The Role of Cognitive Styles in Influencing the Users’ Satisfaction on E-Learning System

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Abstract

E-learning has been a wide research discussion and the evaluation of e-learning interface design has been an imperative importance discussion among previous researchers. But none of the research reveal the influence of cognitive styles with system characteristics and information success which lead to user satisfaction. Despite considerable empirical research, results on the relationships among constructs related to information system (IS) satisfaction, as well as the determinants of IS satisfaction, are often inconsistent. A comprehensive understanding of IS satisfaction thus remains elusive. In an attempt to address this situation, we present and test a comprehensive theoretical model that explains interrelationships among different constructs representing the system context and usage which lead to satisfaction. This study will also identify the role of cognitive style as a moderator between system context and usage. The results will underline the importance of attributes from system context and cognitive theory of cognitive styles in IS satisfaction and raise questions about some commonly believed relationships.

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1. Introduction

Technology is constantly changing and new technological developments can have profound effects on many industries especially education. Information Technologies present many possibilities of development at all levels of the organization. Electronic learning (e-learning) is one of the remarkable recent developments in the information system industry. The success of adopting new technology not only requires changes in the design of the universities structure to facilitate the implementation of e-learning system but in the behaviour of their members (Suri, 2007). Therefore, all members in the organization need to absorb new knowledge and ready to change their behaviour in order to develop new skills. Hence, support from the top management is essential to make e-learning system fully utilized by all members. According to Masrek et al (2007), the top management support towards change is one of the contributing factors in which users will accept or reject the system. Besides that, the organizational culture has been suggested as a factor that may ultimately influence the effectiveness of the system (Zammuto and O'Connor, 1992). However, the benefits of e-learning system that derives from users’ satisfaction will not be maximized unless all members in an organization are influenced to use the system effectively.

Another focus in this research is to look at how system context can influence users to use E-learning system by looking at the information quality, system quality and service quality as the constructs towards users’ satisfaction. e-Learning system creates information which is communicated to the users who are then influenced or not influenced by the system. The answer whether users influenced or not can be reflected by their actual usage of the system. Some researchers have focused on the desired characteristics of the information system which refers to system quality. Others focused on the product itself for desired characteristics such as accuracy, understandability, timeliness and reliability in order to measure information and service quality. Those qualities are appropriate as a reference for upgrading or improving the dynamic of information system but not as mechanism to determine users’ satisfaction. The assumption that all users will learn and use a system in a similar manner is a common approach when designing a system especially e-learning material. This approach nevertheless, ignores the important issues of individual differences in cognitive styles. Messick (1984) defines cognitive style as individual’s consistent approach to organizing and processing information during thinking. Other studies (Riding and Ashmore, (1980); Riding and Mathias, (1991)) found that cognitive style can affect learning performance by using mode of presentation as represented by verbal, pictorial or auditory modes. As for content type, individuals appear to learn best when information can be readily translated into their preferred verbal-imagery mode of representation. Riding and Rayner (1998) noted that not only the mode of presentation, but also the content itself, affects learning performance to an extent that it is of practical significance.

This study however attempts to test a comprehensive theoretical model which explains interrelationships among different constructs in organizational context and system context with system usage which lead to satisfaction. Apart from that, the role of cognitive style as a moderator between system context and usage will be evaluated.
2. Literature Review

2.1. E-Learning

E-learning has now become an accepted part of the student’s life especially in higher institutions. However, they would have their own opinions and feeling about the usability of the e-learning system in order to replace or to enhance their learning approach. Some people would argue that e-learning is just the delivery of web-based lessons. Others would praise e-learning for making it easy and convenient to learn some things quickly. Most universities today offer some forms of e-learning as a tool for enhancing teaching quality. Therefore, there is a growing need for well-designed e-learning materials. Nowadays, many e-learning coursewares are designed more on exploratory and other active learning approaches (Chew, 2000).

The current needs and trends in education point to directions that are different from the ones reflected in the current e-learning specifications (Koper and Olivier, 2004). Some of the major trends that are related to the requirements of learning technology specifications according to [6] are:

- Instruction is becoming more personalized: learner-centred, non-linear and self-directed.
- The distinction between face-to-face and distance education is disappearing through the use of eLearning. Courses that can be followed at a distance and blended distance and face-to-face approaches will be dominant in future.
- Lifelong learning is becoming a competitive necessity, resulting in a need for interoperable, networked learning (e.g. interoperable learning networks and portable learner dossiers).
- Academic emphasis is shifting from course completion to competency attainment.
- Traditional faculty roles are changing toward more specialized roles (course designer, tutor, -etc).
- Faculty members demand decreased workloads, especially while working with learning management systems or online collaborative and conference environments. More automated support in the work process of faculty members is needed.

2.2. Cognitive Style

Cognitive theories stress on the cognitive response in the form of mental operations and internal states. These internal states include simple propositions, schema, general rules, skills, general skills, automatic skills and mental models. From an information processing perspective, students view learning as an internal process that cannot be observed directly where the students use different types of memory during the learning process (Parhar, 2003).

Cognitive theory acknowledges and considers the perceived and real issues that arise during the learning process due to individual learner’s differences. Learning involves the use of memory, motivation, thinking and reflection. It is the execution of internal cognitive processes, such as thinking, remembering, conceptualization, application and problem solving. Learning also involves the acquisition or reorganization of the cognitive structures through which human beings process and store information. Learning is an internal process and the amount learnt depends on the “learner’s processing capacity, the depth of processing, and the learners existing knowledge structures” (Ally, 2004).
On the other hand, cognitive style refers to an individual's way of processing information, his or her preferred approach to creative thinking, decision making and problem solving (Kirton, 1976). Cognitive styles are links between two dimensions, which are personality and cognition and have been referred as an individual’s way of perceiving, remembering, thinking and problem solving during decision making process. Cognitive style is usually described as a personality dimension, which influences attitudes, values, and social interaction. It is also described as the manner in which information is acquired and process (Hansen, 1995).

2.3. Information System Success Model

The issue of an information system success has become a long-standing discussion among information system researchers. Various ways of measuring the success have been introduced and used, with diverse terms to explain it for instance system effectiveness and performance improvement.

One of the models that has been mostly discussed, adopted and validated is the information system success model (Delone and McLean, 1992, 2003). Adopted from the communication theory (Mason, 1975) that seeks to examine the influence level, Delone and McLean (1992) posit six categories as the outcomes or success of management information systems. They are information quality, system quality, use, user satisfaction, individual impacts and organizational impacts.

As the information system success model are actually dependent, interdependent variables, Delone and McLean (1992, 2003) urged for the factors identification. Motivated by the suggestion, Hwang et al. (2000) conducted a study to investigated the antecedents of system success. Using the dimensions of use, satisfaction, individual and organizational impacts, Hwang et al. (2000) claimed the success is related to environmental factors related to organizations, users and IS operations.

3. Research Framework And Hypotheses

Building on Information System Success Model (Delone and McLean, 2003) and Kirton’s Adaptor-Innovator of Cognitive Styles (Kirton, 2003), a model is proposed to investigate the antecedents and outcomes of e-learning system usage among lecturers. The proposed model includes two groups of e-learning system usage antecedents namely organizational context and system context, while the outcome of the usage is investigated as the users’ satisfaction. In addition, cognitive styles measured as adaptor-innovator will be tested to examine its influence to the relationship between system factors and usage.

3.1. Organizational Context

Top management emphasis, facilitating conditions and organizational culture are viewed as the driving factors to e-learning system usage. Jeyaraj et al. (2006) group these factors as organizational IT innovation usage predictors. Top management attitude towards change is very imperative in influencing the decision to accept and use new technology (Masrek et al, 2007). Their role is significant as the usage requires financial commitment and managerial coordination. Top management emphasis is also one of the most influential predictor for IT innovation usage (Jeyaraj et al 2006). Therefore, the discussion offers the following hypothesis:

H1a: There is a significant relationship between top management emphasis and e-learning system usage.
Facilitating conditions are the objective factors in the environment that observers agree make an act easy to do, including the provision of computer support (Thompson et al, 1991). Venkantesh et al (2003) found facilitating conditions have a direct influence on IT usage. Therefore, the following hypothesis is offered:

H1b: There is a significant relationship between facilitating conditions and e-learning system usage.
Organizational culture complicates firm readiness to accept new external information technology (Yusof et al, 2007) and it is also acknowledged as extremely important to firm growth and survival (Irani, 2003). The introduction of new information systems is also likely to have consequences on organizational culture (Smithson and Hirschheim, 1998). Hence, these viewpoints lead to the following hypothesis.
H1c: There is a significant relationship between organizational culture and e-learning system usage.

3.2. System Context

Information quality, system quality and service quality are the system contexts that are perceived to have influential relationship to the system usage. Delone and McLean (2003) posited information quality, system quality and service quality are the predictors that affect the actual usage.
Teng and Calhoun (1996) conducted a study to investigate the influence of information quality on system usage, and the result was significant (Delone and McLean, 2003). Information quality is the desired characteristics of the product at the semantic level, and they are measured as accuracy, meaningfulness and timeliness.

H2a: There is a significant relationship between information quality and e-learning system usage.
System quality focuses on the information processing system itself, that produces the information. In predicting the relationship between system quality and system usage, several studies have found a significant relationship between the variables (Goodhue and Thompson, 1995; Norzaidi et al, 2007). System quality is characterized as design, navigation, response time and security.

H2b: There is a significant relationship between system quality and e-learning system usage.
Parasuraman et al (1985) first defined system quality as the degree of discrepancy between customers’ normative expectation for the service and their perceptions of service performance (Lai, 2006). Service quality dimensions are tangible, reliability, responsiveness, assurance and empathy.

H2c: There is a significant relationship between service quality and e-learning system usage.

3.3. Adaptor-Innovator Cognitive

H3: Cognitive styles influence the relationship between system contexts and system usage.
Cognitive style is an individual difference that refers to an individual's way of processing information, his or her preferred approach to creative thinking, decision making and problem solving (Kirton, 1976). According to Kirton it is divided according to adaptor and innovator. Adaptor is an individual who easy adapt a system while innovator is an individual who is more innovative in using a system.

According to Kate, each individual is difference in terms of system usage. It was found that there is an influence of adaptor and ease of use of the system (Zamzuri, 2007) this lead to an influence of ease of use and system usage. Furthermore, a system that easy to use lead to higher usage of a system (David, 1986).
3.4. Usage Implications to User Satisfaction

In formulating an information system success model, Delone and McLean (1992) posited the role of system usage as a predictor to user satisfaction. The linkage was then tested by Igbaria and Tan (1997), Gelderman (1998) and Torkzadeh and Doll (1999), and significant relationships were proven (Delone and Mclean, 2003). Based on the findings, the following hypothesis is offered:

H4: There is a significant relationship between system usage and user satisfaction.

Fig. 1. Proposed Research Model

4. Methodology

4.1. Population and Sample

The population of the study consisted of lecturers in one of the leading universities in Malaysia. The sample of the study was chosen using the random sampling technique. The study used perceptual measures to capture data on organizational context, system context, cognitive style, usage and satisfaction. Perceptual measures are acceptable measures in most survey research.

4.2. Measures

In most of the questions, a seven-point Likert-scale ranging from 1 as strongly disagree to 7 as strongly agree was used to represent the responses of the sample. 32 items from Kirton (1976) were used to measure cognitive styles, which the reliability test had shown the instrument was valid. Other items were also adopted from previous studies.
The questionnaire was pre-tested by lecturers who specialized in the area of information system. They were asked to critically evaluate the questionnaire with regard to the objectives, contents, clarity and ease of completion.

4.3. Data Collection

After the pre-testing stage, a modified questionnaire was developed for conducting the pilot study. The study was performed by 30 lecturers in the faculty and the result of running the coefficient Cronbach’s alpha test proved the instrument was reliable.

Table 1. Construct and Reliability Test

| Construct               | Items in scale | Cronbach’s α |
|-------------------------|----------------|--------------|
| Organizational context  | 4              | 0.87         |
| System context          | 4              | 0.93         |
| Cognitive styles        | 32             | 0.73         |
| Usage                   | 4              | 0.81         |
| Satisfaction            | 4              | 0.97         |

5. Conclusion

Based on the literature, it was found that there is a significant influence of organizational context and system context towards usage of a system which lead to user satisfaction. It was also found that an adaptor influences the usage of a system, as an adaptor is an individual who is dogmatism in the use of technology. Based on the previous study, it found that the ease of the system lead to system usage as there is an influence of adaptor toward ease of use which lead to system usage. It is predicted that there is an influence of system context towards system usage that mediated by the adaptor and innovator of individual character.

Since this is a theoretical paper, this to propose the model of inter relationship among few construct including cognitive styles as a moderator which play role to influence the user’s satisfaction on e-learning system. According to the analysis, there is significant influence of cognitive styles upon the user’s satisfaction of e-learning system. It was fairly reliable (r=0.73). In conclusion; the organizational context which are top management emphasis, facilitating conditions and organizational culture together with system context which is quality of information, system and service were very significant to influence the user’s satisfaction (r=0.87 and r=0.93). While the cognitive styles significantly plays the role as adaptor and innovator to influence the usage and user’s satisfaction.
References

Ally, M. (2004). Foundations of Educational Theory for Online Learning, in T. Anderson, and F. Elloumi, (Eds).

Chew, S. C. W. (2000). E-learning - a Provider's Prospective, Internet and Higher Education, 4, 337-352.

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

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.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance, MIS Quarterly, 19 (2), 213 – 236.

Hansen, J. W. (1995). Student Cognitive Styles in Postsecondary Technology Programs, Journal of Technology Education, 6 (2), pp. 19-33.

Hwang, M. I., Windsor, J. C., & Pryor, A. (2000). Building a knowledge base for MIS research: A metaanalysis of a systems success model. Information Resources Management Journal, 13 (2), 26 – 32.

Igbaria, M. et al. (1995). Testing the determinants of microcomputer usage via a structural equation model, Journal of Management Information Systems, 11 (4), 87 – 114.

Irani, Z. (2003). Information systems evaluation: navigating through the problem domain. Information & Management. 40, 11–24.

Jeyaraj, A., Rottman, J. W., & Lacity, M. A. (2008). A review of the predictors, linkages, and biases in IT innovation adoption research. Journal of Information Technology. 21, 1- 23.

Koper, R and Olivier, B. (2004). Representing the Learning Design of Units of Learning, Educational Technology & Society, 7 (3).

Masrek, M. N., Abdul Karim, N. S., & Hussein, R. (2007). Investigating corporate intranet effectiveness: A conceptual framework. Information Management and Computer Security. Vol 15. No 3, pp. 168 – 183.

Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. Educational Psychology, 19, 59-74.

Norzaidi, M. D., Siong, C. C., Murali, R. & Salwani, M. I. (2007). Intranet usage and managers’ performance in the port industry, Industrial Management & Data Systems, 107, (8), 1227-1250.

Riding, R. and Ashmore, I. (1980). Verbaliser-imager learning style and children’s recall of information presented in pictorial versus written form. Educational Psychology, 6, pp. 141-145.

Riding, R. and Cheema, I. (1991). Cognitive Styles: an Overview and Integration, Educational Psychology, 11 (3), 193 –216.

Riding, R. and Mathias, D. (1991). Cognitive Styles and preferred learning mode, reading Webster attainment and cognitive ability in 11-year-old children. Educational psychology, 11, pp. 383-393.

Riding, R. and Rayner, S. (1998). Cognitive Styles and Learning Strategies: Understanding Style Differences in Learning and Behaviour. David Fulton Publishers, London, pp. 217.

Smithson, S. & Hirschheim, R. (1998). Analysing information systems evaluation: another look at an old problem. European Journal of Information Systems. Vol 7, pp. 158–174.

Suri, G. (2007). Organizational Culture in ICT Implementation and Knowledge Management in Spanish and Indian Universities: A Conceptual Model.

Thompson, R. L., Higgins, C. A. & Howell, J. M. (1991). Personal Computing: Toward a conceptual model of utilization. MIS Quarterly. March 1991.

Venkantesh, V. et al. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly. Vol 27. No. 3, pp 425 – 478.
Yusof, M. et al. (2007). An evaluation framework for health information systems: Human, organization and technology-fit-factors (HOT-Fit). International Journal of Medical Informatics. Doi:10.1016/j.ijmedinf.2007.08.011.

Zammuto, R.F. and O’Connor, E.J. (1992). Gaining Advanced Manufacturing Technologies' Benefits: The Roles of Organization Design and Culture. The Academy of Management Review, Vol. 17, No. 4, pp. 701-728.