Mobile Learning Environments for Diverse Learners in Higher Education

R. S. Shariffudin, C. H. Julia-Guan, T. Dayang, N. Mislan, and M. F. Lee

***Abstract*—ML (mobile learning) has extended e-learning to a new paradigm of "anywhere, anytime learning" [1][2]. The potential of ML in individualization of learning process for the diverse learners [3] should be optimized as learners learn in different ways and usually have their own styles and preferences for learning environment [4]. Research in ML should include of adaptive features to enable more personalized and successful learning outcomes for students. Matching the main m- learning environment constructs with the learners' preferred learning styles offers an advanced form of learning environment that attempts to meet the needs of different students. Such matrices capture and represent, for each student, various characteristics such as knowledge and traits in an individual learner model. Subsequently, when ML is delivered in an interactive environment, with the right tools and support, studies show that students can retain significantly more and achieve a greater level of skill and performance. The secret and the key to realizing these gains is the environment. However, such matching is still in its infancy in Malaysia higher education. The purpose of this study is to identify the main m-learning environment constructs for learners in Malaysia higher education. A survey using questionnaires will be conducted to the IT experts and university students in Malaysia. The development of the survey items relies extensively on literature pertaining to high-quality higher education, expert content validation techniques and learners' learning styles by Myer-Briggs Type Indicator (MBTI). Expected result includes a matrix recommendation matching the m- learning environment constructs with students' MBTI learning styles.**

***Index Terms*—Mobile learning environment, learning style and MBTI.**

I. Introduction

Mobile learning (ML) with the advent of third generation phones and the advancement of increased speed in data transfer has developed further opportunities for both learners and teachers to meet together, access and exchange information in virtual spaces whilst on the move [5]. ML can increase and maintain the students' motivation and allows a more efficient use of time and resources, hence students are more likely to learn more effectively and learning at a time or location that they need or want, and can enhance the learning process in situated learning scenarios [4], [6]. Hence, mobile technologies such as mobile phones, smart phones and personal digital assistants (PDAs), Pocket PCs or Palmtop devices are being used to aid learning.

Manuscript received March 18, 2012; revised May 8, 2012.

R. S. Shariffudin, C. H. Julia-Guan, T. Dayang, and N. Mislan are with the Faculty of Education, Universiti Teknologi Malaysia (e-mail: alwaysjulia@hotmail.com).

M. F. Lee is with the Faculty of Education, Universiti Tun Hussein Onn Malaysia.

However, while mobile devices are approaching ubiquity today, the ML industry, especially in Malaysia, is still in its infancy. Many issues have yet to be resolved and one of these issues is the potential of individualization of learning process for the learners [3]. ML is causing educators to rethink how learning happens and how specific learning needs and styles are expanded and enabled with multifunctional hand-held devices. There has not been much work done on how learning styles can be incorporated into different learning scenarios facilitated by mobile devices [4]. Using learning styles to personalize web-based learning is more prevalent than using them to personalize ML [4], [7], [8]. Though most of the higher institutions are successful with its e-learning implementation, it is now time for the universities to embark on ML for academic purposes with the primary objective to enrich the learning environment and to offer greater flexibility in learning to their learners.

II. Mobile Learning in Malaysia Higher Education

While most of our higher education institutions are starting to embark ML as one their pedagogies for delivery of instruction for their learners, it is crucially important to construct and validate a ML preferences-oriented model to identify the main constructs in ML environments with the aims to ensure the effectiveness and quality of ML environment and experience for diverse learners. ML can act as a form of performance support system for educational and training purposes in higher education [9]. Some of the well-known local universities, such as UTM (Universiti Teknologi Malaysia), USM (Universiti Sains Malaysia), OUM (Open University Malaysia) and other institutions have started their initial steps by looking into aspects of readiness of learners, and considerations for technology and pedagogy for ML [10], [11], [12]. Their surveys received positive feedbacks where the students are willing to invest their time and money in it [10].

To cater for diverse learners' need, an instrument to identify the main constructs of ML environments in Malaysia higher education setting will be developed and map with the students' main learning styles based on MBTI inventory. It aims to report on an empirical study examining the possible relationships between the dispositional factors measured by MBTI and main constructs of ML environments. Such instrument will provide insights and suggest a matrix that merges the ML environments constructs with diverse learners' preference. Students are expected to be able to learn more efficiently and more effectively by providing the ML environment that suit the student's individual learning style and access device, [3], [4], [13].

III. MBTI (MYERS-BRIGGS TYPE INDICATOR)

Contributions to the congress are welcome from throughout the world. Manuscripts may be submitted to The students' personality traits are measured using the MBTI instrument which is often described as "one of the world's most widely used tools to describe personality," [14], [15], [16]. The MBTI is a typology of personality preferences based on Jungian psychology whom Jung (1971) asserted that individuals have distinctive, unlearned but enduring tendencies to experience the world in particular ways. Myers and Briggs designed the MBTI to reflect individual behavioral preferences across four dimensions:

1) Orientation of energy – extraversion vs. introversion.
2) Preferred modes of perception – sensing vs. intuition.
3) Decision making – thinking vs. feeling.
4) Preferences for dealing with the outer world – judging vs. perceiving

In this study, the students are categorized into EN (Extravert-Intuitive), IN (Introvert-Intuitive), IS (Introvert-Sensing) and ES (Extravert- Sensing). Myers explained that the EI (Extravert-Introvert) dimension is concerned with the way people tend to "recharge their energy". Extroverts will focus their attention on other people through the external environment, while introverts will be fully recharged after staying with close friends or family (or by being alone) in an internal environment. This then has an influence on ML choice in that this dimension influences people to choose the sort of ML environment related to their style: extroverts need contact with people while introverts get stressed when they have too much contact with people as they would prefer to work with impressions and ideas. The (SN) Sensing-Intuition dimension is related to how people prefer to acquire information. Sensing learners gather their information through the five senses in a concrete manner while Intuition learners are through intuition using imagination, impression and inspiration, from the unconscious "sixth sense".

IV. MBTI (MYERS-BRIGGS TYPE INDICATOR)

A. The Rational Analysis of Mobile Education (FRAME) Model by Koole and Ally (2006)

The FRAME model [17] provides a basic yet comprehensive guidance of the understanding of ML and is often being used as a framework for research review of the literature on ML [18], [19]. In her model, Koole describes ML as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction. This model can be represented as an intersecting set of three circles representing device usability, learner, and social aspects of learning (see Figure 1). As such, ML can afford diverse learners access to a variety of human, system, and data resources, as well as to assist them to assess and select relevant information and redefine their goals in ML environments.

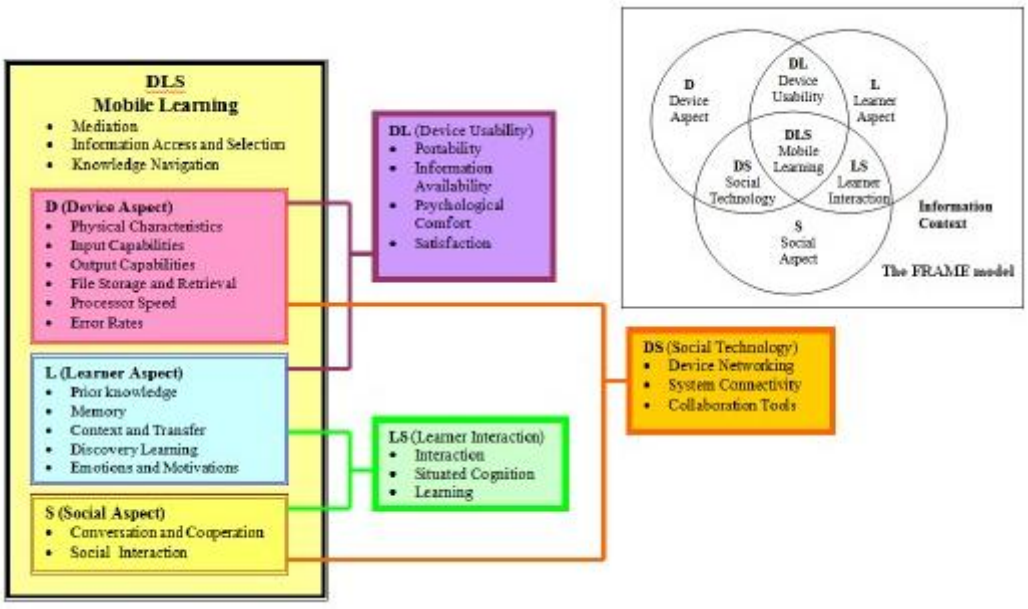

Fig. 1. The FRAME model by marguerite l koole (2006)

A. Hexagonal E-learning Assessment Model (HELAM) by Ozkan, Koseler and Baykal (2008)

Hexagonal E-learning Assessment Model (HELAM) [20] is a conceptual e-learning assessment model that provides guidelines for evaluating the success level of an e-learning environment in higher education. Each significant e-learning success assessment aspect and criteria have been combined in this e-learning effectiveness evaluation tool, which altogether have formed a comprehensive e-learning success assessment method. HELAM has been developed for assessing the e-learning effectiveness according to 6 dimensions of e-learning: (i) Technical Issues: System Quality, (ii) Technical Issues: Service Quality, (iii) Technical Issues: Content Quality, (iv) Social Issues: Learner Perspective, (v) Social Issues: Instructor Attitudes, and (vi) Supporting Issues (see Fig. 2).

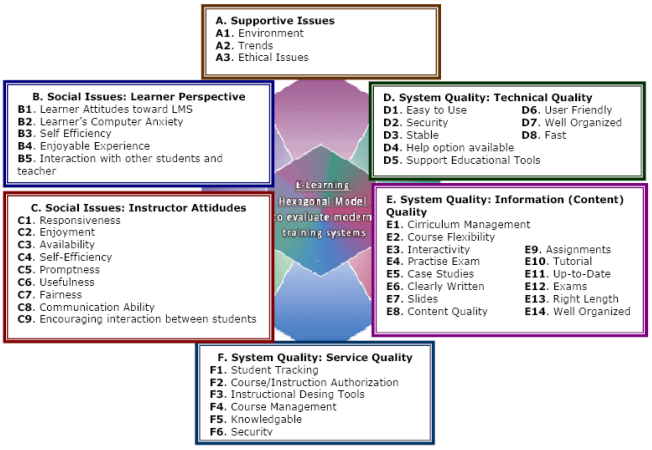

Fig. 2. HELAM (hexagonal e-learning assessment model) by ozkan, koseler and baykal (2008).

B. Other Models

ML design requirement by Parsons, Ryu and Cranshaw (2007) is actually a conceptual framework for ML experience design [13], for assessing the quality of ML [21] and for professional ML development [22]. The purpose of the framework is to encapsulate best practice, drawn from the literature, for building quality and professional ML systems, in terms of product quality and in terms of the quality of the learning experience. They map five design issues that are critical in professional ML: user roles and profiles, working on the move, different media types, interface design and collaboration support with Prensky's six structural elements of games, namely rules, goals and objectives, outcome and feedback, conflict, competition, challenge and opposition, interaction and representation or story [23]; and Wang's six dimensions of learning context: identity, spatio-temporal, facility (device), activity, learner and community [24].

ML Preferences Dimensions [4] consisting of five dimensions of mobile learning preferences – location, level of distractions, time of day, level of motivation and available time. Yau and Joy have established that Schilit et al.'s, and Wang's six dimensions of contexts in mobile learning can be mapped directly onto the Dunn and Dunn learning styles model and these contexts fundamentally have a theoretical learning styles model underpinning it [24], [25]. Their way of mapping will be referred in the phase of analysis in our research.

V. Proposed Mobile Learning Environments Model

Important construct items from previous models will be studied, identified and compiled to be assessed by IT experts and university students in Malaysia to develop the proposed ML environment model which needs future validation (See Appendix I: Theoretical Framework).

VI. Conclusion

Based on these models, the main constructs items in ML environments in higher education for different learners will be developed and map onto the learners' learning preferences based on MBTI inventory. It aims to report on an empirical study examining the possible relationships between the dispositional factors measured by MBTI and main constructs of ML environments. Recommendation of a matrix matching the ML environment constructs with students' learning styles and suggestion of a conceptual framework that is suitable to relate the diverse learners' learning styles and their ML environments will be achieved after the results of this research. The results will be discussed in the next paper.

Acknowledgements

We thank MOHE and Universiti Teknologi Malaysia for providing the Research University Grant (RUG, Vote No.: Q.J130000.7131.04J31).

References

[1] F. Lehner and H. Nosekabel, (2002), "The Role of Mobile Devices in E-Learning: First Experiences with a Wireless E-Learning Environment," WMTE 2002: pp. 103-106.

[2] E. D. Wagner. (2005). "Enabling Mobile Learning. Educause Review," pp. 41-52. Retrieved 25 May 2008 from http://connect.educause.edu/Library/EDUCAUSE+Review/EnablingMobileLearning/40549?time=1229470759

[3] K. Shuk and T. Y. Lin (2004), "Application of Learning Styles Adaptivity in Mobile Learning Environments," *Third Pan-Commonwealth Forum on Open Learning, Dunedin, New Zealand*, July 2004. Retrieved 8 March, 2011, from http://www.col.org/pcf3/papers/PDFs/Kinshuk_Lin_1.pdf

[4] Y. Jane and J. Mike. (2006), "Application of Learning Styles for Effective Mobile Learning," *Proceedings of the IADIS International Conference on Mobile Learning*. Dublin, Ireland, pp. 14-16 July 2006.

[5] R. Wood, (2006), "Mobile learning and initial teacher education," *The Internet Society II: Advances in Education, Commerce and Government*, pp. 51-60. WIT Press, 2006.

[6] M. Munoz and C. Kloos, (2005), "A Web Service Based Architecture for Push-Enabled M-Learning," *IADIS Mobile Learning*, pp. 135-140, 2005.

[7] C. Karagiannidis and D. Sampson, "Adaptation rules relating learning styles research and learning objects metadata," *International Conference on Adaptive Hypermedia and Adaptive Web-based Systems*, 2004.

[8] S. Graf, G. Yang, and T. Liu, "Automatic, global and dynamic student modeling in a ubiquitous learning environment," *International Journal of Knowledge Management and E-learning*, vol. 1, no. 1, pp. 18-35, 2009.

[9] N. Mileva, "The Effectiveness of Mobile Learning in the Form of Performance Support System in Higher Education," *International Journal of Interactive Mobile Technologies* (iJIM), vol 5, no 4, 2011, pp. 17-22,2011.

[10] Z. W. Abas, C. L. Peng, and N. Mansor, "A Study on Learner Readiness for Mobile Learning at Open University Malaysia," *IADIS International Conference Mobile Learning*, pp. 151-157, 2009.

[11] W. H. Choo, "The Readiness of Postgraduate Students in Universiti Teknologi Malaysia towards Mobile Learning," Master thesis, Faculty of Education, Universiti Teknologi Malaysia, 2010.

[12] I. Ismail, R. M. Idrus, and S. S. M. Johari, "Acceptance on Mobile Learning via SMS: A Rasch Model Analysis," *International Journal of Interactive Mobile Technologies*, vol. 4, no. 2, 2010.

[13] D. Parsons, H. Ryu, and M. Cranshaw, "A Design Requirements Framework for Mobile Learning Environments," *Journal of Computers*, Vol.2, No.4, June 2007.

[14] I. B. Myers and M. H. McCaulley, "A guide to the development and use of the Myers-Briggs Type Indicator," *Consulting Psychologists Press*, Palo Alto, CA,1985.

[15] I. B. Myers, M. H. M. Caulley, N. L. Quenk, and A. L. Hammer, "MBTI Manual: A Guide to the Development and Use of the Myers-Briggs Type Indicator," 3rd ed., Palo Alto, CA: *Consulting Psychologists Press* 1998.

[16] C. L. Walck, "Using the MBTI in management and leadership: a review of the literature," *In Fitzgerald*, C. and Kirby, L. (Eds), Developing Leaders: Research and Applications in Psychological Type and Leadership Development, Davies-Black, Palo Alto, CA, pp. 63-114.

[17] M. Koole, "Framework for the rational analysis of mobile education (FRAME): A model for evaluating mobile learning devices," Thesis, Centre for Distance Education, Athabasca University,2006.

[17] M. Koole, (2006), "Framework for the rational analysis of mobile education (FRAME): A model for evaluating mobile learning devices," Thesis, Centre for Distance Education, Athabasca University.
[18] M. L. Koole, (2009), "A Model for Framing Mobile Learning," *Mobile Learning: Transforming the Delivery of Education and Training*. AU Press, Athabasca University, pp. 25-47.
[19] R. F. Kenny, C. Park, J. M. C. V. Neste-Kenny, P. A. Burton, and J. Meiers, (2009), "Using Mobile Learning to Enhance the Quality of Nursing Practice Education," *Mobile Learning: Transforming the Delivery of Education and Training*. AU Press, Athabasca University, pp. 75-98.
[20] S. Ozkan, R. Koseler, and N. Baykal, (2008), "Evaluating Learning Management Systems: Hexagonal E-Learning Assessment Model (HELAM)," *European and Mediterranean Conference on Information System* 2008 (EMCIS 2008), May 25-26, 2008, Al Bustan Rotana Hotel, Dubai.
[21] D. Parsons and H. Ryu, (2006), "A Framework for Assessing the Quality of Mobile Learning," *International Conference for Process Improvement*, Research and Education.
[22] D. Parsons, H. Ryu, R. Lal, and S. Ford, (2005), "Paper Prototyping in a Design Framework for Professional Mobile Learning," *Institute of Information and Matematical Sciences*, Massey University,Albany, Auckland, New Zealand.
[23] M. Prensky, (2001), "Digital Game-Based Learning," *McGraw-Hill*, New York.
[24] Y.-K. Wang, (2004), "Context Awareness and Adaptation in Mobile Learning," *2nd IEEE International Workshop on Wireless and Mobile Technologies in Education* (WMTE'04). 2004. Taoyuan, Taiwan: IEEE. p.154
[25] B.Schilit, N. Adams, and R. Want, (1994), "Context-aware computing applications," *IEEE Workshop on Mobile Computing Systems and Applications*, pp. 85-90.