Satisfaction of Distance Learners towards Mobile Learning in the Universiti Sains Malaysia

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Abstract

The aim of this research is to examine learners' perception concerning the satisfaction level of Mobile learning. The learners are the students who have enrolled in the distance education academic program at the School of Distance Education, Universiti Sains Malaysia (USM) in the 2008/2009 academic year. To what extent did Mobile learning benefited the learners? Data were collected from a sample of 105 undergraduate students from Bachelor of Arts, Bachelor of Science, Bachelor of Social Science and Bachelor of Management through a specially designed questionnaire relating to the satisfaction of using the Mobile learning in their studies. This paper utilised the Rasch model to analyze the data. Results showed that the satisfaction of the respondents towards the Mobile learning was high. All the items in this survey are fit to this survey. From the result, it is indicated that most of the respondents were satisfied with Mobile learning. The items that showed the higher satisfaction are relates to the study material, important notes, reminder can reach them daily. Besides, they highly agreed that Mobile learning has helped them pace their studies in distance learning courses. However the survey also reviewed that the respondents are not satisfied with the cost of communication with the tutor and other students in Mobile learning courses.

Introduction

Mobile learning is a method of learning accomplish with small and portable devices. Moreover, Mobile learning is not one of the new educational paradigms that suddenly blossom in the field of education, become wildly popular for a few years, then quietly fade away (Clark, 2007). Nowadays, with the latest technology, learners are being able to learn anything, at any place and any time they needed the knowledge. Thus, mobile phone is the perfect delivery vehicle for learning in near future.

From a survey of Hand Phone User 2006 by the Malaysian Communications and Multimedia Commission, it shows a major increase in the percentage of mobile users sending more than 5 SMSes per day throughout year 2004 to 2006. At the same time, non SMS user's percentage has dropped from 25.9 percent in 2004 to 16.4 percent in year 2006. The results obviously showed that the non SMS users started to use SMS services over the period 2004-2006 while those already using have intensified usage. The survey also showed that 23.4 billion SMSes were sent out in the first 9 months of year 2006 compare to year 2005 and year 2004 were 14.4 billion and 6.6 billion respectively. This result clearly showed an increase of 255 percent from year 2004 to year 2006 using such technology in this era. SMS technology is common in the era hence the utilisation of this technology to convert into learning process would be benefited.

From the two supportive evidence above, School of Distance Education in USM started to offer the Mobile learning system for their students in academic year 2008/2009. The main focus of the Mobile learning is to allow the learners experience the different approach of learning process which is widely used in abroad. School of Distance Education in USM creatively convert the innovation from the traditional E-learning to the Mobile learning so that the learner can receive and update the data at any place at anytime. The lecturers will send e.g. notes, definition, important notice and reminder to their students everyday additional to the original E-learning portal. All the SMS sent to learners were shortened and edited by the lectures into 160 character. As a result, the content of the SMS is very short and brief but very powerful (straight to the point).

The objective of this paper is to examine learners' satisfaction using Mobile learning in School of Distance Education, USM. Thus, the study is very important because it will illustrate the satisfaction level of learners after joining the Mobile learning method. The data contributes useful information which can be used for future improvement on this approach to ensure the advantages are achieved. From the feedback of learners, school can make improvement on the Mobile learning method to ensure quality learning to be offered in future learners.

History of Mobile Learning

Clark (2007), highlighted that some researchers dated the beginning of mobile learning to the invention of the PDA, a little more than thirty years ago. In early 1970s, Hewlett-Packard programmable calculator, which was developed and become the precursor of the PDA. Satyan Pitroda obtained a patent for an early PDA. After that, Casio introduced the Casio PF-8000, the first PDA with character was being identified. But handheld computer that could be held in a person's hand were introduced in 1984. In about year 1987, the Panasonic Personal Partner became the first palmtop computer to use a version of DOS. The first PDA with a pen GUI and handwriting recognition was introduced in 1990. In a short period of time, Apple coined the term "personal digital assistant" with the introduction of the Apple Newton in the early 1990s. Most PDAs today have many functions and softwares of a laptop computer. Most can also be used as cellphones with extra functions and capabilities e.g. Internet connectivity, data roaming, watching movies, listening to MP3s, and playing games.

Definition of Mobile Learning

Researcher define the term of Mobile learning on the other perspective as defined by Kaplan-Leiserson (2005) is "the new possibilities that are available to people given the mass deployment of devices that everyone now has their hands and the new connectivity that is coming". While, Traxler (2005) defined it as "any educational provision where the sole or dominant technologies are handheld or palmtop devices", however Sharples (2005) took a different approach by describing learning "as a process of coming to know, by which learners in cooperation with their peers and teachers, construct transiently stable interpretations of their world."

Short Message Service (SMS)

According to Shah (2009) cell phone SMS are software applications that lets one get in touch with other SMS users via short text messages. Messaging is becoming a common features of mobile phone nowadays. Almost every phone assisted in the market now can send and receive text messaging conviniently. Wikipedia defines Short Message Service (SMS) as a communication service standardized in the GSM mobile communication system, using standardized communications protocols allowing the interchange of short text messages between mobile telephone devices.

The service available on all the mobile phones types including Pocket PC, desktop computers and some fixed phones that permits the sending of short messages between mobile phones, other handheld devices and even landline telephones. SMS is very much popular in Malaysia as supported by the increasing number of messages send out per day by the hand phone users over the year 2004 to year 2006 in the study of Malaysian Communications and Multimedia Commission. In today's mobile learning environment teachers and instructional designers will be challenged to find creative ways to use SMS as an instructional device (Clark, 2007). However the learning process should be the main goal in order for the undergraduate to grab a degrees at the end of their studies.

Learners' Satisfaction

Learning itself is difficult to measure since there are inconsistencies associated with teacher's assigning grades and measuring process can't be directly observable. For that reason, learners satisfaction on learning often used as an indicator in learning approach. Learners' level of learning satisfaction would be important to the designer of a particular learning program. However, it would be important to the broader audiences to know what factors or aspects of learning were predictors of student learning satisfaction, (Bray et al, 2007). Information on the predoctors satisfaction could be used to inform the designers and leaners support systems in Mobile learning systems.

In the field of information system (IS), the concept of user satisfaction is often used to represent the degree to which users believe the IS they are using conforms to their requirements (Cyert & March, 1963). Whereas, Bailey and Pearson (1983) point outed that satisfaction is usually conceptualised as the aggregate of a person's feelings or attitudes toward the many factors that affect a certain situation. Satisfaction is also defined as " the pleasure or contentment that one person feels when she/he does something or gets smethings that she/he wanted or needed to do or get" in the Collins Cobuild English Dictionary (1999).

In the field of human–computer interaction, user satisfaction is usually visualized as the expression of affections gained from an interaction (Mahmood et al, 2000). This means that user satisfaction is the ''subjective sum of interactive experiences'' influenced by many affective components in the interaction (Lindgaard & Dudek, 2003). At the same time, Holmberg (1986) concluded that "distance teaching will support student motivation, promote learning pleasure and effectiveness if offered in a way to make the study relevant to the individual learner and his/her needs". This statement is supported by the Threlkeld and Brzoska (1994) study that there is little empirical evidence to show mediated instruction suffers in comparison to face-to-face instruction, stating that "the instructional medium doesn't appear to make any important difference in student achievement, attitudes and retention". They conclude that learner characteristics, motivation and instructional alternatives are more important than media do.This variable are more pertinent to the learning or teaching process at a distance. Mobile learning is a subset ofdistance learning and also E-learning, thus this variables have to be taken into consideration.

Methodology

This research examined the satisfaction of the Mobile learning projects of students who enrolled their studies in the Distance academic programme at USM in the academic year 2008/2009 towards Mobile learning which newly launched. The research was conducted on a sample of 105 undergraduate students from Bachelor of Arts, Bachelor of Science, Bachelor of Social Science and Bachelor of Management using simple random sample method and the secondary data was based on the online databases and past researches. Throughout the research, the questionnaire was sent to Mobile learner via e-mail. After the e-mail was sent out, the respondents were being given an acknowledgement SMS. After 2 weeks, the completed feedback of questionnaire was sent via e-mail. Dateline for this survey was on end of April 2009 which is one week before their final exam. There are a total of 105 questionnaires being returned by learners with 100 percent of return rate.

This program was conducted from February 2009 to April 2009 which is the second semester of year 2008/2009. All the students have no experience with Mobile learning before however they are volunteered to take part in this Mobile learning program. The students will be receiving at least one SMS from their lecturers each day which the SMS content includes the definition, important notes and important announcement which are related to the studied subject. The subjects that were delivered through Mobile learning are International Business for third year management students and Financial Principal for second year management students. For the Physics students, the subjects that were delivered using Mobile learning was namely Mechanics and Optics for second year students while for second year students subjects on Money & Banking and Quantitative Economy for the third year students was also conducted in this programme.

The questionnaire consisted of 2 parts which is Part A and Part B. Part A is more focused on the respondent's demographic and personal background such as gender, age, types of courses, year of study, mobile device ownership, marital status, current CGPA, salary range and others. This part has more questions due to the students who pursued their study in School of Distance Education come from wide range of background. Part B questions focus on the issues related to the topic of this research which is the satisfaction level of Mobile learner towards Mobile learning in their studies.

Analysis and Findings

The data was collected and analyzed using 2 types of statistical software. Part A which is the respondent's demographic and personal background was analyzed using PASW (formally known as Statistical Package for Social Science) Version 17. There were no missing data in this survey among 105 respondents. While

Part B of the questionnaire was analyzed using the Winsteps software Version 3.68.2, applying the rating scale Rasch Model.

Part A: Demographic Details

Table 1   Demographic Details

	Frequency	Percentage (%)
Gender		
Male	31	29.5
Female	74	70.5
Age (years)		
20-29	44	41.9
30-39	46	43.8
40-49	12	11.4
50 and above	3	2.9
Ethnicity		
Malay	60	57.1
Indian	11	10.5
Chinese	27	25.7
Others	7	6.7
Types of courses		
Bachelor of Science	2	1.9
Bachelor of Arts	1	1.0
Bachelor of Social Science	2	1.9
Bachelor of Management	98	95.1
Current CGPA		
Below 2.00	1	1.0
2.00 – 2.49	52	49.5
2.50 – 2.99	20	19.0
3.00 – 3.49	27	25.7
3.50 – 4.00	5	4.8
Mobile Device Ownership		
Mobile Phone	96	91.4
Both Mobile Phone and PDA	6	5.7
PDA/ Pocket PC/ Palmtop	3	2.9
Salary Range		
Below RM1500	22	21.0
RM1500 – RM2000	28	26.7
RM2001 – RM2500	24	22.9
RM2501 – RM3000	15	14.3
RM3001 – RM3500 & Above	16	15.2

Part B: Satisfaction Criteria

Learners' satisfaction questions were analyzed using Winsteps, applying the rating scale Rasch model. According to Ren et al (2008), "Rasch is mathematically identical to the most IRT model; however, it is a comparatively more viable proposition for practical testing since it can be applied in the context in which

persons interacts with items." This rating scale specifies that the whole set of items sharing the same rating scale. With the assumption of a one-dimensional domain being measured, hence, all the data must fit into the model. All the way through this analysis, there are several tables and figures used to explain and analyze learners' satisfaction and difficulty level of overall survey.

One statistical summary table will be generated to define the separation rate which is the number of statistically different performance strata that the test can identify in the sample and the reliability rates which show whether the test discriminates the sample into enough levels for intended measure. Variable map illustrated the empirical hierarchy of the items which is connected to the learners' level of willingness to endorse each items with sincere n careful. Each item will be reported in a logit. A logit (log-odds unit, pronounced "low-jit") is a unit of interval measurement which is well-defined within the context of a single homogeneous test (Winsteps Help 2009).

Learners' Satisfaction Reliability and Separation

The results of this analysis were in the form of statistical summary tables of respondents and the items which investigate the reliability and validity of the instrument to the associated respondents. The person reliability in this study was 0.84, with separation of 2.31 whereas the item reliability was 0.85, with separation of 2.39. Assume that the acceptability threshold of 0.80, both reliabilities for person and item scales are reliable and useful for the purpose of this research.

Meanwhile the separation of person and item reliability more than 2 indicated that there are wide ranges of person measures or the number of items in this survey is just adequate. The person reliability and item reliability of 0.84 and 0.85 is good enough. The perfect reliability number is 1.00. The person reliability can be fit to 1.00 if we increase the size of sample or testing learners with more extreme attitudes such as very satisfied or very unsatisfied to the Mobile learning. On the other hand, reliability of item can be increase if we increase the number of very good item in this survey. As a consequence, this result appears to *have functional reliability as a whole.*

Learners' Satisfaction Fit Statistics

Table 2 illustrates that all items in this survey fit the expectation of Rasch model. In particular, all of the items fall within the acceptable infit and outfit Mean-square fit statistics (MNSQs) limits. Smith (1996) suggested that items that produce standardized scores that differ by more than ±2.0 from the actual score are items that are only weakly related to the rest of the items comprising the scale. When addressing infit and outfit, a mean squared value range cutoff is determined by the size of sample. Specifically, the items of this study was agreed to fall within the acceptable infit and outfit limits of 0.6 to 1.5 (Fox, 1999 and Bond and Fox, 2001) which is less than 2. The acceptable range of below 2.00 was cut off from the common because we wish to get more accurate measurement.

As long as the infit and outfit MNSQ fall within the acceptable range, it means that the feedback on this survey are relevant and appropriate to fit the purpose of this study. From Table2, the Mean of infit and outfit MNSQ are 0.99 and 1.01. This result is good as the best Mean for infit and outfit MNSQ are 1.00. If the amount is near 1.00, it means that all these items are appropriate and relevant for this survey.

Table 2   Fit Statistics for Satisfaction Criterias

Item	Statement	Infit MNSQ	Outfit MNSQ
Satis55	The content of the messages are short, brief, useful and powerful.	1.12	1.09
Satis54	I prefer more frequent messages from lecturers.	1.12	1.09
Satis61	The messages send to me can be illustrated in my mind.	1.17	1.15
Satis58	The cost of communicating in the mobile learning course with the tutor and other students was acceptable.	1.34	1.40
Design17	I found the SMS learning enjoyable.	0.89	0.98
PEU87	My interaction with lecturer via mobile learning is clear and understandable.	1.09	1.17
Design18	I can easily remember the term that I received on my mobile	0.99	1.07

	phone.		
Design15	The daily SMS messages assisted in my studies greatly.	0.90	0.98
Satis53	I'm satisfied with the time each messages delivered to me.	0.89	0.89
Satis59	The messages sent to me promptly.	0.98	0.97
Learner8	Mobile learning increases the quality of my distance education course.	0.76	0.72
Learner9	Mobile learning has helped me pace my studies in my distance education course.	0.68	0.65
Mean		0.99	1.01
S.D.		0.18	0.19

Learners' Satisfaction Empirical hierarchy

Variable map is an empirical hierarchy of Rasch model which is another visual guide to information about relatives' scales. Figure 1 present the variable map of the items and persons. M represent mean, S represent standard deviation and T represents two standard deviations in Figure 1.

The right side illustrates the map of items. It is ranked by the level of difficulty to endorse. From the top to the bottom, items had been identified from the most difficult (not very satisfied) to endorse to most easiest (very satisfied) to endorse items by the respondents. The most difficult item is the least favorite item while the easiest item is the most favorite item for respondents.

From Figure 1, the variable map shows that there are two items which is most difficult to endorse by respondents which are items Satis58 and Satis61. Item Satis 58 is "The cost of communicating in the mobile learning course with the tutor and other students was acceptable". The respondents were concern on cost of communication in Mobile Learning which is uncontrollable and costly throughout the whole program. This costing issue is able to be reduced when the administrator arrange the responses from students to their (student's) own mobile phone service provider and the message will be redirect to the administrator (e.g. reply message to call centre with no charge or min charge only) as presented in Diagram 1. This way the problem concerning issue to save the additional concern cost can be overcome.
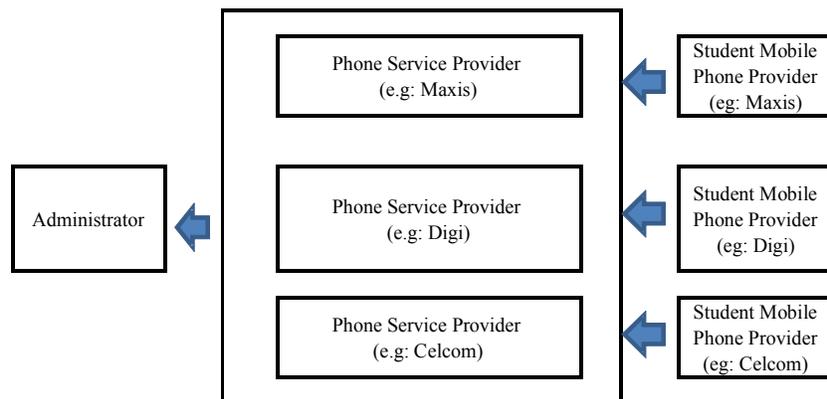
Diagram 1 Flow of Student Response to Administrator

While, Item Satis61 is regarding "The messages sent to me can illustrate in my mind". The respondents disagree with this item since some information received is brief and short (due to the limited capacity of SMS) and the information cannot be illustrated. The students were worried that they cannot get the overall picture or the actual point of the information. This result is a line with the previous finding that students faced difficulty in reading or awkward input on a small screen (Chao et al., 2009). However on the other point of view, any doubt on important messages or information received can serve as the reminder point for future reference. The students can easily retrieve the doubt messages and revise the particular point during their intensive class.

Figure 1, shows that there are two easiest items to endorse which are item Learner9 and Satis55. Learner9 item is on "Mobile learning has helped me pace my studies in my distance education course" and item Satis55 is concerning "The content of the messages are short, brief, useful and powerful". The result from respondents for these two items shows that they are satisfied on mobile learning which helped them pace their studies and contents of information received even though is short but still brief, useful and powerful. The result also shows that Mobile learning can improve the learning mode in distance learning courses and they agree that the Mobile learning is good and workable to help them in their studies. Ting (2005) also supported that SMS is a powerful way to support and help to keep track of their learning. In addition, SMS is also reported as a daily dose of learning to students (Ting, 2005). Although not all SMS can remind the learners but while they do revision, the messages help to refresh them on particular topics and are very convenience. However it provides individual learners with higher satisfaction (Ting, 2005). Thus, this Mobile learning should be offered in all the distance education school to produce more excellence learners and leaders in future.

On the other hand, the left side of the map ranked the respondents from the learners who are most satisfied to Mobile learning to the least satisfied to mobile learning. Most of the respondents satisfied with all the items besides the thirteen respondents who are not so satisfied with the items asked in this survey. Overall, this variable map is considered good as the respondents are satisfied to the newly launched Mobile learning program.

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                              PERSONS - MAP - ITEMS
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                               3    5    9    |
  4                                      22  +
                                         91 T|
                               78   90        |
  3                                          +
                                              |
                              18   79  100    |
                                   72   97 S|
  2                                          +
                              16   31   51   86 |
            13   43   47   65   69   80   81   96  104 |
                       8   12   14   17   70   75 |
     2    4   21   24   25   27   39   45   49   66   73   74 |
  1                                          +|T
                  11   35   38   71   85  101  103  105 M|T
                       32   44   54   62   68   89  |   Satis58    Satis61
                                              |S Satis59
                              46   48   56    |  PEU87
            1    7   10   20   29   34   36   57   58   64   98  |  Design15
  0                                      60   61   87 +|M Design17
                                              |  Learner8   Satis53
                  15   26   30   53   63   84  |  Design18   Satis54
                       19   23   83   92  |S
                              28   67  102 S|  Learner9   Satis55
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Figure 1   Variable map for learners' satisfaction.

Conclusion

As a conclusion, the result of this survey shows a positive impact on the satisfaction level of learners after using the Mobile learning method. The respondents felt supported as this method helped them to refresh on particular subjects and doubts. The learning method is also convenient to the respondents since the SMS sent are brief and powerful. However the cost of the SMSes needs to be taken into consideration so that it won't burden the learners. Since the Mobile learning is a new approach in delivering the additional learning supports to the school and also the learner so this result and feedback is useful to the school for future improvement to meet the satisfaction level and quality of learning centre in order to increase the image of the Malaysian Education System. In future studies, it would be interesting and more useful if more variable such as learner's characteristics, learner's motivation or instructional alternatives are take into consideration as these variables can allow the results to be more accurate. It would also be valuable to examine the pedagogical factors which affect the learning satisfaction of learners using Mobile learning.

References

Shah, A. (2009), "Effectiveness of Using Text Message/SMS to support the Teaching-Learning Process in Distance Education. *Vasudha Kamat Central Institute of Educational Technology, National Council of Educational Research and Training, New Delhi, India.*

Bailey, J. E., & Pearson, S. W. (1983). Development of a tool for measuring and analyzing computer user satisfaction. Management Science, 29(5), pp. 530–545.

Bond T. & Fox C. (2001) Applying the Rasch Model: Fundamental Measurement in the Human Sciences. Lawrence Erlbaum Associates, Mahwah, NJ.

Clark, J.D. (2007), Learning and Teaching in the Mobile Learning Environment of the Twenty-First Century, *Instructional Design Specialist Austin Community College, Austin, Texas.*

Chao, P.Y & Chen, G.D. (2009). Augmenting paper-based learning with mobile phones. Interacting with Computers, 21, pp. 173-185.

Collins Cobuild English Dictionary (1999). London, UK: HarperCollins Publishers.

Cyert, R. M., & March, J. G. (1963). A behavior theory of the firm. Englewood Cliffs, NJ: Prentice-Hall.

Fox, C. (1999). An introduction to the partial credit model for developing nursing assessments. Journal of Nursing Education, 34(8), pp. 340-346.

Holmberg, B. (1986). Growth and structure of distance education. Kent, England: Croom Helm.

Kaplan-Leiserson, E. (2005), "Trend: mobile reality (a table of two experts)", available at www.learningcircuits.org/2005/apr2005/0504_Trends.htm.

Lindgaard, G., & Dudek, C. (2003). What is this evasive beast we call user satisfaction? Interacting with Computers, 15(3), pp. 429–452.

Mahmood, M. A., Burn, J. M., Gemoets, L. A., & Jacquez, C. (2000). Variables affecting information technology end-user satisfaction: a meta-analysis of the empirical literature. International Journal of Human–Computer Studies, 52(4), pp. 751–771.

Malaysian Communications and Multimedia Commission. (2007). *Hand Phone Users Survey 06*. Retrieved from http://www.skmm.gov.my/facts_figures/stats/pdf/HPSurvey2006.pdf

M-learning (20th August 2009). In *Wikipedia, The Free Encyclopedia*. Retrieved 20th August 2009, from http://en.wikipedia.org/wiki/MLearning.

Ren W., Bradley K.D. & Lumpp J.K (2008), Applying the Rasch Model to Evaluate an Implementation of the Kentucky Electronics Education Project, *Journal of Science Education and Technology*, Volume 17, Number 6 / December, 2008, pp. 618-625.

Sharples, M. (2005). Learning as conversation: Transforming education in the mobile age. Proceedings "Seeing Understanding, Learning in the Mobile Age", Budapest, *, April 28–30, 2005*, pp. 147-152.

Smith, R.M. (1996). A comparison of methods for determining dimensionality in Rasch measurement. Structural Equation Modeling, 3(1), pp. 25-40.

Threlkeld, R., & Brzoska, K. (1994). Research in distance education. In B. Willis (Ed.), Distance education: Strategies and tools (pp. 41-66). Englewood Cliffs, NJ: Educational Technology publications.

Ting, Y.R. (2005). Mobile Learning: Current Trend and Future Challenges. Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05). IEEE

Traxler, J. (2005). Defining Mobile Learning. Proceedings IADIS International Conference Mobile Learning 2005, Malta, pp. 261-266.

Winsteps Help (2009) Logit and probit: what are they? Retrieved 20 August 2009 from : http://www.winsteps.com/winman/index.htm?whatisalogit.htm