UNDERSTANDING BEHAVIORAL INTENTION OF E-LEARNING SYSTEM RE-USE

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Abstract: With the rapid development of information and communication technologies, e-learning system has emerged as a new means of education. The learner acceptance of e-learning system has attracted extensive attention, but how the experience of using the existing e-learning system impacts on their behavioural intent to the e-learning system re-use has received limited consideration. As the application of e-learning is gaining its momentum, it is necessary to examine the relationships of e-learners' experience and their behavioural intention of re-use. It was argued that the better understanding of the factors affecting the e-learner's behavioural intention in the future could help e-learning system researchers and providers to develop more effective and acceptable e-learning systems. Based on the technology acceptance model, information system success model and self-efficacy theory, a theoretical framework was developed to investigate the learner's behavioural intention to e-learning system re- use. A total of 280 university students were surveyed to test the proposed structural model. The results demonstrated that perceived usefulness, perceived ease of use, service quality, course quality and self-efficacy had direct effects on users' intention to re-use. Furthermore, self-efficacy affected perceived ease of use which positively influenced perceived usefulness.

1 INTRODUCTION

The development of Information and Communication Technologies (ICTs) has provided significant opportunities for education suppliers to explore and develop new ways of delivering educational programmes. As a result, e-learning has become an emerging phenomenon in revolutionising processes in which teaching and learning can take place. Compared with classroom based teaching and learning, e-learning has received considerable attention due to its flexibility, low cost and convenience.

Education is widely considered as key to the success of a nation like China given increasing global competition. The demand for higher education from a growing and widely dispersed population and an increasingly technology-oriented economy presents major challenges to the developers and providers of modern education. A forecast by Olsen (2003) suggested that "China will be unable to supply the 20 million university places needed to meet the demands of its developing economy". According to the National Bureau of

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Statistics of China (NBS) (2008), the rural population accounted for 54.3 per cent of the total population. Due to the backwardness of rural economic development and inadequate financial resources, the improvement of rural education has been seriously restricted. The statistical data shows that 9.5 per cent of the rural labours are illiterate, 86.2 per cent are educated up to the junior high school level which is the minimum nine-year compulsory education in China, only 4.3 per cent have received the high school education (NBS, 2008). The low education level of rural population seriously hindered the development of rural economy. Therefore, continuous education plays an important role in improving the knowledge and skills of people living in the rural areas. The rapid development of information technology and the Internet provides opportunities for them to participate in adult continuous study in China.

With the increasing public investment in the Internet infrastructures in China, the Internet coverage has been extended to many rural areas, especially in more developed regions. China Internet Network Information Center (CNNIC) reported that the rural Internet users have increased up to 84.6 million at a 60 per cent increasing rate each year (CNNIC, 2009). E-learning has been considered as an efficient solution for expanding adult education and vocational training in rural areas (Ministry of Agriculture, 2005). Although the applications of e-learning have been enhanced by the government promotion programmes and the rapid penetration of the Internet into the rural regions, only 1.6 per cent of 700 million rural population has registered in e-learning programs in 2009 (CNNIC, 2010), despite the fact that many institutions of higher education offer e-learning courses and training course in rural areas.

e-Learning implementation in China are facing challenges. According to the survey of 150 e-learning courses by Guo and Yuan (2009), there was a lack of appropriate e-learning materials. Many factors can affect e-learning success. For example, Lang (2006) and Guo (2006) indicated that the system service and system design were the problems that could impend the system usage and student motivation. Therefore, it is imperative to understand the factors affecting e-learning success. It is argued that the behavioural intention of re-use can be an appropriate overall indicator of e-learning system success.

This study aims to understand how e-learners experience in the rural areas of China in using existing e-learning system affects their behavioural intention of re-use by developing and empirically validating an integrated theoretical framework based on Technology Acceptance Model (TAM), Information System Success (ISS) model and self-efficacy theory.

2 THE RESEARCH MODEL

The theoretical foundation and constructs were established based on previous studies. TAM model, ISS model and self-efficacy theory were simplified and integrated. TAM model and ISS model contributed to the “How success of the technology”, and the self-efficacy theory, as an important component of social cognition learning theory, highlighted “How people learn with the technology”. The research model was adopted to inform the research hypotheses development.

TAM model which was developed by Davis *et al*. (1989), has been widely used to predict user’s acceptance of technology. In 1996, Davis *et al.* modified the original TAM model and suggested that perceived usefulness and perceived ease of use has the direct effect on the individual’s intention to system use. In the meanwhile, the system characteristics, originated from external variables of the original model, only provide the mediate effect on intention by perceived usefulness and perceived ease of use.

Based on a thorough and systematic analysis of research publications in MISQ, Journal of Management Information Systems and Information Systems Research, DeLone and McLean (2003) developed a modified ISS model, or D&M model in 2003. Compared with their original ISS model, service quality is considered as an important new dimension in the modified ISS model. The dimension of system use is replaced by intension to use, and individual benefit by overall benefit. Over 200 research papers have attempted to validate or apply modified ISS model in various fields of information system studies.

Self-efficacy was firstly introduced by psychologist Bandura (1977). The concept has been commonly used by researchers to investigate the individual e-learner’s behavior. Computer-efficacy is defined in this context as “confidence in one’s ability to perform certain learning tasks using an e-learning system” (Pituch and Lee, 2006). For instance, it is found that women usually have more computer anxiety but less computer self-efficacy toward the internet (Whitely, 1997). Prior study has identified that self-efficacy can influence the e-

learning behavioral intention and performance (Ong and Lai, 2006; Pituch and Lee, 2006).

Based on TAM, ISS and self-efficacy, this research developed an integrated model as shown in Figure 1. In TAM model, the construct on system characteristics was not clarified and empirically tested by Davis and Venkatesh (1996). Based on the related empirical study by Pituch and Lee (2006), this study defined the system characteristics as: system functionality, system response and system interactivity.

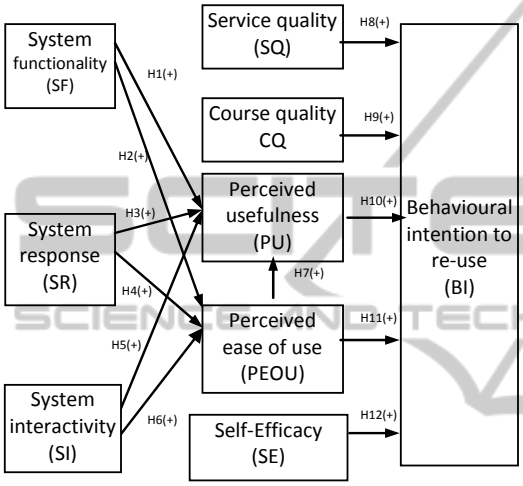


Figure1: Research model.

In accordance with the research model, 12 hypotheses were developed for the empirical validation. Table 1 shows 12 hypotheses of the research.

Table 1: Research hypotheses.

Hypotheses	Statements
H1(+)	System functionality (SF) will have a positive effect on perceived usefulness (PU).
H2(+)	System functionality (SF) will have a positive effect on perceived ease of use (PEOU).
H3(+)	System response (SR) will have a positive effect on perceived usefulness (PU).
H4(+)	System response (SR) will have a positive effect on perceived ease of use (PEOU).
H5(+)	System interactivity (SI) will have a positive effect on perceived usefulness (PU).
H6(+)	System interactivity (SI) will have a positive effect on perceived ease of use (PEOU).
H7(+)	Perceived ease of use (PEOU) will have a positive effect on perceived usefulness (PU).
H8(+)	System service (SQ) quality will have a positive effect on behavioural intention of re-use (BI).

Table 1: Research hypotheses. (cont.)

Hypotheses	Statements
H9(+)	Course (CQ) quality will have a positive effect on behavioural intention of re-use (BI).
H10(+)	Perceived usefulness (PU) will have a positive effect on behavioural intention of re-use (BI).
H11(+)	Perceived ease of use (PEOU) will have a positive effect on behavioural intention of re-use (BI).
H12(+)	Self-efficacy (SE) will have a positive effect on behavioural intention of re-use (BI).

3 RESEARCH METHODOLOGY

3.1 The Development of Instruments

To measure the latent variables of the model, survey items were mainly adapted from validated instruments reported in the relevant studies. For example, system functionality was measured by 5 items which were mainly adopted from Pituch and Lee (2006). All items (32 in total) were reviewed by e-learning experts and researchers in China. Items related to independent variables were modified to make them relevant to the e-learning system usage context of the present study and reviewed by experts. Five-point Likert scale were used to measure the respondent's level of agreement or disagreement of each survey item statement. In addition to the model measuring items, the survey also collected demographic information of the respondent.

3.2 Sampling and Survey Procedure

The sample for this study consisted of 350 part time e-learning students who were working in rural areas at undergraduate level of the Higher Education. The survey questionnaire was revised based on the feedback of pilot interviews and tests with 45 students from the e-learning programme. The final questionnaire was distributed to students at the class room of the local study centers.

With the help of course managers, of the distributed 350 questionnaires, 280 validated responses were collected and used for analysis. In addition to the use of the easy understandable questionnaire design, the university course managers' assistance helped to increase the response rate in our study.

4 DATA ANALYSIS

The measurements and research model were tested using the structural equation modelling (SEM) technique which has been used in measuring user's acceptance of information technology. The computer software program LISREL (Linear Structural Relation) 8.80 was used. LISREL consists of measurement model and structural equation model. The measurement model should be assessed before the structural equation model is examined. According to the recommendation by Anderson and Gerbing (1988), the minimum sample size for SEM approach is 200. One rule of thumb found in the literature is that sample size should be more than 8 times the number of variables in the model (Garson, 2010). Therefore, 280 questionnaires for this study were considered as acceptable for the SEM analysis using LISREL.

4.1 Analysis of Measurements

The adequacy of measurements was evaluated by confirmatory factor analysis, which was proposed to verify the reliability and validity of the measures. Eleven assessment of fit measures were used to evaluate the validity of the research construct. Multiple criteria measures were used to measure the model fit, which were absolute fit measures, incremental fit measures and parsimonious fit measures. Following the LISREL data analysis practice, 7 problematic items of the 32 items were deleted and the measurement model was reassessed.

4.2 Structural Model Testing Results

The significance of the structural model test and individual direct effects, indirect effects and total effects were summarized in Table 2 and shown in Figure 2. Overall, 11 of the 12 hypotheses were supported with statistical significance.

System functionality, system response and system interactivity had a significant positive effect on perceived ease of use (0.475, 0.342, 0.289). The result also showed that self-efficacy had a direct effect on perceived ease of use (0.316). These determinants accounted for 58.9% of the variance in perceived ease of use. The total effect of perceived ease of use on behavioural intention was 0.709.

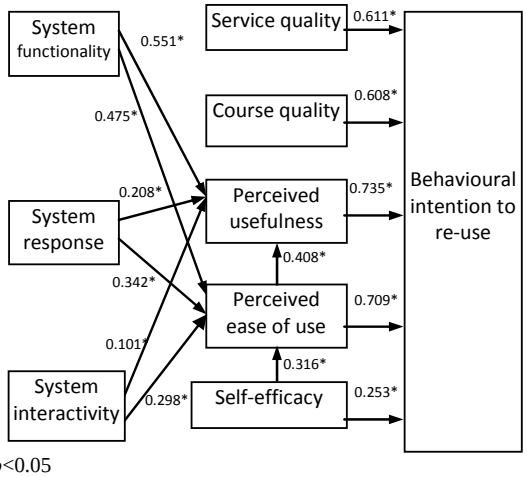
As there was no significant effect of system interactivity on perceived usefulness (0.101, p>0.05), hypothesis 5 was not supported. For the positive relationship between perceived ease of use and perceived usefulness, the direct effect of perceived ease of use on perceived usefulness was 0.408. The total effects of system functionality and system response on perceived usefulness were 0.551 and 0.208 respectively. The variables explained 52.2% of the variance in perceived usefulness. The total effect of perceived usefulness on behavioural intention to re-use was 0.735.

Table 2: Effects of dominants on the behavioural intention to e-learning system re- use.

Latent variables	Independent variables	Standardized estimation		
		Direct effects	Indirect effects	Total effects
PEOU (R^2 =0.589)	SF	0.475		0.475*
	SR	0.342		0.342*
	SI	0.298		0.298*
	SE	0.316		0.316*
PU (R^2 =0.522)	SF	0.329	0.222	0.551*
	SR	0.020	0.188	0.208*
	SI	0.096	0.005	0.101
	PEOU	0.408		0.408*
BI (R^2 =0.609)	SQ	0.611		0.611*
	CQ	0.608		0.608*
	PEOU	0.277	0.432	0.709*
	PU	0.735		0.735*
	SE	0.102	0.151	0.253*

* ρ<0.05

System service quality, course quality and self-efficacy had a significant positive direct effect on behavioural intention to re-use (0.611, 0.608, 0.102). The result shows that the total effect of self-efficacy on behavioural intention to re-use is 0.253. These determinants accounted for 60.9% of the variance in behavioural intention of re-use.



*ρ<0.05

Figure 2: Model testing results.

5 DISCUSSION AND CONCLUSIONS

The results of data analysis demonstrate that most of the causal relationships between constructs are well supported. Comparing with system response and system interactivity, system functionality has the strongest effect on perceived ease of use and perceived usefulness. It seems that a complete and consistent system interface and function design make the system easier to use, thus can motivate the users to re-use the system. It is validated that system functionality and system response indirectly influence the learners' intention of system re-use. It is found that system interactivity has no significant effect on perceived usefulness. Because of the multiple communication tools provided by the Internet, such as email, MSN, QQ and telephone, which are easy to use and popular in China, learners and teachers may choose one of those tools instead of making interactions using e-learning system tools. However, system interactivity positively affects the behavioural intention of re-use, mediated by the perceived ease of use.

Perceived usefulness has the strongest direct effect on the learner's intention of e-learning system re-use. It seems that people living in rural areas concern more about the outcomes of e-learning because it is important for them to improve their personal qualifications and enhance their career prospective. Coping with the rapid economic development in rural areas in China, people pay more attention to continuous education. The advantages of e-learning can provide the opportunities for satisfying the demand. Perceived ease of use is found to have the significant influence on behavioural intention, but less direct effect than perceived usefulness. This suggests that it is also important for learners to use easy-to-use and user friendly e-learning systems. Our findings reveal that the perceived ease of use positively affects the perceived usefulness although there are some criticism on the relationship between perceived ease of use and perceived usefulness (e.g. Mathieson, 1991; Venkatesh, 2000; Roca and Gagne, 2008).

Service quality and course quality appear to be the significant determinant of learner's behavioural intention of e-learning system re-use. The results suggest that the staff support and appropriate interaction between students and teachers strongly affect the e-learners motivation to re-use e-learning systems in the future. Due to students' limited access to the learning facilities and the education centres in rural areas, teachers' support of learning through regular communications, interactions and tutoring is essential. Also, the course quality, such as the course content, assessment methods and supplementary information, affect the learner's intention to re-use the e-learning system.

Learners' computer self-efficacy appears to have a significant effect on behavioural intention of re-use. The study identifies that computer self-efficacy is also related to the perceived ease of use. This finding is consistent with prior e-learning study. For example, computer-efficacy was examined with a significant positive effect on perceived ease of use of e-learning (Venkatesh, 1996), and with significant positive effects on perceived usefulness and negative effects on perceived credibility of e-learning (Ong *et al.*, 2004).

Through the developing and empirically testing the extended research model, a number of interesting implications are generated, which would help e-learning managers and practitioners in rural areas of China to improve the effectiveness of e-learning. These implications include:

1. To improve the learning productivity and effectiveness, it was essential for managers and designers to use appropriate system technologies which could effectively facilitate the teaching and learning process.

2. As the service quality and course quality are significantly affect the learner's intention of e-learning system re-use, pedagogical principles, including principles of developing and structuring the course content should be employed in the development and evaluation of relevant content.

3. Considering the low education level of the people living in rural areas, the system use instructions and manuals are necessary to provide useful guidelines and improve the ease of use.

4. e-Learning programmes developed for learners in rural areas of china must be practical and relevant to learners' personal development goal and work requirements, so the learners can benefit from the learning outcomes and improve their work performance eventually.

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