis,
model summary^d
(Source: made by co-authors)

Model (3)	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin- Watson
1	0.500 ^a	0.250	0.248	0.44311	
2	0.563 ^b	0.317	0.314	0.42340	
3	0.574 ^c	0.329	0.324	0.42015	1.986

a. Predictors: (Constant), factor concerning the attractiveness of lessons' contents

b. Predictors: (Constant), factors concerning the attractiveness of the lesson's contents and the quality of the Internet

c. Predictors: (Constant), factors concerning the attractiveness of lessons' contents, the Internet quality, and the perceived ease of use

d. Dependent Variable: the acceptance of m-learning

Tab. 2 shows that three variables in Model 3 explain the factors affecting the acceptance of m-learning at 32.90%. Durbin-Watson test result is at 1.986, thus ranging between 1.5 – 2.5. It can be concluded that the variance is interdependent and consistent with the multiple regression analysis.

Table 3 - Results of variance analysis, ANOVA^a
(Source: made by co-authors)

Model		Sum of Squares	Df	Mean Square	F	Sig.
3	Regressi on	34.294	3	11.431	64.7 57	0.00 0 ^d
	Residual	69.905	396	0.177		
	Total	104.199	399			

a. Dependent Variable: the acceptance of m-learning

b. Predictors: (Constant), factor concerning the attractiveness of lessons' contents

c. Predictors: (Constant), factors concerning the attractiveness of lessons' contents and the Internet quality

d. Predictors: (Constant), factor concerning the attractiveness of lessons' contents, the Internet quality, and the perceived ease of use

Tab. 3 reveals significance at 0.000 (which is less than 0.05) under the specified value α . This allows us to conclude that at least one independent factor affects the acceptance of m-learning.

The analysis results for the eight factors under consideration point out that the factor affecting the acceptance of m-learning with the highest mean scores include the factors of lessons' contents' attractiveness, followed by the factor of perceived usefulness, then goes the Internet quality, then interactions among learners, then university's support, the skills of using related technology, and the perceived ease of use, in the respective order. The factor with the lowest mean score is security of m-learning.

The analysis of the factors affecting the acceptance of m-learning carried out by means of SPSS, using multiple regression analysis with stepwise order reveals the group of independent variables affecting the acceptance of the m-learning method by considering Model 3 with the highest scores for multiple correlations: R at 0.574, and R Square at 0.329. According to Tab. 3, the variance of independent variables includes perceived usefulness, attractiveness of lessons' contents, and the Internet quality affects the acceptance of m-learning at 32.9%, which is the highest score in all multiple regression analyses carried out. Model 3 of stepwise order is, therefore, employed.

Table 4 - Analysis results for the coefficients of factors affecting the acceptance of m-learning^a
(Source: made by co-authors)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
3	(Constant)	1.552	0.174		8.922	0.000		
	attractiveness of lessons' contents	0.301	0.047	0.323	6.363	0.000	0.658	1.519
	Internet quality	0.195	0.039	0.239	4.976	0.000	0.736	1.358
	perceived ease of use	0.123	0.046	0.142	2.677	0.008	0.599	1.669

a. Dependent Variable: the acceptance of m-learning

Tab. 4 shows the results of the multiple regression analysis concerning the relevance/irrelevance of each independent variable. Tolerance values are 0.658, 0.736, 0.599, and 0.599 with the average score being 0.664 (thus, not equal to 0). Moreover, the correlation occurs here between the ANOVA table and Coefficients table. This also proves the irrelevance among the independent variables under consideration. Furthermore, values of less than 3 obtained for all the variance inflation factors (VIF column in the table above) means that the independent variables' multicollinearity is trouble-free (Luanwan, 2012).

Since the results of the conditional test based on multiple regression analysis disclose the precise conditions as specified, it can be concluded that all of our analysis results can be treated as applicable. Tab. 4 also demonstrates the level of reliability being at 95%. The significance of the three independent factors including perceived ease of use, attractiveness of lessons' contents, and the Internet quality is less than 0.05. It can, therefore, be concluded that these three independent factors are suitable for the analysis of factors affecting the dependent factor — the acceptance of m-learning.

From the multiple regression analysis with the stepwise order, the equation of linear regression for the sample will be as follows:

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$$Y = \beta_0 + \beta_1 X_1(\text{PEU}) + \beta_2 X_2(\text{AC}) + \beta_3 X_3(\text{IQ})$$
$$Y = 1.552 + 0.123 (\text{PEU}) + 0.195 (\text{AC}) + 0.301 (\text{IQ})$$

Unstandardized coefficients' Beta constant is 1.552. No. 3 from Coefficients Table

Y is the acceptance of m-learning (also known as user adoption)

PEU is the perceived ease of use

AC is the attractiveness of lessons' contents

IQ is the Internet quality.

Stemming from the equation above, we can forecast the acceptance of m-learning: 1 unit increase in the perceived ease of use, in the attractiveness of lessons' contents, and the Internet quality leads to to 1.552 unit increase in the acceptance of m-learning methods.

From the analysis results and the hypothesis testing, it can be concluded that three independent factors out of eight, namely, perceived ease of use, attractiveness of lessons' contents and the Internet quality, show the significance at 95% less than 0.05 which is the specified α , thus resulting in the rejection of H_0 but acceptance of H_1 . It can, therefore, be concluded that the perceived ease of use, the attractiveness of lessons' contents, and the Internet quality affect the acceptance of m-learning. However, in terms of factors concerning skills of using digital and mobile technologies, perceived usefulness, interactions among learners, organization's support and online security, there is significance at 95% more than 0.05 resulting in the acceptance of H_0 but rejection of H_1 . It can, therefore, be concluded that the factors concerning skills in using digital and mobile technologies, perceived usefulness, interaction among learners, organization's support and online security do not affect the acceptance of m-learning.

Research Conclusions

The research which was initially aimed to provide guidelines on better acceptance of m-learning may now conclude as follows:

The sample included 400 respondents, most of whom were females studying at the Faculty of Humanities and Social Sciences followed by the Faculty of Management Sciences and the Faculty of Science and Technology, primarily in the 2nd year followed by the 1st year of studies. Equipment used by the students in our sample includes first of all tablets followed by smartphones, while the least used equipment is notebooks.

The most frequently used operating system in the sample is Windows Phone followed by iOS. The highest frequency of the application use is 6-10 times per week.

In terms of factors affecting the acceptance of m-learning, the factor with the highest mean score is the attractiveness of lessons' contents, followed by the factors concerning perceived usefulness, the Internet quality, interaction among learners, organization's support, the skills in using digital and mobile technologies, perceived ease of use, and finally online security, respectively.

The details on each of these factors point out those learners are able to study and review lessons at any place and any time convenient for them. Moreover, the University Internet system is stable, and there is confirmed convenience in the interactions among learners and also between learners and the involved faculty members. Other factors seem to be less significant for the surveyed students.

The total level of opinions in the sample concerning the acceptance of m-learning method is high level, with the average mean being at 3.95.

Stemming from the research hypothesis testing, it can be concluded that the factors related to the acceptance of using m-learning include three items: the perceived ease of use, the attractiveness of lessons' contents, and the Internet quality. It can, therefore, be concluded that 1 unit increase in the perceived ease of use (PEU), attractiveness of the lessons' contents (AC), and the Internet quality (IQ) leads to 1.552 unit increase (or 32.90%) in the acceptance of m-learning as a teaching/learning method.

Discussion

Our analysis results concerning the factors affecting the acceptance of m-learning show that these factors correlate with the Unified Theory of Acceptance and Use of Technology — the UTAUT. That is to say, three factors affecting the acceptance of m-learning method, especially the perceived ease of use, should be certainly taken into account while developing guidelines on organization of training for faculty members. This conclusion of ours is consistent with the ones of Sammaworakit, P. and Jumpolsathaen, A. (2014)..

Our second observation from the analysis results is that it is necessary for education institutions to organize trainings about new technologies so that to continuously facilitate the effective use of these new systems with the purposes of increasing their perceived ease of use.

In terms of attractiveness of lessons' contents and the Internet quality, it is important for education organizations to develop faculty members' skills and, inter alia, to invest in them through allocating extra budgets for the production of lesson contents in the form of various multimedias.

Instructors and/or other academic staff members should become responsible for designing effective and impressive e-lessons supporting learners' self-study process. This conclusion of ours correlates with the previous ideas that m-learning with its regularly updated data, attractive lessons' contents, clear explanation of the knowledge flow, ease to access and the use of various multimedia forms (colorful images, moving pictures, and sound effects) will attract learners to learn from anywhere and anytime, in the conditions most comfortable for them. In simplified terms, colorful graphics, motion pictures and sounds will make sure the students do not get bored.

This correlates with the conclusions of Tuntirojanawong, S. (2014). Their study confirms that the Internet quality is an important external factor attracting users to choose mobile mode for learning due to obvious benefits of m-learning, namely, super easy access to online lessons from anywhere and at any point of time. M-learning context should, therefore, be created within education institutions so that learning can be really performed from anywhere and anytime (Bai & Lee, 2003).

At the same time, we would like to add that there is no correction among other factors, such as gender and age, because there are no demographic problems among today's users when it comes to acceptance of innovations and/or skills needed for m-learning.

Finally, the most important issue in this context is the process of awareness building and experience passing, from person to person. We must not forget that learning is in the core of m-learning (Vaetulan, 2008). Educational objectives should be the top priority, no matter how wireless/mobile is the process of knowledge transfer.

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