A Research on the Relationships among Environmental Characteristic, Innovation Decision, E-Service Quality

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ABSTRACT

The service industry is massively developed and acts a significant role in modern economic structure. Taiwan's service industry has also led economic development. "How does education industry (i.e. the so-called cramming school) obtain outstanding reputation by providing customer the best service quality and learning environment." As a result, reinforcing the upgrade of service quality will be the key to success of corporate sustainable development. The purposes of this paper are exploring the organization-level correlation under IDT general model.

Keywords: Innovation Decision, E-Service Quality, Repurchase Intention, IDT, TAM.

INTRODUCTION

Taiwan's service industry has also led economic development. Besides the importance of collecting 71% of GDP in recent years, service industry also affects job opportunities. For instance, its employment accounts for about six million (58%) of total 10 billion in these 5 years, which represents the mainspring of economy. With more customer-centered services and increasing economic development, customers value quality even more. In such tendency, enterprises must enhance their own competitiveness in the industry by increasing service quality. Thus it can be seen "Service quality" is an important consideration cannot be ignored. However, the rapid development of Information Technology and Network Communications Technology substantially brings people great convenience in daily life and makes industries transform towards digitalized. On the enterprise side, most of them have imported e-commerce to gain efficient competition advantage. Not only enterprises but also education goes through this new transformation in the electronic era. The internet's development dramatically changes the learning environment of education, generating certain changes in higher education over time. The learning paradigm shift (Rovai and Jordan, 2004) is the most obvious instance. Barr and Tagg (1995) once described this transformation as a mode moves from teaching to learning, which leads traditional teaching mode into a new level. That is to say, when entering to Internet-based learning environment, teacher has transferred to support role, the learning focus is characterized by student-centered mode. Students are no longer passive receivers of teacher's lecture, but active learner for knowledge (Gardiner, 1998). , every industry encounters more and more intense market competition. To avoid being eliminated in the keen competition of global information technology, this paper aims to study "How does education industry (i.e. the so-called cramming school) obtain outstanding reputation by providing customer the best service quality and learning environment". As a result, reinforcing the upgrade of service quality will be the key to success of corporate sustainable development (Chin-Ting Chen, 2004).

The purpose of this study is to explore the organization-level correlation under IDT general model, including the factors like technology innovative characteristic, organizational systematic characteristic, environment opening characteristic, innovation adoption policy and E-Service quality.

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LITERATURE REVIEW

The emergence of network makes web-based instruction (WBI) or the so-called e-learning more and more popular nowadays. Thanks to the Internet features and technology, the traditional limits in space and time brought from conventional teaching are broken in this new e-learning. Many Taiwan's colleges thus develop their own Internet teaching system, such e-learning trend also opens a new teaching platform for education industry. E-learning has reversed the traditional and distant learning model/pattern while the Internet impacts the traditional education and its instruction model, this all generate technological challenges for education (Su-Chin Yang, 2000), that is to say, can E-learning education replace traditional face-to-face teaching? The Commercial Times (89/6/14) cited opinions from John Chambers, the President of Cisco. He believes the web-based education helps students not only find the best teachers bust also learn what they want most, anywhere online. This outlines the Internet will make educational effects even more significant; meanwhile future education will be dramatically changed, no more restrictions in space and time. During the span from 1980s to the 21st century, the emerging technology "Distance teaching" represents a breakthrough on the change of teaching concepts change in traditional education (Jin Wu, 1997).

In terms of educational theory, any teaching activity should follow proper job experience and expect adequate performance results; this will conform to the significance of education (Jiao Ouyang, 1990). Cui -Xia Lu (1993) also pointed out, in fact, there is no the best teaching model suitable for every learner. When teachers select teaching model, the factors should be taken into consideration, such as students' development characteristic, pros and cons in each model, teaching goal, material content. With comprehensive plan, they are able to select the best combination of teaching and learning model.

Traditional face-to-face teaching is to proceed teaching activities by following inherent teaching form. For instance, a teacher teaches dozens of students in one class. Students have regular test on one subject, to evaluate their learning effect by their grades (Lein-wen Mao, Li-Hua Chen, 1987). In other words, this teaching model usually refers to the teaching activities inside classroom. Both teacher and learners are at the same classroom, teacher conducts didactic teaching all the time; meanwhile, learners must obey the established behavior norms and communication pattern, absorbing knowledge passively. In this traditional face-to-face teaching namely fixed environment space, teacher delivers their experience and knowledge to learners by established teaching goal, material and schedule. As a result, traditional teaching could be regarded as a teaching model for teacher's explanation as well as students' learning and practice. Its major progress is that according to teaching schedule, teacher explains textbook content in consequences to all students. Students acquire/master the knowledge of textbook or teacher's lecture by listening, drill/practice and review after class. If necessary, teacher will supplement extra materials or increase practices via tests (Jing-Ku Zhang, 1996).

The traditional face-to-face teaching refers to the educational method we get used to for a long time, which features teacher-centered curricular activities and study plans. Yong Lin et al. (Yong Lin, Jin-Cheng Zhan, 2000) thought traditional face-to-face teaching is a sort of liberal education. Learners' individual differences are not the concern, it places teachers first and learners second. Curriculum content is often decided by teachers, so learners may not study independently and suitable materials are also shortages. Teachers or their material is the only source of learning data. Since learners' individual differences are not taken into consideration, many materials and curricula are unable to measure learners' standard and provide any convincible ability proof. For those students who have been proficient in curriculum, this situation will force them finally follow the other learners and accept the repeated curriculum they already learned. In the long term, this causes them time-wasting and even low learning depression. If teachers only focus on "Teaching" than "Learner's learning condition", the education can only produces students without ideal learning outcome and independent learning. Therefore, learners cannot achieve self-learning effect (Yong Lin, Jin-Cheng Zhan, 2000). From scholars' statements above, the characteristic of

Jay Cross, the U.S. expert was first to propose the term "e-learning" in 1999, which stimulated/inspired/brought the upsurge of enterprises and schools on e-learning. And Jing-Fong, Huang (2003) conducted the discussions of his e-learning study from two parts: the definition of e-learning; the advantages and disadvantages of e-learning.

In 2000, WR Hambrecht Company classified E-learning into four groups in its research: Computer based learning, online learning, E-learning and distance learning. The four definitions were classified and illustrated as Figure 2-1 (Lin, 2003)
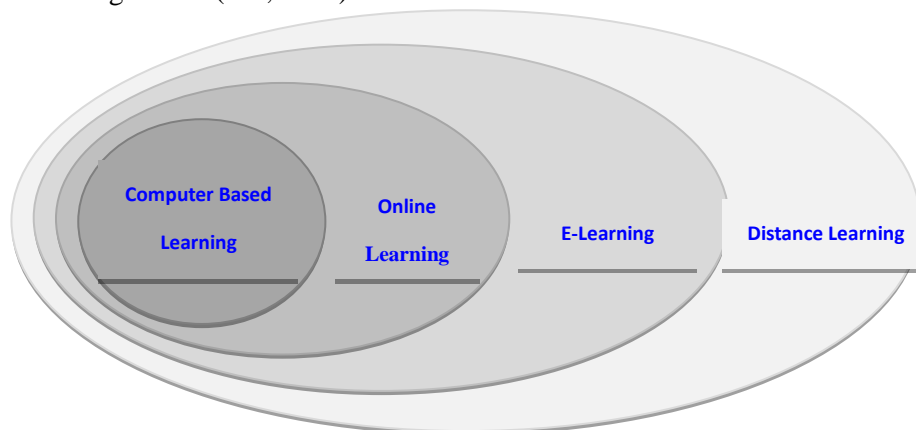

Figure2-1. *The scope of E-learning definitions*

*(**Source:** Hambrecht Co., 2000)*

According to American Society for Training and Development (ASTD), e-learning is defined as the process for users to apply <u>digital-media learning</u>. Digital media includes the Internet, enterprise's network, computer, Satellite broadcast, cassette, video, interactive TV and DVDS. The application range of e-learning covers online learning, computerized learning, virtual classroom and digital cooperation.

Innovation diffusion theory (IDT) was derived from Gabriel Trade's research on social science in 1903, many scholars have proposed all kinds of opinions and applications. The first-purchase diffusion model, for instance, was proposed in 1960 by Fourt & Woodlock's study on grocery products. Mansfield also studied technology alternative of industrial innovation in 1961, then proposed its model framework. However, Everelt Rogers, a professor from the Department of Communication & Journalism at the University of New Mexico, is the person to epitomize almost all thoughts of this model. He collected more than 3,000 IDT cases in 1995 and fully described the fundamental principle of innovation diffusion in a social system, so he is also known as the father of the IDT. The first concept "Diffusion of innovation" in 1962 comes from Rogers's observation. He found an agricultural innovation scheme with obvious merit was not accepted by local farmers for a long time. This insight further helped him realize innovation users can't make immediate decisions but experience a series of dynamic process over time, from innovation to eventual decision. The process is: (1) Knowledge phase: individual begins to collect data after knowing innovation scheme. (2) Persuasion phase: after individual integrates knowledge, his attitude to accept or reject innovation scheme. (3) Decision phase: Individual must decide whether to accept innovation scheme. (4) Implementation phase: Individual's decision on specific implementation of innovation scheme (accept or reject). (5) Confirmation phase: An individual is expected to experience this process first, and then decides whether he accepts this innovation (Ting-Ting Li, Yu-Shan Shi, 2009). Literally, the IDT is made from two words "Innovation" and "Diffusion". The concept of innovation means unprecedented design, technology, cultural forms in society, new finding in commerce or science fields, as well as the output of distinctive production, technology or method to get additional benefits (Wen-Ju Jiang, Zhi-Jia Chen, 2008).

Innovation adoption process was agreed by scholars recently, that innovation adoption decision is not a rare event but a consequence caused by a series of process (Ryan & Gross,1943; Pedersen,1951), this claim thus launches the researches on innovation adoption process model. Rogers proposed "Innovation-adoption model" in 1962, which defines adoption process as "One's mental process from knowing innovation to adoption", and divides it to five phases "Awareness→ interest→ evaluation→ trail→ adoption". However, this process still exists several restrictions (Schiffman & Kanuk, 1994), for instance: scholars think innovation process seldom ends at adoption process. As a result, many scholars then have raised more complete innovation process models (Zaltman, Duncan & Holbek, 1973; Daft, 1978; Ettlie, 1980; Tornatsky et al., 1983; Rogers, 1983; Meyer & Goes, 1988; Cooper & Zumd, 1990 et al). From so many models, Wolfe (1994) further selected the models which belong to

organization innovation process, and concludes a comprehensive argument.
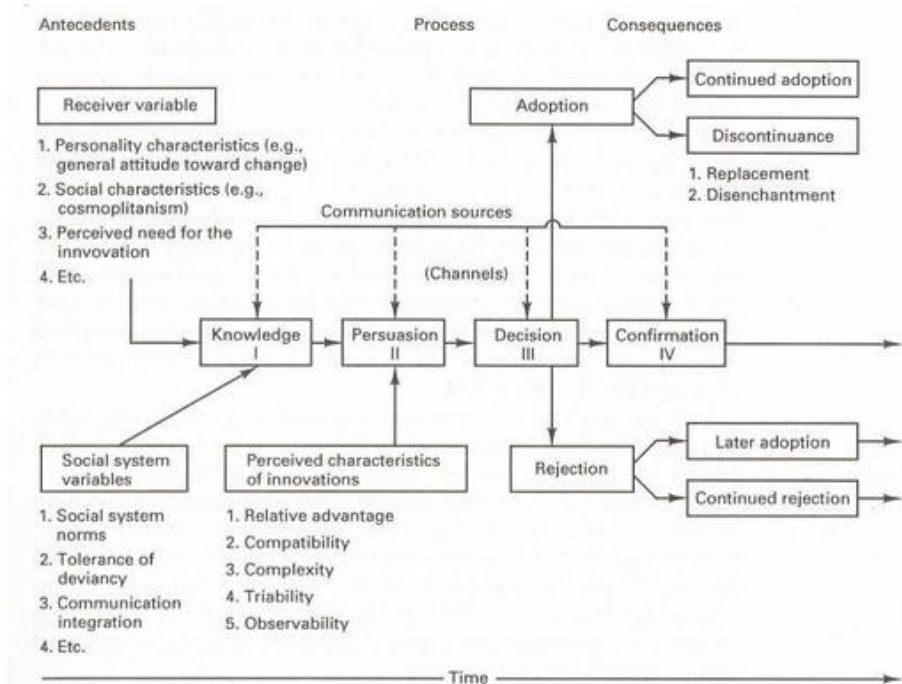
(1) Innovation adoption theory

Figure2-2. *innovation adoption theory*

Source: *Rogers (1995)*

Based on the literature review and inference, the hypotheses are listed below:

H1a: Innovation diffusion has significant positive influence on adoption decision on innovation technology

H1a: Technology innovative characteristic has significant positive influence on adoption decision on innovation technology

H1b: Organizational systematic characteristic has significant positive influence on adoption decision on innovation technology

H1c: Environment opening characteristic has significant positive influence on adoption decision on innovation technology

H2: Adoption decision on innovation technology has significant positive influence onE-Service quality

RESEARCH FINDINGS

Table3-1. *Comparison of Measurement Models*

	χ^2	df	$\triangle\chi^2$	$\triangle$df	χ^2/df	RMSEA	NNFI	CFI	SRMR	GFI
Baseline model	630	644	-	-	0.978	0.0229	0.0705	0.982	0.0705	0.851
Model 1	656	648	26	4	1.012	0.0302	0.963	0.979	0.0718	0.846
Model 2	703	650	73	6	1.082	0.0339	0.958	0.961	0.0738	0.836
Model 3	837	655	207	9	1.278	0.0376	0.939	0.943	0.0773	0.817
Model 4	913	659	283	13	1.385	0.0443	0.915	0.921	0.0886	0.803
Model 5	1069	666	439	22	1.605	0.0501	0.892	0.898	0.0834	0.790
Model 6	1220	664	590	20	1.837	0.0654	0.815	0.826	0.0862	0.753
Model 7	2049	665	1419	21	3.081	0.103	0.542	0.566	0.109	0.645

Formal questionnaire retrieved

Our studies examined the structure of the data as threats to discriminant validity may particularly appear when variables are measured at the same occasion. Results are shown in Table 3-1. As can be

seen, the seven-factor model of variables yielded a good fit to the data, χ^2 (644) = 630, p < .01, RMSEAM= 0.0229, NNFI=0.0705, CFI = .982, SRMR = 0.0705, GFI = 0.851. Our studies also tested a six-factor model, such that all brand association items loaded on the first factor, this approach also produced a worse fitting model than the proposed model , χ^2 (665) = 2049, p < .01, RMSEAM= 0.103, NNFI= 0.542, CFI = 0.566, SRMR = 0.109, GFI = 0.645.

Organizational Level

a. Technology innovative characteristic

b. Organizational systematic characteristic

c. Environment opening characteristic

d. Adoption decision on innovation technology

We chose the company's managers to fill in the questionnaire. With the focus on, the research conducted 28 questionnaires. After excluding invalid questionnaires, there are 28 valid ones retrieved, as shown in Table 3-2.

Table3-2. *Organizational level valid questionnaire survey*

	The total of 28 questionaires		The total of samples retrieved
	Valid samples	Invalid samples	
Sample number	28	0	28
Return rate	100%	0%	100%

Table3-3. *Organizational level frequency table*

Item	Category	Number of people	Percentage (%)
Gender	Male	27	67.5
	Female	1	32.5
Educational level	Master	26	93
	University	2	7
	College	0	0
	Total	28	100

Source: *data are organized by this paper*

Individual Level

With the focus on e-learning students, the research conducted 200 questionnaires. After excluding invalid questionnaires, there are 120 valid ones retrieved, as shown in Table 3-4.

Table3-4. *Individual level valid questionnaire survey*

	The total of 200 questionaires		The total of samples retrieved
	Valid samples	Invalid samples	
Sample number	120	34	154
Return rate	60%	17%	77%

The paper analyzed subjects' basic data based on descriptive statistics, items includes "Gender", "Age", "Educational level", "Enrollment status" and "Curriculum category". These items are summarized in Table 4-5. According to the statistical result, male who is accounted for 67.5% shows higher frequency. The age item is under age 25, accounting for 73.3%. In the educational level item, college group shows higher frequency, accounting for 76.7%.

Table3-5. *Individual level frequency table*

Item	Category	Number of people	Percentage (%)
Gender	Male	81	67.5
	Female	39	32.5
Age	Under age 25	88	73.3
	Age 25 to 29	19	15.8
	Age 30 to 34	10	8.3
	Age 34 to 39	3	2.6
Educational level	Master	24	20
	University	92	76.7
	College	4	3.3
Enrollment status	Yes	69	57.5

	No	51	42.5
	Total	120	100
Source: data are organized by this paper			

This part focuses on the "Curriculum category" of basic data. Students select the items based on their current curriculum and subject. The curriculum includes graduate school, civil service examination, state-owned enterprise, certificate, testing for transfer student, further education per personal demand. There are three main subjects: Commerce & Management, Science & Engineering, and Liberal arts & Education.

Table 3-6 is the frequency overview for curriculum category. This analysis result can present subjects' answers of valid samples, including the sample frequency and percentage. Statistical analysis showed that the highest frequency (i.e. 42 times in frequency) locates at the curriculum of graduation school (Science & Engineering), accounting for 35.0% of total. The second one (i.e. 21 times in frequency) locates at the curriculum of civil service examination (Science & Engineering), accounting for 17.5% of total. The third one (i.e. 13 times in frequency) locates at the curriculum of state-owned enterprise (Science & Engineering), accounting for 10.8% of total. When it comes to the total of six-category curriculum (graduate school, civil service examination, state-owned enterprise, certificate, test for transfer student, further education per personal demand), graduate school has a higher proportion in these six categories (i.e. 54 times in frequency, namely 45.0 % of total). Regarding the total of subject (Commerce & Management, Science & Engineering, and Liberal arts & Education), Science & Engineering is in the majority of the three, with 96 times in frequency, namely 80.0% of total.

Table 3-6. *Individual level the analysis of frequency for curriculum category*

	Commerce & Management	Science & Engineering	Liberal arts & Education	Total
Graduate school	7(5.8%)	42(35.0%)	5(4.2%)	54(45.0%)
Civil service examination	4(3.3%)	21(17.5%)	2(1.7%)	27(22.5%)
State-owned enterprise	3(2.5%)	13(10.8%)		16(13.3%)
Certificate		3(2.5%)		3(2.5%)
Test for transfer student		6(5.0%)	2(1.7%)	8(6.7%)
Further education per personal demand	1(0.8%)	11(9.2%)		12(10.0%)
Total	15(12.5%)	96(80.0%)	9(7.5%)	120
Source: data are organized by this paper				

Correlations

Table 3-7 presents the descriptive statistics, alpha reliabilities, and zero-order correlations among variables in the study at both the individual and organization levels. At the organization level, as expected adoption decision on innovation technology was positively correlated with technology innovative characteristic (r = . 161, p < .05), organizational systematic characteristic, (r = .162, p < .05), which in turn was also positively correlated with E-Service quality (r = .628, p < .01), PU (r = .538, p < .01), PEOU (r = .237, p < .01), learning satisfaction (r = .329, p < .01), repurchase intention (r = .154, p< .05). At the individual level, learning satisfaction was significantly correlated with E-Service (r = .664, p < .01) and also positively correlated with PEOU (r = .449, p < .01), PU (r = .236, p < .01), and repurchase intention (r = .144, p < .01). Descriptive statistics, internal consistency reliabilities, and correlations for the study variables are presented in Table 2. As can be seen, all variables displayed good internal consistency (α s > .785).

Table3-7. *Means, Standard Deviations, Inter-Correlations, and Coefficient Alphas*

variables	mean	sd	1	2	3	4	5	6	7	8	9
1. technology innovative characteristic	4.797	.626	(.865)								
2.organizational systematic characteristics	4.700	.459	.243[**]	(.859)							
3.environment opening characteristic	5.600	.490	.148[*]	.014	(.812)						
4.adoption decision on innovation technology	4.297	1.091	.161[*]	.162[*]	.085	(.890)					
5.PU	3.659	.699	.046	.119	.117	.538[**]	.548[**]	(.841)			
6.PEOU	3.353	.78	.010	.130	.040	.237[**]	.193[**]	.601[**]	(.898)		

7.learning satisfaction	5.070	.867	.021	.057	.265**	.329**	.664**	.449**	.236**	(.785)	
8.repurchase intention	5.147	. 558	.002	.119	.169	.154*	.121	.102	.101	.144*	(.830)

Note: *$p < .05$; **$p < .01$; reliability coefficients are in parentheses along the diagonal.*

Hypotheses Testing

In order to accommodate the multilevel structure of our data and the need to simultaneously test the several mediated relationships proposed, including both top-down and bottom-up relationships, we tested our hypotheses using multilevel structural equation modeling (MSEM). We employed the procedures recommended by Zhang and colleagues (Preacher, et al., 2010; Preacher, Zhang, & Zyphur, 2011; Zhang, Zyphur & Preacher, 2009), which allow examining mediation pathways with Level-2 outcomes and avoids the problems of conflated estimates of between-and within-level components of indirect effects. Given the nature of our path model, we used manifest variables in the estimation. All analyses were conducted using Mplus 7.2 (Muthén & Muthén, 1998-2011) with robust maximum likelihood estimation (MLR) using a type two level random model. We employed a random coefficients model allowing the intercept to vary across units.

As shown in Table 4-8, the results of MSEM analyses indicate that Technology Innovative Characteristic was positively associated with adoption decision on innovation technology (t= .503, p < .05); organizational systematic characteristic was positively associated with adoption decision on innovation technology (t= .480, p < .05). adoption decision on innovation technology was also positively related toE-Service quality (t=6.87, p < 0.01). In addition, adoption decision on innovation technology was positively related to PU (t= .372, p < .01), PEOU (t= .310, p < .01); learning satisfaction was positively related to repurchase intention (t = 3.455, p < .01). Thus, Hypothesis 2 was supported; Hypothesis 1 was partially supported.

CONCLUSION AND DISCUSSION

For adoption decision on innovation technology, this paper utilized the IDT and UTAUT to discuss its organizational-level mediating effect among environment opening characteristic, technology innovative characteristic, organizational systematic characteristic and e-learning service quality. Meanwhile, its multi-level mediating effect among PU, PEOU and learning satisfaction was also the research topic. Learning satisfaction influences the individual-level mediating effect among PU, PEOU and repurchase intention. Adoption decision on innovation technology influences multi-level mediating effect among PU, PEOU and learning satisfaction.

The research findings showed when IDT general model is adopted, adoption decision on innovation technology influences mediating effect on e-learning service quality among environment opening characteristic, technology innovative characteristic, organizational systematic characteristic. Only adoption decision on innovation technology fails to generate cross-level mediating effect among PU, PEOU and learning satisfaction. The cause might be that customers don't know the thinking from organizational level when they decide to use the technology. Therefore, organizational-level decision will only influence their operational perception, not their satisfaction.

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