

# e-Learning에서 학습자 만족에 영향을 미치는 자기조절학습전략, 서비스품질 및 학습관리시스템 품질

이종기

한성디지털대학교 경영학과

## The effect of self-regulated learning strategy, service quality and learning management system quality on learners' satisfaction of an e-Learning

JongKi Lee

Department of Business Administration, Hansung Digital University.

### Abstract

With the increasing use of the Internet improved Internet technologies as well as web-based applications, the effectiveness assessment 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 e-learning strategy. The former consists of learning management system, learning content quality and service quality that are provided by e-Learning. The latter refers to the learners' self-regulated learning strategy. We will show the validity of the model empirically.

### 1. The Introduction

Many researchers stay on an exploratory plane regarding explanations of the variations of e-Learning effectiveness[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.

### 2. Theoretical Background

#### 2.1 Self-regulatory efficacy and 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 objectivism 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 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 service quality, information quality and LMS quality

The effect on e-Learning is measured with an ISS model because it is also one of the information systems. The e-Learning success[ELS; Lee, 2004]model evaluates e-Learning effectiveness based on the information systems success[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 in ELS model. The interaction of the corresponding course between teacher and students is applicable to the human service process in ELS model[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 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 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.

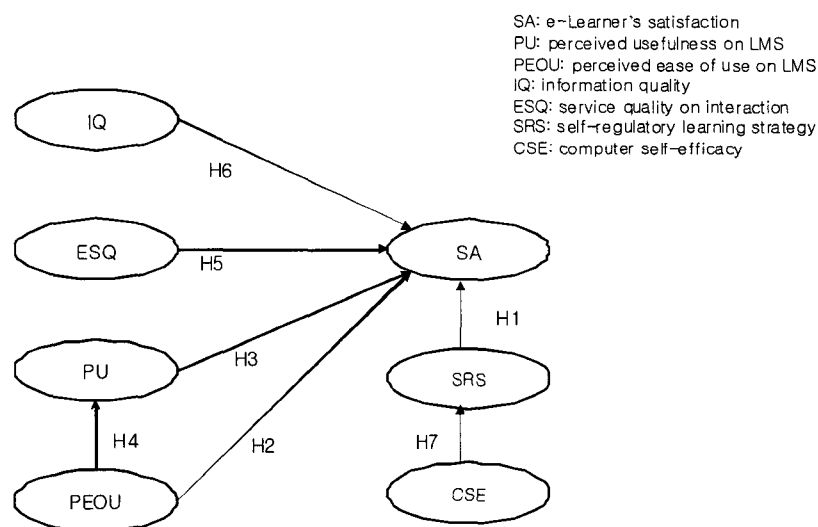
#### 3.2 Hypothesis

##### 3.2.1 ISS model and user Satisfaction

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]. 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. 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



<Figure 1> Research model

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 Self-regulated learning, the learner uses the strategic relationship between self-regulation learning for reaching his chosen self learning goal, to develop, revise, and complement the learning strategy via self feedback. In the points of view discussed until now, we suggest the following hypotheses.

Hypotheses-1[H1]: Learner's self-regulated learning strategy in e-Learning will be positively related to e-Learner's satisfaction.

### 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 [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-Learner's satisfaction.

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

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

### 3.2.3 Self-regulatory learning strategy and computer self-efficacy

The learner must make constant efforts to sustain learning motivation[Zimmerman, 1990]. 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 content[Lee, 2004]. According to Thatcher and Pamela[2002], personal innovativeness in information technology effect on computer self-efficacy. 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.

## 4. Research method

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 student that took cyber courses in 3 different subjects opened at Daegu University in 2005 and 230 copies of an analysis questionnaire. An analysis method made use of partial least square called PLS and PLS Graph software.

An analysis tool was used PLS Graph 3.0 software with Chin's help [Chin, 1998].

We used the following measurement tools for this study. For perceived ease of use and usefulness of LMS, we used 2 and 5 edited items suggested by Davis et al.[1989]. In the case of information quality for learning contents, we used 3 items suggested by Lee et al.[2002]. In the case of service quality, we used 6 items suggested by Kettinger and Lee[1997]. In case of

computer self-efficacy, we used 4 items suggested by Compeau and Higgins[1995]. In case of e-Learning satisfaction, we used 2 items suggested by Wang[2003].

We have used Likert's 5 points scale.

## 5. Data analysis and result

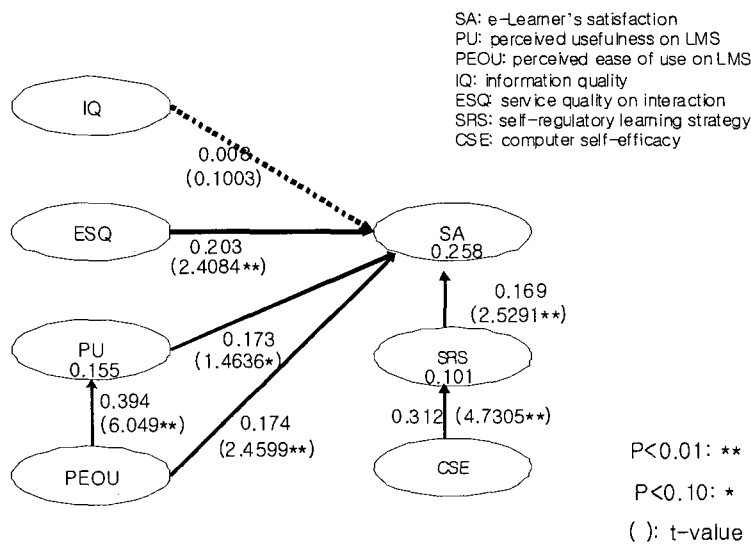
Construct reliability is proved as shown by <Table 1>, the suggested measure model is estimated as a good discriminant validity because the AVE value is higher than the correlation coefficient of other construct as shown on <Table 2>. Every hypothesis is accepted with the exception of H6, <Figure2>showed every value of analysis.

<Table 1> Convergent validity analysis

Construct	Item	Factor loading	Composite reliability	AVE	Cronbach alpha
ESQ	ESQ1	0.914	0.872	0.538	0.898
	ESQ2	0.787			
	ESQ3	0.723			
	ESQ4	0.722			
	ESQ5	0.684			
	ESQ6	0.509			
IQ	IQ1	0.854	0.847	0.650	0.738
	IQ2	0.832			
	IQ3	0.726			
PU	PU1	0.897	0.866	0.570	0.865
	PU2	0.852			
	PU3	0.757			
	PU4	0.641			
	PU5	0.579			
CSE	CSE1	0.935	0.872	0.635	0.915
	CSE2	0.850			
	CSE3	0.727			
	CSE4	0.644			
SRS	SRS1	0.887	0.787	0.557	0.879
	SRS2	0.688			
	SRS3	0.641			
SA	SA1	0.882	0.807	0.678	0.530
	SA2	0.761			
PEOU	PEOU1	0.963	0.897	0.814	0.794
	PEOU2	0.838			

<Table 2> Correlation coefficient of construct and AVE

	IQ	ESQ	PU	PEOU	CSE	SRS	SA
IQ	0.65						
ESQ	0.402	0.538					
PU	0.452	0.314	0.570				
PEOU	0.329	0.342	0.394	0.814			
CSE	0.177	0.321	0.184	0.138	0.635		
SRS	0.378	0.357	0.272	0.242	0.312	0.557	
SA	0.289	0.380	0.354	0.354	0.083	0.333	0.678
MEAN	3.2261	3.7348	3.1339	4.0326	3.1174	3.4283	3.6217
VAR	0.9378	1.0998	0.7685	0.9872	1.1799	0.9215	1.2138



<Figure 2> Path analysis in PLS

The reason for the H6[IQ→SA] 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 on one side 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 of the H2, H3 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. Conclusions

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 self regulated learning strategy.

Second, e-Learner's 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's satisfaction as shown in this study. This study suggests the importance of qualitative assessment and interaction through LMS.

Third, Learner's self-regulatory learning strategy is very important variable related to the e-Learner's satisfaction. And learner's computer self-efficacy is important variable too.

## References

- [1] Au, N., Eric, W. T. N., and Cheng, T. C. E., "A Critical Information System Satisfaction Research and a New Research Framework", *Omega*. Vol. 30, 2002, pp. 451-478.
- [2] Bailey, J. E., and Pearson, S. W., "Development of a tool for measuring and analyzing computer user satisfaction", *Management Science*, 1983, 530-545.
- [3] Balajthy, E., "Hypertext, hypermedia, and meta cognition : Research and instructional implications for disabled readers", *Reading, Writing, and Learning Disabilities*, 6, 1990, pp. 183-202.
- [4] Bandura, A., *Social Foundations of Thought and Action: A Social Cognitive Theory*, Englewood Cliffs, NJ: Prentice-Hall, 1986.
- [5] Bandura, A., *Self-Efficacy: The Exercise of Control*, W. H. Freeman and Company. 1997.
- [6] Bong, M. M., "Self-efficacy and Self-regulated Learning: The Implication of Research Related in Education Engineering", *Journal of Educational Technology*, Vol. 14, No. 1, 1998, pp. 97-118.
- [7] Chin, W. W., "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.
- [8] Compeau, D. R., and Higgins, C. A., "Application of Social Cognitive Theory to Training for Computer Skills", *Information Systems Research*(6: 2), 1995, pp. 118-143.
- [9] Corno, L., and Mandinach, E. B., "The Role of Cognitive Engagement in Learning from Instruction", *Educational Psychologist*, 18, 1983, pp. 88-108.
- [10] Davis, F. D., "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", *MIS Quarterly*, Vol. 13, No. 3, 1989, pp. 319-340.
- [11] Davis, F. D., Bagozzi, R. P., and Warshaw, P. R., "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", *Management Science*, Vol. 35, No. 8, August, 1989, pp. 982-1003.
- [12] Deci, E. L., *Intrinsic Motivation*. Plenum Press, New York, 1975.
- [13] Delone, W. H., and Mclean, E. R., "Information Systems Success: The Quest for The Dependent Variable", *Information Systems Research*, Vol. 3, No. 1, 1992, pp. 60-95.
- [14] Doll, W. J., and Torkzadeh, G., "The Measurement of End-User Computing Satisfaction", *MIS Quarterly*, Vol. 12, No. 2, 1988, pp. 259-274.
- [15] Gatian, A. W., "IS User Satisfaction A Valid Measure of System Effectiveness", *Information & Management*, Vol. 26, Issue 3, March, 1994, pp. 119-131.
- [16] Gefen, D., and Straub, D. W., "The Relative Importance of Perceived Ease of Use In IS

- Adoption: A Study of E-Commerce Adoption", *Journal for Information Systems*, Vol. 1, Article 8, 2000.
- [17] Heo, G. and Rha, I. J., "Optimal Flow Experience in Web Based Instruction", *Korea Association of Computer Education papers*, Vol. 6, No. 2, 2003, pp. 71-79.
- [18] Kettinger, J. W., and Lee, L. L., "Pragmatic Perspectives on The Measurement of Information Systems Service Quality", *MIS Quarterly*, Vol. 21, No. 2, 1997, pp. 223-240.
- [19] Lee, J. K., "The effect of e-Learning environmental quality and self-efficacy on effectiveness of an e-Learning", *Business administration Doctoral dissertation*, Daegu University, 2004.
- [20] Lee, Y. W., Strong, D. M., Kahn, B. K., and Wang, R. Y., "AIMQ: A Methodology for Information Quality Assessment", *Information and Management* Vol. 40, 2002, pp. 133-146.
- [21] Lyman, B. G., "Learning strategies for the internet: Playing Catch Up", *Proceedings of 1998 Ed-media conference [CD-ROM]*, 1998.
- [22] Oliver, R. L., and Swan, J. E., "Consumer Perception of Interpersonal Equity and Satisfaction in Transactions: A Field Survey Approach", *Journal of Marketing*, Vol. 53, 1989, pp. 21-35.
- [23] Piccoli, G., Ahmad, R., and Ives, B., "Web-Based Virtual Learning Environments: A Research Framework and A Preliminary Assessment of Effectiveness in Basic IT Skills Training", *MIS Quarterly*, Vol. 25, No. 4, 2001, pp. 401-426.
- [24] Rai, A., Lang, S. S., and Welker, R. B., "Assessing The Validity IS Models: An Empirical Test and Theoretical Information Analysis", *Information Systems Research*, Vol. 13, No. 1, 2002, pp. 50-69.
- [25] Schunk, D. H., *Learning Theories In Educational Perspectives*. Prentice Hall. 2000.
- [26] Seddon, P. B., and Kiew, M. Y., "A Partial Test and Development of The Dclone and Mclean Model of IS Success", *The Proceeding of International Conference of Information Systems*, Vancouver, Canada, 1997, pp. 99-110.
- [27] Thatcher, J. B., and Pamela, L. P., "An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy", *MIS Quarterly*, Vol. 26, 2002.
- [28] Wang, Y. S., "Assessment. of Learner Satisfaction with Asynchronous Electronic Learning Systems", *Information and Management*, Vol. 41, No. 1, 2003, p. 75.
- [29] Zimmerman, B. J., "Self-regulated learning and academic achievement: An overview", *Educational psychologist*, 25(1), 1990, pp. 3-17.