Understanding e-Learners' Satisfaction with Learning Management Systems

Sean B. Eom

Abstract—**Our university has recently transitioned from a home-grown learning management system (LMS), online instructor suite (OIS), to an open-source LMS, Moodle. Reactions of students to the new LMS range from "extremely dislike" to "extremely like." This study tested a model for determining e-learner satisfaction with LMS using WarpPLS. Of the four antecedent constructs hypothesized to affect user satisfaction with LMS, only two (information quality and readiness for online learning) are significant, while both learners' psychological variables (self-efficacy) and psychological learning process (self-regulated learning management) failed to show significant and positive relationships with e-learner satisfaction with LMS.**

Index Terms— *Learning management systems, satisfaction, self-efficacy, self-regulated learning, readiness for online learning, warpPLS*

I. INTRODUCTION

Our university has recently transitioned from a home grown learning management system (LMS), online instructor suite (OIS), to an open-source LMS, Moodle. Reactions of students to this transition range from "extremely dislike" to "extremely like" as shown below.

> "I like the new Moodle system even though it was difficult at the beginning."

> "This course was one of the fall courses that switched to the Moodle interface and it was so much better than the old LMS."

> "I like the websites like they are now with Moodle so much better."

> "Moodle was very difficult to use in this class. I think this had a strong impact on not only my grade, but also my feelings towards online classes in general."

> "Get rid of Moodle!"

> "Moodle is absolutely terrible and does not help students learn."

A possible theoretical model that can be applied to explain these differing perceptions on-line students on the identical LMS is the DeLone and McLean (DM) model, which is one of the widely recognized information system (IS) success models. The DM model has explanatory power and therefore it has merit for explaining IS success [1] and perceived system quality and information quality are significant predictors of user satisfaction. The crucial component of the DM model is the "use" construct. A large number of empirical studies in mandatory, quasi-voluntary contexts failed to provide the link between "use" and "satisfaction". A series of research tested the DM model in an university e-learning context [3]. It was found that three constructs (system quality, information quality, and system use) may not be sufficient enough to fully explain the success of e-learning systems. The DM model, despite its huge success in many different settings, may have a very limited explanatory power to understand learner satisfaction with LMS and LMS's effectiveness [3]. This paper investigates determinants of e-learner satisfaction with LMS to better understand and explain why some e-learners view the new LMS was so much better than the old LMS, while others think it was absolutely terrible.

II. USER SATISFACTION

This research used the definition of user satisfaction by Ives et al. [4] and Larker and Lessig [5]. The former defined it as "the extent to which users believe the information system available to them meets their information requirements." The latter defined it as "perceived usefulness" of many features of information systems.

LMS help e-learners (a) access instructional information in the form of assignment pages, hyperlinked supplementary documents and multi-media files, (b) actively interact with the instructor and fellow students, (c) complete assignments and upload them to the dropbox, (d) take exams and quizzes. Any LMS provide a wide range of features in support of students' activities (a) through (d) such as communication/collaboration, contents, and assessment. Communication/ collaboration features include mobile messaging, blogs, wikis, chat, discussion forums, calendars, etc. Content features of an LMS include file types supported and file uploading capabilities, and ease of integrating media. Finally, Assessment features include quizzes, surveys, discussions, and assignment dropbox.

Satisfaction from students' activity (a) may be directly linked to information quality (IQ), while the remaining activities (b) through (d) are more influenced by students'

perception of usefulness" of communication/collaboration, contents, and assessment features of an LMS.

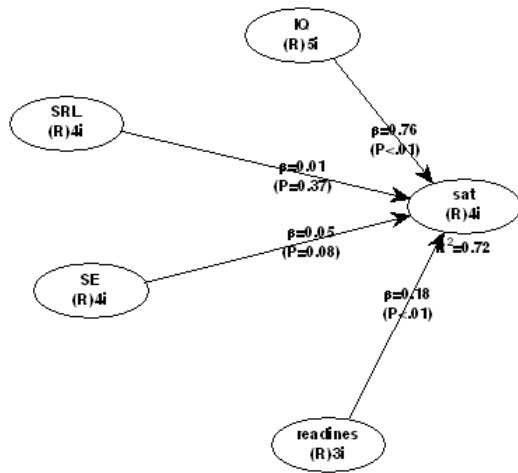## III. RESEARCH MODEL AND HYPOTHESES

Fig. 1 Research model and results

The model in Figure 1 represents the relationships among five constructs. The four independent constructs are information quality (IQ), self-regulated learning (SRL), self-efficacy (SE), and readiness for online learning (Readiness). The dependent construct is the satisfaction with LMS (sat). Due to space limitation, figure 1 contains both the research model and results.

A. Information quality

Information quality is the measure of distinctive characteristics of the quality of information produced by LMS. Information quality consists of a range of attributes including accuracy, timeliness, reliability, relevance, format, perceived usefulness, and understandability [6, 7].

We hypothesize the following.

H_1: Information quality will be positively related to e-learner satisfaction with LMS.

B. Self-regulated learning

Self-regulation refers to self-managing behavior, motivation, and cognition [8]. Self-regulation in distance learning may be more important than in traditional face-to-face learning because of the changing role of students from passive learners to active learners [9, 10]. Education psychologists found that the essential qualities that discriminate a self-regulated learner from others are the individual's conscious choice of cognitive learning strategy, and continuous monitoring and self-assessment of learning effectiveness and progress toward the learning outcome [11, 12]. Self-regulated learners possess three self-regulatory attributes (self-efficacy, self-awareness, and resourcefulness), which drive learners' self-regulatory processes (attributions, goal setting, and self-monitoring). Self-regulatory attributes,

especially self-efficacy, are positively related to task persistence, effective study activities, and learning outcomes [12]. A self-regulated learner is an active and persistent seeker of information.

A self-regulated learner, as an active seeker of information, presumably interacts with the instructor and fellow students more than other students via ccommunication and collaboration features of LMS. Therefore, we hypothesize the following:

H_2: Self-regulated learning will be positively related to e-learner satisfaction with LMS.

C. Self-efficacy

Self-efficacy is an individual's belief in his or her ability to accomplish a certain task and to produce designated levels of performance with the skills he or she has [13]. Self-efficacy beliefs determine how people motivate themselves and behave [14]. Computer self-efficacy was positively linked to e-learning outcomes measured by average test scores in e-learning [15], perceived content value, course satisfaction, and course performance [16], individuals' intentions to continue using LMS [17], and e-learner satisfaction [18]. Therefore, we hypothesize the following.

H_3: Computer self-efficacy will be positively related to e-learner satisfaction with LMS.

D. Readiness for Online Learning

One of the different natures of on-line and face-to-face learning environments is using the Internet and many other information and telecommunication technologies with no direct contact with the instructor and students. Consequently, a determinant of e-learners' satisfaction with LMS is the internet and technology readiness. Online Learner Self-Assessment was developed to provide potential e-learners with a comprehensive analysis of their readiness for success in an online learning environment prior to enrolling in e-learning courses [19, 20]. Readiness constructs of Parnell and Carraher [20] include information and internet technology skills, course flexibility, Quality. Therefore, we hypothesize the following:

H_4: Readiness for online learning will be positively related to e-learner satisfaction with LMS.

IV. SURVEY INSTRUMENT AND SAMPLE

The survey questionnaire is selected from a multi-dimensional model for assessing e-learning systems success (ELSS) from the perspective of the e-learner developed by Wang, Wang, and Shee [21]. The ELSS model conceptualized the construct of e-learning systems success and provided empirical validation of the construct and its underlying dimensionality. The survey instrument consisted of 35 items using a seven point Likert scale ranging from "strongly disagree" to "strongly agree." In this study, all constructs are

reflective constructs. The population was undergraduate and graduate students that were enrolled in an online course at a large university located in the Midwest United States. Invitations to reply to the survey were sent to 2,156 unique students. Of those students invited, 809 students volunteered responses with 633 surveys being complete and usable for a response rate of 29.35%.

V. Measurement Model Estimation and Validation

The research model (figure 1) is tested using WarpPLS, which is the structural equation modeling (SEM)-based Partial Least Squares (PLS) methodology. The test of the measurement model includes an estimation of the internal consistency and the convergent, discriminant, and factorial validity of the instrument items, as suggested by Straub et al. [22]. Construct validity is assessed through establishing both convergent and discriminant validities. Convergent validity refers to the extent to which a set of indicator variables load together and they load highly (loading >0.50) on their associated factors. Individual reflective measures are considered to be reliable if they correlate more than 0.7 with the construct they intend to measure. Most of the loadings were above 0.8 for the five constructs, higher than the threshold value .7. When indicator variables do not cross-load on two or more constructs, each construct is said to be demonstrating discriminant validity. Indicator variables in each construct do not cross-load on two or more constructs. All constructs in the estimated model fulfilled the condition of discriminant validity.

All reliability measures were above the recommended level of 0.70., thus indicating adequate internal consistency [27, 28]. The average variance extracted scores (AVE) were also above the minimum threshold of 0.5 [24, 25] and ranged from 0.743 to 0.920. When AVE is greater than .50, the variance shared with a construct and its measures is greater than error. This level was achieved for all of the model constructs.

VI. STRUCTURAL MODEL RESULTS

A. Information quality

This study found a strong positive relationship between information quality and user-satisfaction with e-LMS. Our findings strongly support the previous works of Rai, et al [1], Livari [2], and freeze, et al. [29]. These three studies found strong positive relationships between information quality and user-satisfaction in a voluntary or mandatory use context. This research solidifies their findings that information quality is a significant predictor of the satisfaction of e-learners with LMS, regardless of the nature of systems use.

B. Readiness for online learning

A key element of e-learning success factors is the active role of students who are ready to engage in e-learning activities. A significant positive relationship was found between students' satisfaction with e-LMS and readiness for e-learning. This result confirms that the determinants of e-

learning success [30] differ from those of conventional classroom.

C. Self-efficacy

This study failed to confirm that students with a high level of computer self-efficacy were positively related to e-learner satisfaction with LMS.

D. Self-regulated learning

No statistically significant evidence is found to suggest that the psychological learning process (e.g., self-regulated learning management) had effects on e-learners' satisfaction with LMS.

VII. CONCLUSION

This study tested a model for determining e-learner satisfaction with LMS. As can be seen from the results (figure 1), Of the four antecedent constructs hypothesized to affect user satisfaction with LMS, only two (information quality and readiness for online learning) are significant, while both learners' psychological variables (self-efficacy) and psychological learning process (self-regulated learning management) failed to show significant and positive relationships with e-learner satisfaction with e-LMS.

Our study showed that e-learner satisfaction with LMS largely depends on the information quality of LMS. Students' satisfaction will increase if LMS provide information which is relevant to learning, easy to understand, and up-to-date. The quality of information is largely determined by the instructor who designs the course structure and delivers the course contents. Another key Determinants of e-Learners' Satisfaction with LMS students readiness for e-learning measured by basic skills of using computers, the Internet, e-mails, etc.

REFERENCES

[1]   A. Rai, S. S. Lang, and R. B. Welker, "Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis," *Information Systems Research*, vol. 13, pp. 50-69, 2002.

[2]   J. Livari, "An Empirical Test of the DeLone-McLean Model of Information System Success," *The DATA BASE for Advances in Information Systems*, vol. 36, pp. 8-27, 2005.

[3]   S. B. Eom, "Effects of e-learning management systems, self-efficacy, and self-regulated learning on system effectiveness " *Journal of International Education in Business*, vol. 5, pp. 129-144, 2012.

[4]   B. Ives, M. Olson, and J. J. Baroudi, "The Measurement of User Information Satisfaction," *Communications of the ACM*, vol. 26, pp. 785-793, 1983.

[5]   D. F. Larker and V. P. Lessig, "Perceived usefulness of information: a psychometric examination," *Decision Sciences*, vol. 11, pp. 121-134, 2007.

[6]   W. H. DeLone and E. R. McLean, "Information System Success: The Quest for the Dependent Variable," *Information Systems Research*, vol. 3, pp. 60-95, 1992.

[7] W. H. DeLone and E. R. McLean, "The DeLone and McLean model of information systems success: A ten-year update," *Journal of Management Information Systems*, vol. 19, pp. 9-30, 2003.

[8] B. J. Zimmerman, "self-efficacy and educational Development," in *Self efficacy and Changing society*, A. Bandura, Ed. New York: Cambridge University Press, 1995, pp. 202-231.

[9] F. B. King, M. Harner, and S. W. Brown, "Self-regulatory behavior influences in distance learning," *International Journal of Instructional Media*, vol. 27, pp. 147-156, 2000.

[10] D. Jonassen, M. Davidson, M. C. Collins, J., and B. B. Haag, "Constructivism and computer-mediated communication in distance education," *The American Journal of Distance Education*, vol. 9, pp. 7-26, 1995.

[11] B. J. Zimmerman, "Development of self-regulated learning: Which are the key subprocesses?," *Contemporary Educational Psychology*, vol. 16, pp. 307-313, 1986.

[12] B. J. Zimmerman, "A Social cognitive view of self-regulated academic learning," *Journal of Educational Psychology*, vol. 81, pp. 329-339, 1989.

[13] A. Bandura, *Social Foundations of thought and action: A Social cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall, 1986.

[14] A. Bandura, "Self-efficacy," in *Encyclopedia of human behavior*, vol. 4, V. S. Ramachaudran, Ed. New York: Academic Press, 1994, pp. 71-81.

[15] M. J. Simmering, C. Posey, and G. Piccoli, "Computer Self-Efficacy and Motivation to Learn in a Self-Directed Online Course," *Decision Sciences Journal of Innovative Education*, vol. 7, pp. 99-121, 2009.

[16] R. D. Johnson, S. Hornik, and E. Salas, "An empirical examination of factors contributing to the creation of successful e-learning environments," *International Journal of Human–Computer Studies*, vol. 66, pp. 356-369, 2008.

[17] C.-M. Chiu and E. T. G. Wang, "Understanding Web-based learning continuance intention: The role of subjective task value," *Information & Management* vol. 45, pp. 194-201, 2008.

[18] J. Womble, "E-learning: The Relationship among Learner Satisfaction, Self-efficacy, and Usefulness," *The Business Review*, vol. 10, pp. 182-188, 2008.

[19] R. Watkins, D. Leigh, and D. Triner, "Assessing Readiness for E-Learning," *Performance Improvement Quarterly*, vol. 17, pp. 66-79, 2004.

[20] J. A. Parnell and S. Carraher, "The Management Education by Internet Readiness (MEBIR) scale: Developing a scale to assess personal readiness for internet-mediated management education," *Journal of Management Education*, vol. 27, pp. 431-446, 2003.

[21] Y.-S. Wang, H.-Y. Wang, and D. Y. Shee, "Measuring e-learning systems success in an organizational context: Scale development and validation," *Computers in Human Behavior*, vol. 23, pp. 1792–1808, 2007.

[22] D. Straub, M.-C. Boudreau, and D. Gefen, "Validation Guidelines for IS positivist Research," *Communications of the Association for Information Systems*, vol. 13, pp. 380-427, 2004.

[23] W. W. Chin, "Issues and Opinion on Structural Equation Modeling," *MIS Quarterly*, vol. 22, pp. VII-XVI, 1998.

[24] C. R. Fornell and D. Larcker, "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, vol. 18, pp. 39-50, 1981.

[25] W. W. Chin, "The partial least squares approach to structural equation modeling," in *Modern Methods for Business Research*, G. A. Marcoulides, Ed. Mahwah, NJ: Lawrence Erlbaum Associates, 1998, pp. 295-336.

[26] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 7th ed. Upper Saddle River, New Jersey: Prentice Hall, 2010.

[27] J. C. Nunnally and I. H. Bernstein, *Psychometric theory*, 3rd ed. New York: McGraw-Hill, 1994.

[28] C. R. Fornell and F. L. Bookstein, "A Comparative Analysis of Two structural Equation Models: LISREL and PLS Applied to Market Data," in *A Second Generation of Multivariate Analysis*, C. Fornell, Ed. New York: Praeger, 1982, pp. 289-394

[29] R. D. Freeze, K. A. Alshare, P. Lane, and H. J. Wen, "IS success model in e-Learning context based on student Perception," *Journal of Information Systems Education*, vol. 21, pp. 173-184, 2010.

[30] S. B. Eom, N. Ashill, and H. J. Wen, "The Determinants of Students' Perceived Learning Outcome and Satisfaction in University Online Education: An Empirical Investigation," *Decision Sciences Journal of Innovative Education*, vol. 4, pp. 215-236, 2006.

Sean B. Eom (Ph.D. in management science from the University of Nebraska) is a Professor of Management Information Systems (MIS) at the Harrison College of Business of Southeast Missouri State University, Cape Girardeau, MO. His research areas include distance education and business intelligence. He is the author/editor of nine books including *Student Satisfaction and earning Outcomes in E-Learning: An Introduction to Empirical Research.* He has published more than 60 refereed journal articles. He has won "best paper of the conference" four times in the e-learning area at the annual meetings of Decision Sciences Institute, the International Academy for Information Management, and International Conference on Information Systems and Technologies. He is an Inductee of *Decision Sciences Institute Hall of Fame* with the 2006 Best Paper, "The determinants of students' perceived learning outcome and satisfaction in university online education: An empirical investigation," in *Decision Sciences Journal of Innovative Education (DSJIE).*