LEARNERS' ENSEMBLE BASED SECURITY CONCEPTUAL MODEL FOR M-LEARNING SYSTEM IN MALAYSIAN HIGHER LEARNING INSTITUTION

Sheila Mahalingam, Faizal Mohd Abdollah and Shahrin Sahib

C-ACT Faculty of Information Technology and Communication - Univeristi Teknikal Malaysia Melaka,
Locked Bag 1752, Pejabat Pos Durian Tunggal, Melaka, 76109 Malaysia

ABSTRACT

M-Learning has a potential to improve efficiency in the education sector and has a tendency to grow advance and transform the learning environment in the future. Yet there are challenges in many areas faced when introducing and implementing m-learning. The learner centered attribute in mobile learning implies deployment in untrustworthy learning environment, which introduces high mobile threats. Security is an unfocused issue even though statistically proven that threats are increasing each day on mobile application and ensemble devices. The research question deals with how a security conceptual model could be derived and constructed to address the mentioned threats without introducing high security gadgets or restraining the mobile learners' performance. Available literature has been studied; revised and discussed .The salient characteristics as well as the drawbacks of current countermeasures were explored. The model is based on the definition of dependability with security integration and a dynamic mobile learner's satisfaction in security trustworthiness was defined. This study however selected to focus on mobile technology threat and vulnerabilities along with the solutions and countermeasures to be viewed with appropriate guidelines, awareness, standards and best practices. The findings in this study therefore represent a multiple view of mobile learners' trustworthiness in a m-learning environment. The model was constructed to be compatible to be efficient and competent, giving the m-learning users insight into potential security threats as well as tools for maximum protection against malicious and non malicious attack.

KEYWORDS

M-Learning, ensemble devices, learners', security conceptual model

1.   INTRODUCTION

Nowadays mobile devices are highly present and well integrated into learners' everyday life. Aspect related to mobile security adoption had never been seen in previous studies. Researchers have performed an empirical study on the adoption of a student toward mobile learning in their formal learning activities and type of content to be delivered. Nevertheless research study on students or users security awareness towards mobile devices and mobile computing in m-learning. Mobile learning is a new learning enhancement yet to be analyzed and explored in the South East Asia developing country such as Malaysia which has already begun to adapt to this new technology in early 2009. Several researchers have used surveys of students and university lecturers as their starting point for investigating m-learning adoption and readiness. There have been increasing numbers of investigation studies of m-learning over the last few years, in Malaysia. The survey is conducted to identify the literature gap in mobile learning specifically on mobile user security perspectives. The uniqueness of this research is to identify the literature gaps in the direction in a secure learning for mobile learning users in Malaysia Higher Learning Institution beyond traditional security theory. As a result a gap has been distinguished from breadth analysis of the literature example security and dependability with the evaluation factors such as satisfaction in the trustworthy domain. The contribution of the proposed conceptual model is to improve existing m-learning frameworks and models, where security threats and countermeasures are mapped with the dependability attributes to focus both dependability and security in a unified model to generate trustworthiness in m-learning learners.

2.   PROBLEM STATEMENT

Despite the great interest of the universities as well as the ministry to engage the digital technologies and making the learning of all students more interactive and supported anywhere, anytime and on the go there are still many questions which are urgently needed to be investigated. Through detail analysis in the literature by (Ariffin, 2011; Jacob, S.M., & Issac, 2007; Litchfield, Dyson, & Lawrence, 2007; Rachel, Cobcroft, Towers, Smith, & Bruns, 2006; Rajasingham, 2011; Rapetti, Picco, & Vannini, 2011; Sabeeh, 2011; M. . Sharples, 2006; Cobcroft, 2006;Naismith, L. &Corlett,2006; M. Sharples, Taylor, & Vavoula, 2007) as described below:

   i.   There is a major need for secure platform for large scale implementations across a range of subject areas and discipline across Higher Learning Institution.
   ii.   Security knowledge and awareness of learning and teaching principles and strategies is urgently needed to use mobile technologies and inform the development of Higher Education Strategic Plan and Government Policy about the emerging ensemble mobile devices.
   iii.   There is a great demand for investigation of security countermeasures and solutions to implementing mobile learning in a secure platform so that it can be reliable and sustainable in the future.
   iv.   Investigations are needed to develop security strategies for effective learning about future and current mobile technologies and ensemble mobile devices

   After analyzing the overall literature, the derived problem statements above were developed with references from several established workshops, conference and international official bodies' security report.Mobile Learning(m-Learning) has become a challenging platform to be implemented in global and in Malaysia Higher Learning Institution. Vulnerability issues in mobile and ensemble technologies are becoming famous devices for attackers, due to lots of ad-hoc mobile, high penetration of mobile devices and lack of user security awareness on mobile devices. The rapid growth of mobile computing in m-learning environment has a big question on the learners' acceptance, trust and satisfaction use the content and application which address to security issues.

2.1 Research Question

The research question that is addressed in this paper deals with how security model can be constructed to resolve the mobile learning problem without introducing high cost or restraining the mobile technologies and ensemble computing mobility, performance and lightweight operation. In order to further discuss and identify the research problem three sub research questions are constructed in the Table 1 below:

Table 1. Sub Research Question

No	Research Question
RQ1	What are the security issues faced by learners in the m - learning system and ensemble mobile computing?
RQ2	Are there models that can be used to evaluate the m-learning system's learner's satisfaction and trustworthiness, in terms of security and dependability behavior?
RQ3	How to improve the success of addressing to security issues at the learners level in the m - learning system?

2.2 Research Aim

The research aims to inform readers of suggested direction for researching how secure mobile environment can enhance learners' trustworthiness and satisfaction to accept and use the m-learning system. These directions are informed by a survey and contemporary literature search.

2.3 Proposed Model

There are similarity striking between dependability and security concepts which the end product satisfaction and fitness for use that include availability, accessibility and awareness. The other attributes of security has and external relationship of dependability which also could work together and posed as a minor attribute. M-learning is a sophisticated learning system which is developed to provide services that place great trust for

learners and providers. As suggested earlier by (Sheila.M, 2012) here Figure 1 is an integrated system model dependability and security is highly needed to describe the system in terms of accessibility, availability, behavioral and protective characteristic, in which this complete combination would produce a trusted system. From the literature, variables and parameters are derived to evaluate and validate the proposed model. "Learners Based Security Conceptual Model" is dependant to three major independent variables: threat countermeasures', user satisfaction and trustworthiness and Standards & Guidelines. The example Figure 2 illustrates the interaction between learners and well established trusted system domain knowledge. Trust of user is measured in service based given to the learners. Parameters or indicators involved to assess the trust of services or availability, accessibility and awareness. The characteristic of trust could be described as level of service being rendered to the satisfaction of the learners and confidence.
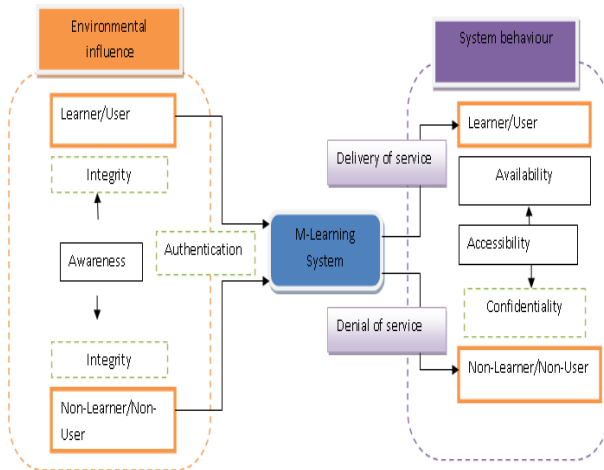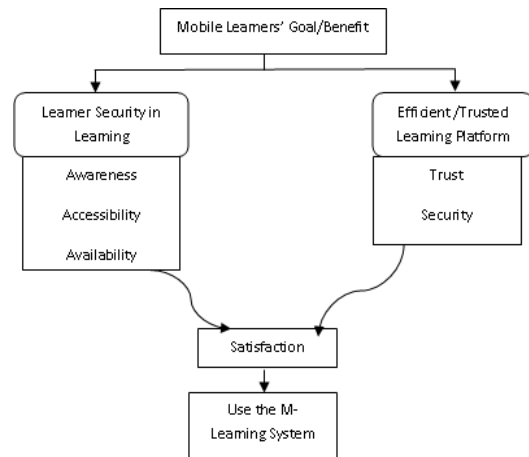

Figure 1. Learner Centric Security Model   Figure 2. Learner Trusted System Domain Knowledge

Evaluation of the model is categorized into three sections. An extended conceptual model of user satisfaction based on security for learner centered m-learning system is derived to ensure the learners in the m - learning system to get trust of service levels coupled with what they are asked for. Table 2 describes the evaluation method and results related to the research questions.

Table 2. Mapping research question with evaluation method and result

Research Question	Evaluation Method and Result
RQ1	Trust of service at learners' level can be classified as the key measurement of physical attributes of the mobile device user by learners, behavior attributes subjective to learners' awareness surveys.
RQ2	The model is evaluated by interviewing panel experts which they understand the reality of mobile technology and value of security implementation of m-learning systems in higher learning institutions
RQ3	Comparative analysis is conducted to analyze the theoretical study and the empirical study result with the current threats involved at user level.

3. CONCLUSION

The research work focus on learner's security in mobile learning and how it is important to ensure that all information within the mobile learning environment is properly protected; to gain confidence towards learners and providers by addressing the security requirement in m-learning system for the primary process: developing content or application, teaching & learning environment and university governance. The Proposed model contains the definition, the user's view of m-learning operation, assumption, readiness and assertions. The work is not to propose new solutions to security problems, but it indirectly proposed protection mechanisms that can be used to secure the device against attacks and propose a complete learners security conceptual model where various countermeasures , best practices , policy , guidelines reside.

ACKNOWLEDGEMENT

REFERENCES

Ariffin, S. A. (2011). Mobile Learning in the Institution of Higher Learning for Malaysian students : Culture Perspectives. In *Proceeding of the International Conference on Advanced Science, Engineering and Information Technology 2011* (pp. 283–288).

ENISA, & European Network and Information Security Agency. (2012). *ENISA Threat Landscape Responding to the Evolving Threat Environment* (p. 90pp).

GTISC, G. T. I. S. C., & GTRI, G. T. R. I. (2011). *GTSS Georgia Tech Cyber Security Summit 2011:EMERGING CYBER THREATS REPORT 2012* (p. 16pp).

Horizon, N. (2012). *Horizon Report > 2012 Higher Education Edition*.

Jacob, S.M., & Issac, B. (2007). Mobile Learning Culture and Effects in Higher Education. *IEEE Multidisciplinary Engineering Education Magazine*, *2* (2), 19–21.

Litchfield, A., Dyson, L. E., & Lawrence, E. (2007). Directions for m-learning research to enhance active learning, 587–596.

Rachel, S., Cobcroft, R., Towers, S., Smith, J., & Bruns, A. (2006). MOBILE LEARNING IN REVIEW: OPPORTUNITIES AND CHALLENGES FOR LEARNERS, TEACHERS, AND INSTITUTIONS, 21–30.

Rajasingham, L. (2011). Will Mobile Learning Bring a Paradigm Shift in Higher Education? *Education Research International*, *2011*, 1–10. doi:10.1155/2011/528495

Rapetti, E., Picco, A., & Vannini, S. (2011). Is mobile learning a resource in higher education ? Data evidence from an empirical research in Ticino, *7*(May), 47–57.

Sabeeh, A. (2011). Users ' Perceptions on Mobile Devices Security Awareness in Malaysia. In *6th International Conference on Internet Technology and Secured Transactions, 11-14 December 2011, Abu Dhabi, United Arab Emirates Users'* (pp. 428–435). doi:978-1-908320-00-1/11/

Sharples, M. . (2006). *Big Issues in Mobile Learning Report of a workshop by the Kaleidoscope Network of Excellence*.

Sharples, M., Taylor, J., & Vavoula, G. (2007). A Theory of Learning for the Mobile Age (pre-print).

Sheila.M. (2012). Designing Ensemble Based Security Framework for Secure M-Learning System in Malaysian Higher Learning Institution. *Malaysian Journal of Educational Technology*, *12*(3), 33–41. doi:ISSN 1675 0292 41

UNESCO Asia and Pacific Regional Bureau for Education. (2005). *International Workshop on Mobile Learning for Expanding Educational Oppurtunities* (p. 164pp). Tokyo Japan. doi:ISBN 92-9223-074-3 Workshop

Zeta Dooly, Jim Clarke, W. Fitzgerald, W. Donnelly, WIT; Michel Riguidel, ENST; Keith Howker, V. (2007). *SecurIST D3 . 3 – ICT Security & Dependability Research beyond 2010 : Final strategy. D3.3 – ICT Security & Dependability Research beyond 2010:* (pp. 1–196).