The effect of learning management system quality and self-regulated learning strategy on effectiveness of an e-Learning

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Abstract

With the increasing use of the Internet improved Internet technologies as well as web-based applications, the uses of e-Learning have also increased the effectiveness of e-Learning has become one of the most practically and theoretically important issues in both Educational Engineering and Information Systems.

This study suggests a research model, based on an e-Learning success model, the relationship of the e-learner's self-regulated learning strategy and the quality perception of the e-Learning environment. This research model focuses on the learning environment and on the learners' self-efficacy. The former consists of LMS, learning contents and interaction that are provided by e-Learning and the latter refers to the learners' self-regulated learning strategy.

In this study, academic performance was measured by student's real record.

We will show the validity of the model empirically, and most of the hypotheses suggested in this model were accepted.

Key word: e-Learning, information quality, self-regulated learning strategy, LMS

1. Introduction

Many researchers stay on an exploratory plane regarding explanations of the variations of e-Learning effectivenesses [i.e., Wang, 2003]. The tendency of educational engineering to introduce theoretical variables explaining e-Learning effectiveness is insufficient except for a few information systems [i.e., Piccoli et al., 2001; Heo and Rha, 2003]. Moreover, this approach of putting together information systems and educational engineering is rarely observed.

This research investigates the theoretical background of pedagogical e-Learning, closely examines the relationship between information systems success models and e-Learning, and suggests as well as verifies new research models that assess or evaluate e-Learning effectiveness based on models of educational engineering variables and information systems which will be verified theoretically or empirically.

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2. Theoretical Background

2.1 Self-regulated learning strategy in e-Learning

The learner's independent assessment of self-regulated learning abilities is called self-regulatory efficacy [SRE; Bong, 1998]. According to the cognitive psychology theory, SRE is the efficacy of well performed self-regulatory mechanisms such as self-observation, self-judgment, self-response [Bandura, 1986]. Confidence promotes learning performance by promoting individual goal in traditional education psychology [Bandura, 1997].

Learning performance in teaching SDL is possibly lower than the cramming educational style based on the objectivist educational philosophy, except for a strategic approach relating to effort and study for the pleasure of the self-learner. The teacher in SDL remains available as an assistance and guide of learning; not as a unilateral knowledge source and messenger.

Self-regulated learning is required for academic performance by SDL. Self-regulated learning is a learner's intended effort for learning subjects [Corno and Mandinach, 1983]; it is a systematic management process regarding one's own thoughts, emotions and behavior for one's personal goals and achievements [Schunk, 2000]. According to Self-regulated learning, the learner uses the strategic relationship between self-regulation and learning for reaching his chosen self learning goal, to develop, revise, and complement the learning strategy via self feedback . The learner must make constant efforts to sustain learning motivation [Zimmerman, 1990]. Lack of learning strategy is one of important variable that is explained learner's difficulty[Balajthy, 1990].

In e-Learning, many researches confirmed that theme of related learner is a key factor of academic achievement and satisfaction level[Lyman, 1998]. e-Learning strategy is needed for self-directed learning and needed instructional design strategy based on self-directed learning.

2.2 The relationship of e-Learning and information systems success model

The effect on e-Learning is measured with an ISS model because it is also one of the information systems. The e-Learning success model [ELS; Lee, 2004] evaluates e-Learning effectiveness based on the ISS model, constructivism and self-regulatory efficacy. The learning management system[LMS] is applicable to information process system that processes learning content and supports all sort of matters related to other learning. Learning content is the product created through LMS. The interaction of the corresponding course between teacher and students is applicable to the human service process that the information system department staff offers the system user [Lee, 2004].

In a student situation, LMS can be a critical factor in e-learner satisfaction, by offering the subject through e-Learning. Because it discharges it's transmission duties through a variety of learning content and offer a unique forms for each and every lesson.

From an offline view point, it is similar logic that classroom and educational facilities transfer educational content such as in a school or private educational organization and having an effect on learner satisfaction is not related to attending lectures of a given subject [Lee, 2004].

Learning content has different qualities according to each lecturer's and producer's ability or character. Therefore, the learning content is a critical assessment factor and a direct factor in deciding learner satisfaction, unlike LMS.

It is similar logic that direct factors decide learner satisfaction in the case of offline learning content. Learner's request human services to resolve a difficulty, an inconvenience or a technical problem that can be generated when using the system because LMS is one of many information systems. Of course, every e-Learning organization should have a department to resolve technical problems and sustain management separately [Lee, 2004].

Learner's as user appeal to the teacher even with support for technical problem such as the usage of LMS, in addition to guidance and help about the learning content. Therefore, the teacher's service quality plays a more important role than the staff's service quality of the general information system department. This is similar to the difference between service staff and a head cook producing food. Guest confront the staff with their problems and they resolve it [Lee, 2004].

3. Research model and hypothesis

3.1 Research model

We suggest a research model like Figure 1. It is a modified information systems success model considering information system attributes and self-regulated learning attributes and supporting education engineering in e-Learning. This model is composed of independent variables, PU and PEOU of LMS, satisfaction of learning content and interaction between teacher and learner. The moderating variable is SRE, self assessment about self-efficacy, ability of self-regulated learning and computer usage offered by e-Learning.

The dependent variable is the academic performance of the learner after experiencing e-Learning.

3.2 Hypothesis

3.2.1 Satisfaction and academic performance

According to the consumer behavior theory, satisfaction is measured through customer response regarding fulfillment, and customer judgment regarding product or service. Satisfaction also includes fulfillment of one's performance [Oliver and Swan, 1989]. For judgment, fulfillment of one's performance is required as a reference to be compare with standard. The references are needed to compare with result or outcomes in order to judge satisfaction [Au, et al., 2002].

In the information system view, consumers or customers of consumer behavior theory refers to users who use the system directly , unless they have a technical background[Delone and McLean, 1992; Au et al., 2002].

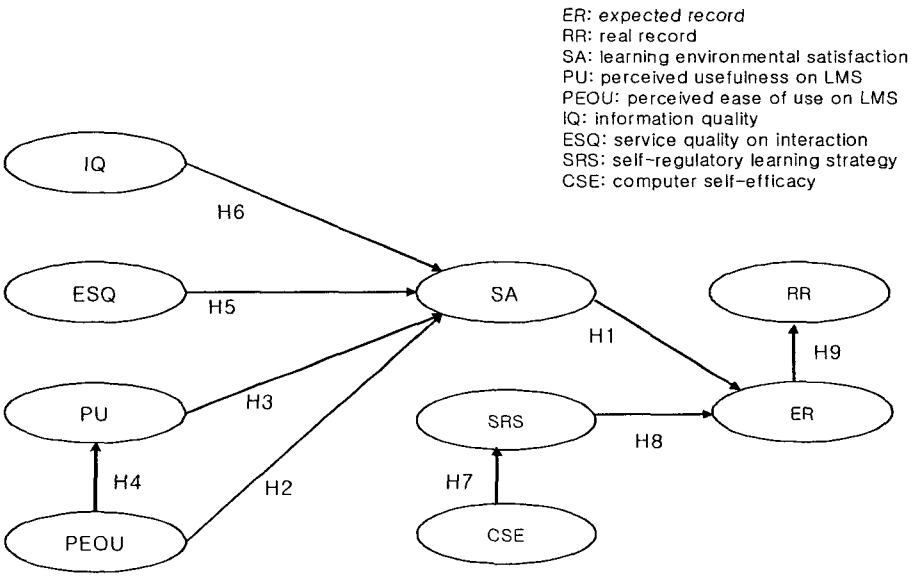

Figure 1. Research model

Similar to consumer behavior theory, end user satisfaction is a user's attitude towards the specific computer application system they utilized [Doll and Torkzadeh, 1988], or is justified by perceived and emotional assessment regarding fulfillment level referring to experienced performance via the information system[Au et al., 2002].

e-Learning is also regarded as an information system. E-Learning satisfaction should correlate with end user based on information system satisfaction.

Experiencing e-Learning is compared with offline course. Satisfaction for e-Learning and assessment of the information system is compared with consumer behavior theory.

Traditionally, in field of information systems, it has been assumed that user information system satisfaction obtained higher performances than unsatisfied users

[Bailey and Pearson, 1983]. For instance, according to the research of Gatian [1994] there is a powerful relationship among user satisfaction, decision making performance and efficiency. Also, in the information systems success model of DeLone and McLean [1992], satisfaction was an effective variable on working efficiency or decision making level.

It is inferred that for e-Learning, learner's satisfaction will be positively related to academic performance. In the points of view discussed until now, we suggest the following hypotheses linking information system and educational engineering.

Hypotheses-1[H1]: Learner's satisfaction of the e-Learning environment will be positively related to the expected record of e-Learning.

3.2.2 Quality of e-Learning environment

According to the information systems success model, system quality is the measure of the information system process itself and effects user satisfaction [DeLone and McLean, 1992]. System quality implies accuracy and efficiency of system according to communication theory based information systems success model [Shannon and Weaver, 1949; DeLone and McLean, 1992]. In regards to information system theory, system quality is the user's judgment of dealing with the system familiarly and easily [Doll and Torkzadeh, 1988; Rai et al., 2002]. It is acknowledged that system quality in information systems success model is substituted for perceived ease of use [Seddon and Kiew, 1997; Rai, et al., 2002]. Perceived ease of use can be justified as the perception of system usage effort, as an important variable in information system attitudes [Davis, 1989; Davis et al., 1989].

LMS is one of many information system used by learners. Perceived ease of use for LMS effects total learning environmental satisfaction.

E-Learning environmental satisfaction included LMS, learning content and service quality of interaction. It is estimated by perceived usefulness and perceived ease of use. Therefore, we suggest the hypothesis as follows:

Hypotheses-2[H2]: Learner's perceived ease of use for the learning management system will be positively related to e-Learning environmental satisfaction.

Hypotheses-3[H3]: Learner's perceived usefulness for the learning management system will be positively related to e-Learning environmental satisfaction.

Hypotheses-4[H4]: Learner's perceived ease of use for the learning management system will be positively related to the learner's perceived usefulness for the learning management system.

Hypotheses-5[H5]: Learner's assessment of the service quality of interaction between professor and learner will be positively related to e-Learning environmental satisfaction.

Hypotheses-6[H6]: Learner's assessment for information quality will be positively related to e-Learning environmental satisfaction.

3.2.3 Self-efficacy and academic performance

SRE's higher learners will be concerned with substance and quality of the learning contents more than SRE's lower learners. SRE's lower learners will be interested in easily accessible information and focused understanding. SRE's lower learners will have preference to represent method about given learning contents. And personal innovativeness in IT effect on computer self-efficacy[Lee, 2004]. The learner must make constant efforts to sustain learning motivation[Zimmerman, 1990]. Therefore, we suggest the following hypotheses:

Hypotheses-7[H7]: Learner's computer self-efficacy will be positively related to self-regulated learning strategy in e-Learning.

Hypotheses-8[H8]: Learner's self-regulated learning strategy in e-Learning will be positively related to learner's expectation for learning performance.

Hypotheses-9[H9]: Learner's expectation for learning performance will be positively related to learner's real record.

4. Research method

We used the following measurement tools for this study. For perceived ease of use and usefulness of LMS we used 3 and 6 edited items suggested by Davis et al. [1989]. In the case of contextual information quality and representational quality for learning contents, we used 10 items suggested by Lee et al.[2002]. In the case of service quality, we used 8 items suggested by Ketting and Lee [1997]. We have used 3 items revised for academic SRE measurements among academic self-efficacy suggested by Kim et al.[2001], 3 items for academic performance, that is, expected record suggested by Chemers et al.[2001], and finally 4 items for learning satisfaction suggested by Wang[2003]. We have used Likert's 5 points scale.

Every student enrolled in the one of the three e-learning courses at Daegu University in 2005 took an analysis questionnaire. The analysis object was every

students that took cyber courses in 3 different subjects opened at Daegu University in 2005 and 230 copies of an analysis questionnaire. An analysis tool was used PLS Graph 3.0 software with Chin's help[Chin, 1998].

5. Data analysis and result

Construct reliability is proved as shown by Table 2, the suggested measure model is estimated as a good discriminant validity because the AVE value is higher than the correlation coefficient of other construct as shown on Table 3.

Table 1. Convergent validity analysis

Construct	Item	Factor loading	Composite relibility	AVE	Cronbach alpha
ESQ	ESQ1	0.853	0.890	0.577	0.898
	ESQ2	0.843			
	ESQ3	0.779			
	ESQ4	0.705			
	ESQ5	0.682			
	ESQ6	0.674			
IQ	IQ1	0.75	0.750	0.500	0.738
	IQ2	0.701			
	IQ3	0.668			
PU	PU1	0.794	0.847	0.526	0.865
	PU2	0.738			
	PU3	0.733			
	PU4	0.679			
	PU5	0.677			
CSE	CSE1	0.91	0.927	0.761	0.915
	CSE2	0.893			
	CSE3	0.885			
	CSE4	0.797			
ER	ER1	0.881	0.878	0.707	0.879
	ER2	0.872			
	ER3	0.765			
SA	SA1	0.725	0.680	0.516	0.530
	SA2	0.711			
SRS	SRS1	0.716	0.643	0.474	0.725
	SRS2	0.66			
PEOU	PEOU1	0.814	0.784	0.645	0.794
	PEOU2	0.792			

Table 2. Correlation coefficient of construct and AVE

	IQ	ESQ	PU	PEOU	CSE	SRS	SA	RR	ER
IQ	0.5								
ESQ	0.409	0.577							
PU	0.465	0.329	0.526						
PEOU	0.321	0.34	0.393	0.645					
CSE	0.169	0.338	0.198	0.115	0.761				
SRS	0.378	0.337	0.276	0.198	0.317	0.474			
SA	0.303	0.362	0.379	0.342	0.091	0.233	0.516		
RR	0.092	0.137	0.069	-0.019	0.063	0.22	0.139	1	
ER	0.283	0.28	0.348	0.173	0.187	0.368	0.322	0.29	0.707
MEAN	3.2261	3.7348	3.1339	4.0326	3.1174	3.4283	3.6217	74.68	3.1739
VAR	0.9378	1.0998	0.7685	0.9872	1.1799	0.9215	1.2138	188.1	1.1482

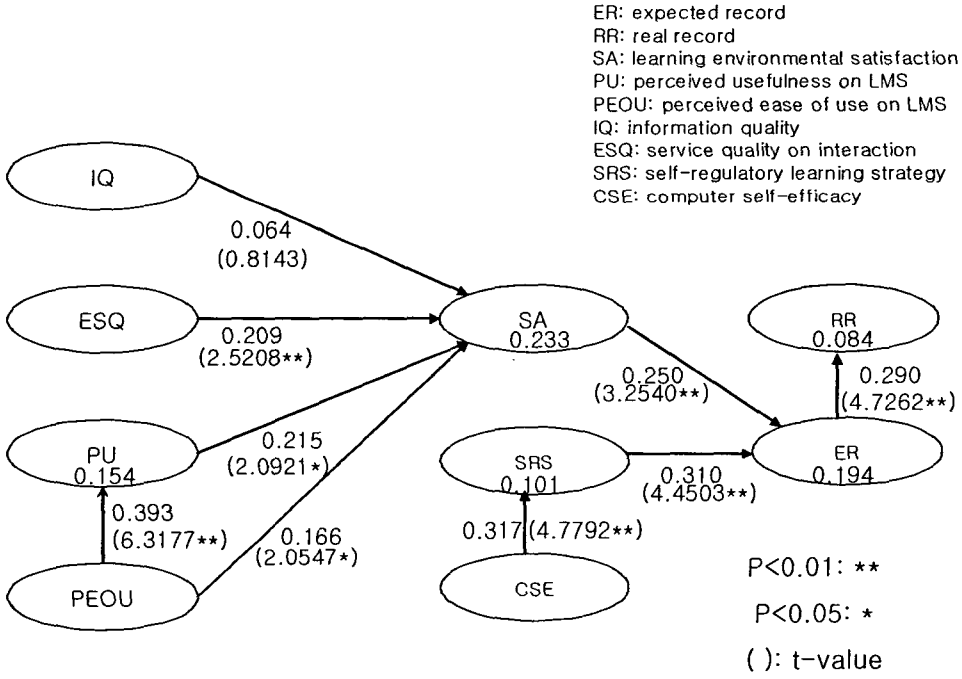

Figure 2. PLS analysis of research model

Every hypothesis is accepted with the exception of H6 [IQ→SA], Figure 2 showed every value of analysis. The reason for the H6 rejection is explained through a survey of many learner's traits. It is not used to judge the consistency with which learning content agrees with a self-purposed learning context. Repeatedly, learners would memorize and understand transferred knowledge one-sidedly from a professor and learners would show a tendency toward critical learning content courteously and respectfully because of the professor's authority.

The reason for path coefficient[0.166] of the H2 is explained through the use of LMS which promotes an extrinsic motivation. Extrinsic motivation is a behavioral response which corresponds to accomplishing one's objective or making remuneration through mastery of an activity. Reversely, intrinsic motivation is a behavioral response corresponding with the behavior itself [Deci, 1975]. According to Gefen and Straub [2000], it is known that PEOU has a lower effect in the cases of the IS purpose and is not intrinsic motivation. The reason for IS use regarding extrinsic motivation is the learning method through LMS rather than learning itself.

6. Conclusion

First, we suggested a model to measure e-Learning effectiveness and decided an interdisciplinary method was needed, in view of web based information systems, the education engineering theory based on constructivism education philosophy, as well as the service management theory, composed of service related learning and technology. This study suggested a theory model of assessment to learning environmental satisfaction offered by e-Learning based on the ISS model, adopting SRE as a moderating variable to reflect the constructivism educational philosophy, interpreted interactions as human services offered from professor to a learner.

Second, learning environmental satisfaction requires quality assessments of interaction. Many researchers emphasized the importance of interaction or to the quantitative side of interaction already, but they did not consider how to use this interaction. That is, they did not emphasize the assessment method for interaction quality. Interaction quality had a significant effect on learner satisfaction as shown in this study. This study suggests the importance of qualitative assessment and interaction through LMS.

Third, in this research, we used real record to academic performance measurement.

This study suggested the necessity of practical offering of differentiated learning environments. Furthermore, longitudinal research in this field is needed as e-Learning is a new service and educational egineering variables needs to be considered.

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