Practitioners' Validation on Effectiveness of Mobile School Model

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ABSTRACT

MobileSchool model is developed for the implementation of MobileSchool system in Malaysian secondary schools. This paper presents practitioners' perceptions on effectiveness of MobileSchool model. For this specific study, practitioners refer to practitioners in field of information and communication technology (ICT) and education. This study uses questionnaire instrument that involves 108 respondents who are in ICT and education fields. MobileSchool model involves five variables; software as a service (SaaS) of cloud computing, mobile web technology, transactional distance theory (TDT), Social Information Processing theory (SIPT) and mobile usability principle. Descriptive analysis and hypothesis evaluation have been conducted to validate the effectiveness of the variables that were included in MobileSchool model. Five hypotheses have been constructed to represent five variables. In analyzing the data, Pearson's Product-Moment Correlation has been conducted to determine significant correlation between these five variables with the effectiveness of MobileSchool model. Results showed that the mean score of all variables were higher than mean of Likert scale, thus, most of the respondents gave positive feedbacks to all elements identified in MobileSchool model. Besides, result also showed that there are statistical evidence to proof the significant relationship between variables of MobileSchool model and the effectiveness of MobileSchool model to be implemented in MobileSchool system.

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1. INTRODUCTION

MobileSchool system is a learning management system (LMS) that will be developed for the use of secondary schools in Malaysia. By adopting MobileSchool system, teaching and learning activities would be conducted via mobile devices including smartphones and tablets. The development of MobileSchool system applies the elements of MobileSschool model [1]. The derivation of MobileSchool model has been discussed in detail in [1] where the model was developed to solve existing problems of current teaching and learning practices in Malaysian secondary schools [2] especially communication, and mobile learning system problems including physical limitation of mobile devices [3] and usability [4]. MobileSchool model integrates theories and concepts that theoretically can solve the identified problems. Then, MobileSchool system will be developed by integrating all theories and concepts that have been adopted in MobileSchool model.

Before developing MobileSchool system, all elements identified in MobileSchool model must be tested to validate the effectiveness of the model. Therefore, the main objective of this study is to validate the effectiveness of MobileSchool model. In Information Systems' (IS) discipline, there are two different types of effectiveness; practical effectiveness and theoretical effectiveness [5]. Practical effectiveness refers to the positive changes or improvements of a business process outputs after implementing the new IS model [6].

However, this study will focus on theoretical effectiveness where it refers to the perceptions of stakeholders on the effectiveness of the IS model when the model is applied into the real system [7]. In the context of the study discussed in this paper, the target stakeholders involve the practitioners in Information and Communication Technology (ICT) and education fields.

2. RELATED WORKS

Related works will be discussed in this section that discuss the measure for the effectiveness of human resource information systems in an Iranian oil company [7] and validating a model for mobile learning service quality [8].

In the study that has been conducted by Ramezan [7], there are three variables incorporated in the model of human resource information systems in national Iranian oil company; information quality; system quality; and system use. This study involves 1110 respondents from for different Iranian oil companies which are NIOC, NIORDC, NIGC and NPC. Reliability test had been conducted where 35 respondents were involved. The reliability of the data reported was represented by the Cronbach's alpha value, which was 0.92 indicating that the questions in the questionnaire were internally consistent. The data of 1110 respondents then been entered into SPSS software and the normality is conducted. The normality test shows that the data is not normally distributed. Binomial test, which is one of the non-parametric tests, was therefore performed. The reported p values for all variables are 0.92, 0.82 and 0.91 for information quality, system quality and system use respectively. Results of the Binomial test shows that the p values for all three variables are higher than α value 0.05. Hence the significant relationships were statistically proven between all three variables with the effectiveness of the Human Resource Information Systems utilized in 4 Iranian oil companies.

A similar study had been conducted by Al-Mushasha [8] to validate the a model for mobile learning service quality. The model incorporated nine variables which are interface, reliability, trust, personalization, content usefulness, content adequacy, easy to use, accessibility and interactivity. This study involves 258 respondents who are students in Universiti Utara Malaysia. Pilot testing had been conducted before the questionnaires were distributed to the larger sample. It involved 30 respondents and the questionnaires were statistically proven for internal consistency. After collecting all data from 258 respondents, the data then been analyzed. Normality test was performed and it was found that the data was not normally distributed. Different from the study discussed earlier which was conducted [7], Al-Mushasha [8] disregarded the normality of the data distribution since the sample size was bigger than 258, hence the data was assumed to be normally distributed. In order to validate the variables in the proposed model, Pearson correlation of parametric statistical had been conducted. The results of this analysis show that the value of Pearson correlation, r is 0.486 for interface, 0.591 for reliability, 0.501 for trust, 0.374 for personalization, 0.227 for content usefulness, 0.608 for content adequacy, 0.505 for ease of use, 0.429 for accessibility and 0.560 for interactivity. Based on these results, it can be concluded that all variables have significant relationships with the quality of mobile learning service quality model in a university environment.

3. METHODOLOGY

3.1. Questionnaire Distribution

The study reported in this paper employed a convenient sampling where the questionnaires were distributed via online SurveyMonkey system (https://www.surveymonkey.com/s/6WRYGKN) to 108 respondents who were practitioners in ICT and education fields. The questionnaire contains 7 sections; demographic information, Software as a Service (SaaS) of cloud computing, mobile web technology, Transactional Distance theory (TDT), Social Information Processing theory (SIPT), mobile web usability and effectiveness of the system. The questions of the questionnaire have been adopted from [9], [10], [11], [12], [13], [14] and [15]. For all sections except demographic information, respondents have to rate the statements using the Likert scale of 1 to 5 (strongly disagree to strongly agree) practice. Out of 108 respondents, only 95 respondents completed the questionnaire (response rate was 87.96%). The number of respondents for this study was sufficient and will be able to produce reliable data as it was in line with the study that had been conducted by [16], [17] and [18] where these studies involved less than 100 respondents.

The respondents involved 57.4% male and 42.6% female, 54.63% are from ICT field and 45.37% in education field, most of the respondents were Malaysian and Indonesian and aged between 16 to 35 years old. For respondents in ICT field, majority of them have the expertise in Information System, Knowledge Management, and E-learning.

Before the questionnaires were distributed to 108 respondents, the questionnaire has been previously pilot tested to 53 postgraduate students from Department of Computer & Information Sciences, Universiti Teknologi PETRONAS in order to check the internal consistency of the questions. As presented in Table 1, the Cronbach's alpha values of all sections were higher than 0.70 which indicate the questions were reliable [19].

Table 1. Reliability Score of Questionnaire

Section	Cronbach's Alpha
Software as a Service	0.83
Mobile Web Technology	0.79
Transactional Distance Theory	0.77
Social Information Processing	0.86
Mobile Web Usability	0.73
Effectiveness of the System	0.89

a. Data Analysis

Five hypotheses have been constructed to analyze the relationship between five different elements with the effectiveness of MobileSchool model:

1. *There is significant correlation between software as a service (SaaS) implementation with the effectiveness of MobileSchool model.*
2. *There is significant correlation between mobile web technology implementation with the effectiveness of MobileSchool model.*
3. *There is significant correlation between transactional distance theory implementation and the effectiveness of MobileSchool model.*
4. *There is significant correlation between social information processing theory implementation with the effectiveness of MobileSchool model.*
5. *There is significant correlation between mobile web usability implementation with the effectiveness of MobileSchool model.*

Then, the data by the respondents were then entered into Statistical Package for the Social Science (SPSS) software version 20.0. Prior to the data analysis, normality test would been conducted in order to determine the distribution of the data. A parametric analysis would then be carried out if the data is normal. On the other hand if the data are not normally distributed, non-parametric would be performed. The normality test and hypotheses evaluations will be further discussed in the following section.

4. RESULTS & ANALYSIS

This section discusses the descriptive results of the questionnaire, normality test and hypothesis evaluation.

4.1. Descriptive Results

As mentioned in section 3, the questionnaire adopted the Likert scale of 1 (strongly disagree) to 5 (strongly agree). Table 2 presents the summary of mean score for every section in the questionnaire.

Table 2. Summary of Mean Score

No	Section	Mean score
1	Software as a Service	3.45
2	Mobile Web Technology	3.78
3	Transactional Distance Theory	3.83
4	Social Information Processing Theory	3.74
5	Mobile Web Usability	3.90
6	Effectiveness of MobileSchool	3.88

Based on Table 3, the mean score for all sections (variables) were higher than mean of Likert scale (3.00). Therefore, it can be concluded that all variables were very important to be included in order to ensure the effectiveness of MobileSchool system.

a. Hypothesis Evaluation

Hypothesis evaluation was used to determine the significant correlation between the variables and the effectiveness of MobileSchool model. As mentioned in section 3, there are five hypotheses that will be tested. As mentioned by [19], the data is considered as normally distributed if the number of sample (n) is bigger than 30, thus, Pearson's Product-Moment Correlation has been used to analyze the hypotheses. Table 3 illustrates the results of Pearson's Product-Moment Correlation analysis that has been conducted.

Table 3. Results of Pearson's Product-Moment Correlation Analysis

No	Variable	r	p
1	Software as a Service	0.68	0.04
2	Mobile Web Technology	0.70	0.00

No	Variable	r	p
3	Transactional Distance Theory	0.64	0.00
4	Social Information Processing Theory	0.68	0.03
5	Mobile Web Usability	0.82	0.00

Based on the results presented in Table 3, hypothesis evaluation can be conducted in order to determine the correlation between the variables and the effectiveness of MobileSchool model.

1. *There is significant correlation between Software as a Service (SaaS) implementation with the effectiveness of MobileSchool model.*
   As shown in Table 5, the Pearson's correlation value, *r* was 0.68. The *r* value was bigger than 0.6 where it indicates the strong correlation between these two variables. Thus, the hypothesis was failed to reject. In conclusion, there is statistical evidence to proof the strong correlation between Software as a Service implementation with the effectiveness of MobileSchool model.
2. *There is significant correlation between mobile web technology implementation with the effectiveness of MobileSchool model.*
   Pearson's correlation value, *r* was 0.70 was bigger than 0.6. Therefore, it indicates the strong correlation between these two variables. Thus, the hypothesis was failed to reject. Thus, there is statistical evidence to proof the strong correlation between mobile web technology implementation with the effectiveness of MobileSchool model.
3. *There is significant correlation between transactional distance theory implementation with the effectiveness of MobileSchool model.*
   Pearson's correlation value, *r* was 0.64 was bigger than 0.6. Therefore, it indicates the strong correlation between these two variables. Thus, the hypothesis was failed to reject. There is statistical evidence to proof the strong correlation between transactional distance theory implementation with the effectiveness of MobileSchool model.
4. *There is significant correlation between social information processing theory implementation with the effectiveness of MobileSchool model.*
   Pearson's correlation value, *r* was 0.68 was bigger than 0.6. Therefore, it indicates the strong correlation between these two variables. Thus, the hypothesis was failed to reject. There is statistical evidence to proof the strong correlation between social information processing theory implementation with the effectiveness of MobileSchool model.
5. *There is significant correlation between mobile web usability implementation with the effectiveness of MobileSchool model.*
   Pearson's correlation value, *r* was 0.82 was bigger than 0.8 and close to 1. Therefore, it indicates very strong correlation between these two variables. Thus, the hypothesis was failed to reject. There is statistical evidence to proof very strong correlation between mobile web usability implementation with the effectiveness of MobileSchool model.

Based on the evaluation of all hypotheses, it can be concluded the implementation of all variables including Software as a Service (SaaS), mobile web technology, transactional distance theory, social information processing theory and mobile web usability have been statistically proven their strong correlation with the effectiveness of MobileSchool model. Thus , the effectiveness of MobileSchool model has been validated.

b. Discussions

MobileSchool model was developed to help reduce the problems occurred with current practices of teaching and learning in secondary school and current implementation of mobile learning system [1].

Theoretically, SaaS of cloud computing can eliminate the physical limitations of mobile devices involving limited data storage, limited processing power and small screen size of mobile devices [20]. Then, mobile web technology can increase the compatibility of the system access to more devices as the system can be accessed through the web [21]. On the other hand, mobile web usability principles were employed to ensure the deliverable of useful, usable and effective system to the end users [22].

In terms of current practice of teaching and learning activities, students are very much dependant on the activities in a classroom setting. Transactional distance theory integration into MobileSchool model provides better teaching and learning approach where it can train students to become active knowledge-seekers rather than only being dependent solely on the teachers [23]. Moreover, communication in Malaysian secondary schools amongst the school communities including school administrators, teachers, students and

parents, is in need of an improvement. As to minimize this weakness, social information processing theory has been integrated in which online and offline conversation facilities were provided [24].

The validation of MobileSchool model's effectiveness has been using descriptive statistical results. The results showed positive responses given by the respondents to all variables included in MobileSchool model where the mean score for each variable was higher than mean in the Likert scale. Therefore, the included variables gave positive effects to ensure the effectiveness of MobileSchool model. Finally, the hypothesis evaluation was conducted to support the descriptive results and strengthen the argument of claiming the effectiveness of the model. Based on the hypothesis evaluation, it was statistically proven that there is a significant correlation between all the five tested variables with the effectiveness of MobileSchool model. Therefore, statistically, the effectiveness of MobileSchool model was validated.

5. CONCLUSION & FUTURE WORK

This study was conducted to validate the effectiveness of MobileSchool model based on the perspectives of ICT and academic practitioners. Based on the results, the effectiveness of the model was validated where statistical evidences have proved the significant correlation between all variables and the effectiveness of MobileSchool model. The variables include SaaS, mobile web technology, Transactional Distance theory, Social Information Processing theory and mobile web usability principles. These results have been supported by descriptive data where the mean scores for all variables were higher than mean of Likert scale which indicates the respondents agreed with the variables that will give positive outcomes to the effectiveness of the model.

As for future direction, the questionnaire will be distributed to other relevant stakeholders including school administrators, teachers, students and parents of secondary schools in Malaysia since MobileSchool system will be developed for these target users. Similar step of analyzing the data will be conducted including normality test and hypothesis test.

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REFERENCES

[1] H. Ahmad Sobri and W.A. Wan Fatimah, "The Development of New Conceptual Model for MobileSchool," *Proc. International Conference on Intelligent System and Informatics (ISI 2012)*, 2012.

[2] A. Barker, et al., "A proposed theoretical model for m-learning adoption in developing countries.," *Proc. 4th World Conference of Mobile Learning (mLearn 2005)*, 2005.

[3] J. Wei and B. Lin, "Development of Value Increasing Model for Mobile Learning," *Proc. Decision Sciences Institute Conference*, 2008.

[4] R. Deegan and P. Rothwell, "A Classification of M-Learning Applications from a Usability Perspective," *Journal of the Research Center for Educational Technology*, vol. 6, no. 1, 2010, pp. 16-27.

[5] H. Sajady and M. Dastgir, "Evaluation of the Effectiveness of Accounting Information Systems," *International Journal of Information Science and Technology*, vol. 6, no. 2, 2008, pp. 49-59.

[6] A.R. Hevner, et al., "Design Science in Information Systems Research," *MIS Quarterly*, vol. 28, no. 1, 2004, pp. 75-105.

[7] M. Ramezan, "Measuring the Effectiveness of Human Resource Information Systems in National Iranian Oil Company (an empirical assessment)," *Education, Business and Society: Contemporary Middle Eastern Issues*, vol. 3, no. 1, 2010, pp. 28-39.

[8] N.F.A. Al-Mushasha, "A Model for Mobile Learning Service Quality in University Environment," Graduate Department of Information Technology College of Arts and Sciences, Universiti Utara Malaysia, Sintok, 2008.

[9] A. Julka, et al., *Student Use of Communication Technologies–Parent/Guardian Survey Report*, UWRF, 2010.

[10] G. Kismihók, "Flexible Learning, Flexible Working Exploiting the Potentials of Ontology Based Content Management," Department of Information Systems, Corvinus University of Budapest Budapest, 2011.

[11] H.T. Dinh, et al., "A Survey of Mobile Cloud Computing: Architecture, Applications, and Approaches," *Journal of Wireless Communications and Mobile Computing*, 2011.

[12] L.F. Motiwalla, "Mobile Learning: A Framework and Evaluation," *Journal of Computer & Education*, vol. 4, no. 9, 2007, pp. 581-596.

[13] B. Fetaji, et al., "Assessing Effectiveness in Mobile Learning by Devising MLUAT (Mobile Learning Usability Attribute Testing) Methodology," *International Journal of Computers and Communications*, vol. 5, no. 3, 2011, pp. 178-187.

[14] H.X. Lin, et al., "A Proposed Index of Usability: A Method for Comparing the Relative Usability of Different Software Systems," *Behaviour & Information Technology*, vol. 16, no. 4/5, 1997, pp. 267-278.

[15] Y.-S. Wang, "Assessment of Learner Satisfaction with Asynchronous Electronic Learning Systems," *Information & Management*, vol. 41, no. 2003, 2003, pp. 75-86.

[16] N.A. Mohammad Mazlan, "Students' Perception of Motivation to Learn: Does an Avatar Motivated?," School of Engineering and Computer Sciences, Durham University, Durham, 2012.

[17] A. Istanbullu, "Mobilim: Mobile Learning Management Framework System for Engineering Education," *International Journal of Engineering Education*, vol. 24, no. 1, 2008, pp. 32-39.

[18] C.-C. Yi, et al., "Acceptance of Mobile Learning: a Respecification and Validation of Information System Success" *International Journal of Human and Social Sciences*, vol. 5, no. 7, 2010, pp. 477-481.

[19] S.J. Coakes and C. Ong, *SPSS Version 18.0 Analysis without Anguish*, John Wiley, 2011.

[20] AEPONA, "Mobile Cloud Computing Brief," 2010; http://www.aepona.com/white-papers/bringing-mobile-intelligence-to-cloud-computing/.

[21] M.A. Chatti, et al., "Mobile Web Services for Collaborative Learning," *Proc. Fourth IEEE International Workshop on Wireless, Mobile and Ubiquitous Technology in Education - (WMTE'06)*, 2006.

[22] R. Budiu and J. Nielsen, *Usability of Mobile Websites: 85 Design Guidelines for Improving Access to Web-based Content and Services through Mobile Devices*, Nielsen Norman Group, 2012.

[23] D. Starr-Glass, "Learner Perceptions of Distance in an Online Course: Revisiting Moore's Theory of Transactional Distance," *Online Educational Research*, 2012.

[24] J.B. Walther, *Theories of Computer-Mediated Communication and Interpersonal Relations. In: Knapp, M. L. and Daly, J. A. (eds.) The Handbook of Interpersonal Communication*, CA: Sage, 2011.

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