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Conceptualizing security measures on mobile learning for Malaysian higher education institutions

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Abstract

The paper examines the existing researchers view on security measures on mobile learning. In general, it discovers related measure on security which includes reliability, trust, privacy and security itself. Each measure is widely used as determinants in previous studies and its range in some environments and perspectives. Reliability and security determinants are widely adapted to measure in terms of the infrastructure of mobile learning environment, while trust and privacy mostly measure behaviours and perceptions from the user or human towards mobile learning. Furthermore, the study will also investigate the infrastructure and components of mobile learning itself in order to determine the security vulnerabilities that may involve in the mobile learning environment. Other security features that are discussed at glance include the key distribution and management, information confidentiality and privacy, secure routing, intrusion detection, data integrity, entity authentication and secure data aggregation. However, at the end of this study, mapping on the relevant security measures with each component of mobile learning will be formulated for further study.

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1. Introduction

Since in the year 2006, people were moving to webs 2.0, therefore teaching and learning were expanding towards the e-learning style. The birth of Y generation which hunger of online communication supporting with the

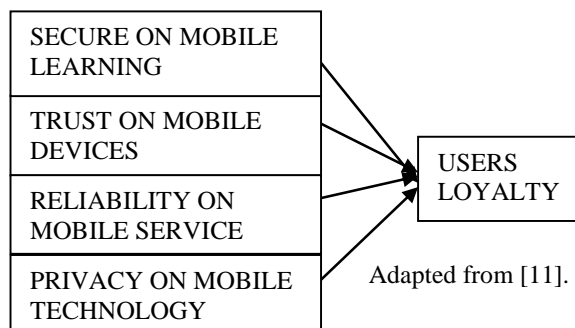
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existence of gadgets such smart phones and tablet PCs in the market also drive the trends of mobile learning to take in part. Malaysians nowadays are also accepting the new era of online communication and heading towards mobile computing. Thus, mobile learning is an initiative for Malaysians to have/engage lifelong learning especially for those who are employed and those who have anxiety in information seeking. The term M-learning approach is given to the delivery of learning materials by the means of mobile devices that can be accessed from anywhere at any time. Currently, some of the higher institutions use the Mobile Learning Systems (M-LS) as a complementary to obtain the aforementioned advantages. Due to the varieties and limitations of mobile devices, there is no conventional standard or specification to develop the M-LS. Thus, there are various types of M-LS using different specifications depending on the case study. Nevertheless, evaluation has been made according to their capabilities and services that they support using some of the indicators which are specified in (Dye and Torstein 2008; Attewell 2005; Evgeniya et al. 2005; Naismith et al. 2005; Riaza & Fazilah 2010). This include the types of supported mobile devices; availability of content; supported types of data and tools used; and types of information. (Devinder and Zaitun, 2006) have developed the M-learning application for wireless classrooms at the University of Malaya which aims to facilitate the educational opportunities of teaching in a real time wireless classroom using the Pocket PC, notebook and mobile phone as learning instruments on the Windows platform. Moreover, (Anang et al., 2006) have also developed the M-learning management tool in campus-wide environment by using the Microsoft.Net infrastructure which is the Windows platform. Learning theories have also been proposed to be included in the IDM. Amongst them include the Behavioral theory, Cognitivism and Constructivism. All these learning theories serve an essential part in the students' learning and understanding (Riaza and Halimah, 2011).

2. The proposed framework

The model below was conceptualized when studying existing literature on security and related variables. Based on the literature reviewed, we adopt the measures that cover the components of people, hardware, software, data and procedures that govern the mobile learning environment. (Rob, coronel, 2013) stressed in their database management book that in order to secure data in the database management system, we need to entirely secure the whole component of information system itself. Thus, elements secured on mobile learning represent the people's perception on mobile learning and the element of privacy will look at the data side or information privacy on the mobile learning framework, where trust on mobile device is associated in identifying how secured the hardware and software used in mobile learning are. In addition, the reliability indicator on mobile service will investigate the availability of the process flow (procedure) in mobile learning.



Adapted from [9], [10].

Adapted from [11].

The dependent variable for the proposed study is selected based on the review and comparison of literatures on previous studies and it is named as the user's loyalty. This variable widely exists in the study on related areas of the marketing field. Most of the studies are related to loyalty no matter in the context of services, product or technologies as it is always associated with the element of trust (Zhou Dou, Hongxiu Li and Yong Liu, 2010) and (Roostika, Ratna, 2011).

3. Secured on mobile learning

The element of security plays a major role in any type of application. Higher institution members are concerned about the authentication and security of mobile learning. A secure mobile communication should possess the following security features: key distribution and management; Information confidentiality and privacy, secure routing, intrusion detection, data integrity; entity authentication and secure data aggregation. All of the above features must be provided if we want to have a fully secured transmission of learning materials by the means of the mobile devices mentioned as well as wireless computing. The two important security requirements - confidentiality and data integrity can be fulfilled by implementing simple link-layer security mechanisms that encrypt packets and employ message authentication codes. The Authentication is also an important security property as it ensures the receiver that the message did come from the originated or right sender.

(Catalin Boja et'al, 2011) proposed the Secure SMS Communications for the M-Learning Services in 2011 where the SMS communication delivers in real time different announcements, information, alerts, tasks. Basically, the use of SMS is to define a mobile assessment architecture based on short quiz tests where students receive questions and submit the answers via SMS.

(B. Schneider,1996) briefs the transmission of encryption and decryption key through a secured channel. The Advanced Encryption Standard (AES) is also known as Rijndael. This is a standard algorithm for symmetric encryption, adopted as a standard algorithm by the US National Institute of Standards and Technology (NIST) which defines data security procedures in governmental institutions.

(Lirong He, Lisha He, Ian Rogers.) proposed a Network Assisted Authentication Protocol (NAAP) for the M-Learning in low cost computational, communication and storage requirements on mobile devices in an asymmetrical approach proving peer-to-peer authentication and key establishment. However, it has not been proven suitable for other security requirements like confidentiality and data integrity.

4. Trust on mobile devices

(Lu, June et al. 2008). described mobile trust as a complex social phenomenon that reflects technological, behavioral, social, psychological, and organizational interactions between various agents. It is further proven by (Mohamad Noorman Masrek, Nor'ayu Ahmad Uzir and Irni Iliana Khairuddin, 2012) in their study on the adoption of mobile banking which covered on the trusting belief in mobile technology, trusting belief in mobile devices and trusting belief in mobile services.

Hence, as this study is related to mobile learning, we will adopt a trust element for mobile devices (Choi, K. J. Kim and S. J. Ahn, 2012) which used 4 items. The two items selected will discover the smart phone application provider is reliable and trustable. Another two items constructed to know level of confidence towards application and security applications produce by smart phone provider.

5. Reliability on mobile services

Most literatures relate reliability of the technical aspect of the security such as the mobile applications reliability and network reliability: (Anang Hudaya, Ahmad Mahmud, Ahmad Izuddin, Miziani Abd Rahman, 2006), (Mahalingam, S., 2012) and (Wolfenbarger, M., Gilly, M.C., 2003). The reliability of network for example technically will study on secure routing, authentication, intrusion detection, Access control and other network issues. On other perspective which involves human behavior towards the technology (Cho, Jin-Hee Cho, Swami Ananthram and Chen, Ing-Ray., 2011) in defining electronic retailer service quality have grouped reliability/fulfillment as involving accurate representation of the product, on-time delivery, and accurate as what have been ordered.

However, in this study, the reliability measure will look into mobile learning services that are used for obtaining and use of information available in the mobile learning environments for the purpose of learning process which includes learning discussion in forum threads, uploading assignments, online quiz or assessing scores and results and others. Thus, items that are appropriate to adopt are from (Du Jiang, Lu Jong, 2013) which generally cater for the objective of selected measures. The listed items are as follows: REL1: My mobile services quickly deliver what I order. REL2: My mobile service runs on reliable and secure networks and platforms. REL3: My mobile service makes services available for delivery within a suitable time frame. REL4: My mobile service insists on providing a long-term service.

6. Privacy on information and mobile learning technology

The element of privacy is always related to data and information. (Parasuraman, A., Zeithaml, V.A., Malhotra, A., 2005) defined privacy as the Degree to which the customer believes the site is safe from intrusion and personal information is protected. Privacy become one of the measures in this study and can be leverage into three division of information privacy: personal information, credit card information and purchased information.

(Carlos Flavián, Miguel Guinalú, 2006) provided an example on web commerce-related mobile users where over 40 percent of consumers feel that their privacy is jeopardized and that the government probably monitors their transaction through web filtering. In detailed, their study analyzes the effect of privacy and perceived security on the level of trust shown by the consumer in the internet which is includes honesty, benevolence and perceived competence. Instead, this study also tests the relationship between trust in a web site and the degree of loyalty to it.

In slightly differ perspective, (Parasuraman, A., Zeithaml, V.A., Malhotra, A., 2005) had studied on electronic services quality on web that process online purchase which include privacy as one of the measure. However, in this context of study it will use information as context and the selected items such as in the list: PRI1: It protects information about my mobile learning behavior. PRI2: It does not share my personal information with other sites. PR3:1 I feel like my privacy is protected at this mobile technology (Carlos Flavián, Miguel Guinalú, 2006). PR4: I feel safe in my transactions with this mobile technology (Parasuraman, A., Zeithaml, V.A., Malhotra, A., 2005). PR5: This mobile technology has adequate security features (Parasuraman, A., Zeithaml, V.A., Malhotra, A., 2005). PR6: The mobile service has adequate security features (Cho, Jin-Hee Cho, Swami Ananthram and Chen, Ing-Ray., 2011).

7. Privacy on information and mobile learning technology

Loyalty has been widely measured in many perspectives and fields of studies. It is supported by (Hur, Y., Ko, Y. J., & Valacich, J., 2011). who mentioned that loyalty covers all the behavioral and attitudinal aspects which can also be expressed in many ways depending on the products/services and situations, such as retention, making re-purchase and financial/non-financial contributions. In web site perspective, (Insh, Andrea., 2008) the E-loyalty to a sport website was defined as a sport consumer's intention to revisit a sport website which contains both the conative phase and the action phase. Both phases are focused on to assess whether the consumer is expected to revisit the website and make decision whether to engage in purchasing behavior or vice versa.

In another context, loyalty is also associated with customer satisfaction and the term is widely used in the marketing field of study. (Yee, Beh Yin and Faziharudean, T.M, 2010) studied on the relationship between customer satisfaction, customer complaint and customer loyalty in the context of place satisfactions among Scotland city residents. Thus, for our study we decide to have a dependent variable of the user's loyalty in order to determine whether students in the Malaysian higher education will continuously use mobile learning.

In this article, we identify overall measures that should be including securing all components of mobile learning. We therefore proposed framework to be used as a predictive tool for assessment of secured mobile learning environment from the user's perspective. Next, we researcher plan to conduct a survey among the Malaysian local

university located at Klang Valley area using the measures identified in the proposed framework. Then, an improved framework will be take place based on the findings gathered from the survey soon.

8. Conclusion

In this article, we identify overall measures that should be including securing all components of mobile learning. We therefore proposed framework to be used as a predictive tool for assessment of secured mobile learning environment from the user's perspective. Next, we researcher plan to conduct a survey among the Malaysian local university located at Klang Valley area using the measures identified in the proposed framework. Then, an improved framework will be take place based on the findings gathered from the survey soon.

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