ASSESSING PAID MOBILE LEARNING APP SUCCESS

[1]HSIN-HUI LIN, [2]YI-SHUN WANG, [3]YU-YIN WANG, [4]TUNG-HAN TSAI

[1]Department of Distribution Management, National Taichung University of Science and Technology, Taiwan
[2,3,4] Department of Information Management, National Changhua University of Education, Taiwan
E-mail: [1]brenda@nutc.edu.tw, [2]yswang@cc.ncue.edu.tw

Abstract - Increasing mobile device market penetration across the globe and growing demand for digital education are visibly driving the market for mobile learning (m-learning). Facing increased competition, paid m-learning applications (apps) are much less likely succeed in the app marketplace than free ones. Therefore, understanding how to assess the success of paid m-learning apps has become an important issue for academics and practitioners. Based on the information systems (IS) success models and the value-based adoption model, this study proposed a multidimensional model for assessing paid m-learning app success. The proposed model describes the interrelationships among seven paid m-learning app success variables: System Quality, Information Quality, Perceived Enjoyment, Perceived Fee, User Satisfaction, Intention to Reuse, and Learning Effectiveness.

Keywords - Paid mobile learning apps, information system success model, value-based adoption model, intention to reuse, learning effectiveness.

I. INTRODUCTION

With the development of mobile computing technology that provides users with unprecedented opportunities for communicating, interacting, sharing, meaning-making, content and context generation (Cook & Pachler, 2012), mobile learning (m-learning) will play a vital role in the rapidly growing electronic learning market (Wang, Wu, & Wang, 2009). The rapid development of mobile computing has made m-learning ubiquitous (Motiwalla, 2007). Increasing mobile device penetration across the globe and growing demand for digital education are visibly driving the market for m-learning. RnRMarketResearch.com (April 2015) had predicted that the worldwide market for m-learning products and services will grow from US$7.98 billion in 2015 to US$37.60 billion by 2020, a compound annual growth rate (CAGR) of 36.3%. Africa, Latin America, and Asia are forecast to have the highest growth rates throughout this period.

Researchers have defined m-learning as personal learning facilitated by mobile computing devices (Herrington & Herrington, 2007; Valk, Rashid, & Elder, 2010; Gikas & Grant, 2013). An m-learner is a person who uses wirelessly connected mobile computing devices to acquire knowledge at any time and place. Common forms of m-learning include e-books, video-based courseware, mobile content authoring, portable learning management systems (LMS), and other m-learning applications, or apps, which are software programs specially designed to run on mobile devices. M-learning apps (e.g., dictionaries, language support, image editing, and math games) can come preloaded on handheld devices and are available to users to download from device/OS-specific app marketplaces (e.g., Google Play, Apple App Store, and Windows Phone Store). These apps can make learning easier because they allow m-learners to keep up with their courses whenever and wherever (Quinn, 2001). And the use of m-learning apps can improve learning, especially when coupled with additional learner-centered instruction (Zhu & Kaplan, 2002), or when learning can take place asynchronously at the m-learner's own pace or on as needed (Palloff & Pratt, 2001).

The mobile product and service industry is highly competitive. This gives m-learners a great choice of providers and learning options to choose from. But apps that require payment to download or in-app purchases are much less likely succeed in the app marketplace compared to free ones (Statista, 2015). Accordingly, understanding the key influences that affect m-learners' decisions to use/purchase paid m-learning apps is crucial for mobile marketers and app developers. To ensure a paid m-learning app's success, it is important to assess its effectiveness and then take necessary actions based on these assessments. M-learning apps are only effective when app developers understand the strengths and weaknesses of mobile technology and are able to integrate it with appropriate pedagogical practices. However, little is known about the success and effectiveness of paid m-learning apps. Therefore, the current study aimed to examine a paid m-learning app success and effectiveness from the m-learners' perspective, not just from the technology user's perspective. Because assessing paid m-learning app success may not be reflected by customer usage, the authors of the current study measured m-learners' reuse/repurchase and learning effectiveness to determine app success.

The measurement of information system (IS) success or effectiveness has been widely investigated (Counihan, Finnegan, & Sammon, 2002; Murphy & Simon, 2002; Shang & Seddon, 2002; Wang, 2008; Wang & Liao, 2008). The most prominent IS success model employed to explain technology usage by individuals and organizations is the DeLone & McLean IS success model (DeLone & McLean,

2003). However, this success model has limitations when applied to the usage of mobile products and services such as paid m-learning apps. Most m-learners use/purchase paid m-learning apps for personal purposes, so the cost of voluntary use/purchase is usually borne by individuals. Therefore, one of the major barriers to purchasing an m-learning app is monetary cost. Potential adopters are m-learners who likely evaluate an app's price/cost and its perceived qualities/benefits. In other words, m-learners are not simply technology users.

Researchers have found that delivering a better trade-off between the *benefits* and *sacrifices* of a mobile product/service, that is, offering better *value* than the competition, can help create sustainable competitive advantage (Eggert & Ulaga, 2002; Kim, Chan, & Gupta, 2007). In the mobile services context, user perceived value has been empirically linked to increased usage/purchase intentions (Kim et al., 2007; Tseng & Lo, 2011; Chung & Koo, 2015). However, while IS success models have been widely used, few studies have assessed the success of paid m-learning apps. As such, there is a remaining need to examine app performance and m-learners' decision-making processes.

II. THEORETICAL FOUNDATIONS

2.1. DeLone and McLean IS Success Models

DeLone and McLean (1992) comprehensively reviewed articles published from 1981 to 1987 in seven publications to develop a taxonomy of IS success measures. The result was a model of interrelationships between six IS success variable categories. These were System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. DeLone and McLean (1992) developed this *original* taxonomy using established communication theories adapted to IS contexts (Shannon & Weaver, 1949; Mason, 1978; Petter & McLean, 2009). This widely adopted model made two important contributions to the understanding of IS success. First, was its *multidimensional* nature: The model provided a scheme for categorizing the multitude of IS success measures used in the research literature. Second, was its *interdependent* nature: The model suggested temporal and causal interdependencies between the categories (Seddon, 1997; McGill, Hobbs, & Klobas, 2003; Bernroider, 2008).

Grounded on the original DeLone and McLean (1992) IS success model, which was a *process* model, Seddon (1997) proposed an alternative model that focused on the causal (*variance*) aspects of the interrelationships among the taxonomic categories and separated the variance model of IS success from the variance model of behaviors that occur as a result of IS success. Seddon's IS success model, as both a process and variance model, had three components: Information Quality and System Quality, general perceptual measures of Net Benefits of IS use (i.e., Perceived Usefulness and User Satisfaction), and other measures of net benefits of IS use (i.e., net benefits to individuals, organizations, and society). To adapt the model to both volitional and non-volitional IS usage contexts, Seddon (1997) also claimed that IS use is a behavior rather than a success measure, and replaced DeLone and McLean (1992) model's Use with Perceived Usefulness, which served as a general perceptual measure of the net benefits of IS use. Additionally, Rai et al. (2002) empirically and theoretically assessed both DeLone and McLean's (1992) model and Seddon's (1997) model in a quasi-voluntary IS use context, and found that both models exhibited reasonable fit with the collected data.

Reflecting on this debate, DeLone and McLean (2003) modified their original model to address some of its limitations, and they proposed an updated model of IS success, which added Service Quality as an additional aspect of IS success and grouped all the impact measures (i.e., individual impact and organizational impact) into a single Net Benefits variable. In the updated model, quality was considered to be a three-dimensional construct (i.e., Information Quality, System Quality, and Service Quality), each measured and controlled separately. DeLone and McLean (2003) also recommended assigning different weights to the three quality dimensions depending on the context and application of the model. Those quality dimensions were predicted to singularly or jointly affect Intention to Use, Use, and User Satisfaction, resulting in certain net benefits. DeLone and McLean (2003) suggested that, given the variability of IS contexts, it may sometimes be appropriate to measure Intention to Use (an *attitude*) rather than Use (a *behavior*). They went on to state that if Intention to Use was a measure, then increased user satisfaction would lead to higher Intention to Use, which would subsequently affect Use. This resulted in the addition of Intention to Use in the updated model. These changes addressed the criticism that IS can affect levels other than individuals and organizations. Accordingly, the updated model accounted for benefits occurring at any level of analysis (e.g., workgroups, industries, customers, and societies also experience IS success); the choice of which level was to be determined by researchers using the model. In the m-learning context, m-learners use m-learning apps to acquire knowledge, seek information, or just have fun, which suggests that the updated DeLone and McLean (2003) IS success model can be applicable to mobile communications and IS phenomenon. Thus, the current authors adapted the updated IS success model to measure app success in the m-learning context, excluding m-learners' value perceptions.

2.2. Value-based Adoption Model

The value-based adoption model (VAM), developed by Kim et al. (2007), put forward an overall

estimation of the perceived value of a choice object (e.g., a product/service) that explains an individual's choice among various decision-making strategies. Perceived value refers to an overall estimation of the choice object. Individuals decide their choice of behavior (e.g., adopt or purchase) according to this overall estimation. When consumers encounter an object, they face both visible and invisible costs and benefits, which determines their behavior. From the behavioral decision theory perspective (BDT; Johnson & Payne, 1985), the cost-benefit paradigm is treated as a cognitive trade-off between give and get components of a choice object. Similarly, in the VAM, a consumer's overall assessment of the value of a choice object (e.g., the utility of a product) is based on perceptions of what is given and what is received (Zeithaml, 1988). Consumers estimate the overall value of the choice object by considering all relevant perceived benefits and sacrifices. Based on the VAM, mobile product/service (e.g., mobile Internet) adoption is determined by perceptions of the value of the mobile product/service, and these in turn are determined by the users' perceptions of Usefulness, Enjoyment, Technicality and Perceived Fee for the mobile product/service (Kim et al., 2007). Accordingly, the current authors assumed that m-learners' value perceptions can be adapted to a paid mobile product/service success measurement in the m-learning context, especially the measures of Perceived Enjoyment (perceived benefit) and Perceived Fee (perceived sacrifices).

III. RESEARCH MODEL AND HYPOTHESES

Grounded on the previous discussion, the authors proposed a comprehensive, multidimensional research model of paid m-learning app success (see Fig. 1), which suggests that System Quality, Information Quality, Perceived Enjoyment, Perceived Fee, User Satisfaction, Intention to Reuse and Learning Effectiveness are success variables for paid m-learning apps. Also, the hypotheses are proposed as follows.

H1. System Quality positively affects User Satisfaction in the paid m-learning app context.

H2. Information Quality positively affects User Satisfaction in the paid m-learning app context.

H3. System Quality positively affects Intention to Reuse in the paid m-learning app context.

H4. Information Quality positively affects Intention to Reuse in the paid m-learning app context.

H5. Perceived Enjoyment positively affects User Satisfaction in the paid m-learning app context.

H6. Perceived Fee negatively affects User Satisfaction in the paid m-learning app context.

H7. Perceived Enjoyment positively affects Intention to Reuse in the paid m-learning app context.

H8. Perceived Fee negatively affects Intention to Reuse in the paid m-learning app context.

H9. User satisfaction positively affects Intention to Reuse in the paid m-learning app context.

H10. User Satisfaction positively affects Learning Effectiveness in the paid m-learning app context.

H11. Intention to Reuse positively affects Learning Effectiveness in the paid m-learning app context.

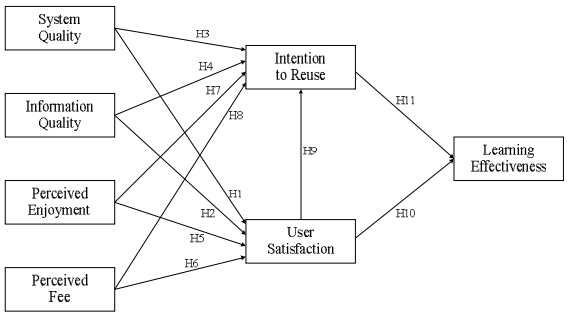


Fig.1. A Research Model of Paid M-Learning App Success

CONCLUSIONS

Despite the innovative developments in the paid m-learning app market, few studies have investigated the relevant success factors of these apps, including m-learners' reuse behaviors and learning performance. This study presents a theoretical model of paid m-learning app success that is based on the updated DeLone and McLean (2003) IS success model and VAM; this model captures the multidimensional and interdependent nature of factors determining paid m-learning app success.

REFERENCES

[1] Bernroider, E.W. N. (2008). IT governance for enterprise resource planning supported by the DeLone–McLean model of information systems success. *Information & Management, 45*(5), 257-269.

[2] Chang, C. Y., Sheu, J. P., & Chan, T. W. (2003). Concept and design of ad hoc and mobile classrooms. *Journal of Computer Assisted Learning, 19*(3), 336-346.

[3] Chung, N., & Koo, C. (2015). The use of social media in travel information search, *Telematics and Informatics, 32*(2), 215-229.

[4] Cook, J. & Pachler, N. (2012). Online people tagging: Social (mobile) network(ing) services and work-based learning. *British Journal of Educational Technology, 43*(5), 711-725.

[5] Counihan, A., Finnegan, P. & Sammon, D. (2002). Towards a framework for evaluating investments in data warehousing. *Information Systems Journal, 12*(4), 321-338.

[6] DeLone, W. H. & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

[7] DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95.

[8] Eggert, A., & Ulaga, W. (2002). Customer perceived value: A substitute for satisfaction in business markets? *Journal of Business & Industrial Marketing, 17*(2/3), 107-118.

[9] Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *Internet and Higher Education, 19*, 18-26.

[10] Herrington, A., & Herrington, J. (2007, November). *Authentic mobile learning in higher education*. Paper

presented at Australian Association for Research in Education, Fremantle, Western Australia.
[11] Johnson, E. J., Payne, J. W. (1985). Effort and accuracy in choice. *Management Science, 31*(4), 395-414.
[12] Keegan, D. (2002). *The future of learning: From elearning to mlearning*. Retrieved January 13, 2017, from the World Wide Web: http://www.pubhealth.spb.ru/Handheld/mlearn_web.pdf
[13] Kim, H.-W., Chan, H.-C., & Gupta, S. (2007). Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems, 43*(1), 111-126.
[14] Korucu, A. T., & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia Social and Behavioral Sciences, 15*, 1925-1930.
[15] Mason, R.O. (1978). Measuring information output: A communication systems approach. *Information & Management, 1*(4), 219-234.
[16] McGill, T., Hobbs, V., & Klobas, J. (2003). User-developed applications and information systems success: A test of DeLone and McLean's Model. *Information Resources Management Journal, 16*(1), 24-45.
[17] Motiwalla (2007). Mobile learning: A framework and evaluation. *Computers & Education, 49*(3), 581-596.
[18] Murphy, K.E., & Simon, S.J. (2002). Intangible benefits valuation in ERP projects. *Information Systems Journal, 12*(4), 301-320.
[19] O'Malley, C., Vavoula, G., Glew, J., Taylor, J., Sharples, M., & Lefrere, P., et al. (2005). Guidelines for learning/teaching/tutoring in a mobile environment. Public deliverable from the MOBIlearn project (D.4.1).
[20] Palloff, R. M., & Pratt, K. (2001). *Lessons from the cyberspace classroom: The realities of online teaching*. San Francisco, CA: Jossey-Bass.
[21] Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information & Management, 46*(3), 159-166.
[22] Quinn, C. N. (2011). *Designing mLearning: Tapping into the mobile revolution for organizational performance*. San Francisco, CA: Pfeiffer.
[23] Rai, A., Lang, S. S., & Welker, R. B. (2002) Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research, 13*(1), 50-69.
[24] Seddon, P. B. (1997) A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research, 8*(3), 240-253.
[25] Shang, S., & Seddon, P. B. (2002). Assessing and managing the benefits of enterprise systems: The business manager's perspective. *Information Systems Journal, 12*(4), 271-300.
[26] Shannon, C. E. & Weaver, W. (1949). *The Mathematical Theory of Communication*. University of Illinois Press, Urbana, IL.
[27] Statista (2015). Statistics and facts about mobile app usage. Retrieved October 13, 2016, from the World Wide Web: https://www.statista.com/topics/1002/mobile-app-usage/
[28] Tseng, F.-M., & Lo, H.-Y. (2011). Antecedents of consumers' intentions to upgrade their mobile phones. *Telecommunications Policy, 35*(1), 74-86.
[29] Valk, J.-H., Rashid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *International Review of Research in Open and Distance Learning, 11*(1), 117–140.
[30] Vavoula, G. N., & Sharples, M. (2002). KLeOS: A personal, mobile, knowledge and learning organisation system. In Milrad, M., Hoppe, U. Kinshuk (Eds.), *Proceedings of the IEEE International Workshop on Mobile and Wireless Technologies in Education (WMTE2002)* (pp. 152-156). Vaxjo, Sweden.Korucu, A. T., & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. Procedia Social and Behavioral Sciences, 15, 1925-1930.
[31] Wang, Y.-S. (2008). Assessing e-commerce systems success: A respecification and validation of the DeLone and McLean model of IS success. *Information Systems Journal, 18*(5), 529-557.
[32] Wang, Y.-S., & Liao, Y.-W. (2008). Assessing eGovernment systems success: A validation of the DeLone and McLean model of information systems success. *Government Information Quarterly, 25*(4), 717-733.
[33] Wang, Y.-S., Wu, M.-C., & Wang, H.-Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology, 40*(1), 92-118.
[34] Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing, 52*(3), 2-22.
[35] Zhu, E., & Kaplan, M. (2002). Technology and Teaching. In W. J. McKeachie (11th Ed.), *McKeachie's teaching tips: Strategies, research, and theory for college and university teachers* (pp. 204-223). Boston: Houghton Mifflin.

★★★