The Application of IC Ticketing System in Clinic Fees Payment

Yi-Horng Lai, Oriental Institute of Technology, Taiwan

The Asian Conference on Society, Education & Technology 2015
Official Conference Proceedings

Abstract
The purpose of this study was to investigate the demand of application of IC ticketing system in domestic retail industry by examining the needs of adoption of small amount paying method and the reasons for customers' using of IC stored value card in this industry and aimed at providing suggestions on the e-development of small amount paying methods for domestic retail and banking industries. This study was developed in a way that the model constructs in TAM were adapted to the context of IC ticketing system application in clinic fees. Scale items on the survey include those measuring perceived usefulness, perceived ease of use, a user's attitude toward using and intention. The questionnaire contains no identifying information about the individual participants. A total of 501 Taipei City Hospital patients' feedbacks were collected. Results indicate that with the exception of perceived ease of use with behavioral intention, and the experience with the relationship between subjective norm and behavioral intention, analysis supported most of the hypothesized relationships and results complement prior research on experience, subjective norm, and TAM.

Keywords: IC ticketing system, Clinic fees, Partial Least Squares (PLS)

Introduction

In recent years, the development and commercial application of IC ticketing system have shown promising growth in the industries of transportation, telecommunication, etc. As for in the retail industry, paying by cash is still the dominant method, especially in the convenience stores, huge quantity of transactions with small amount makes payment via credit card or cash card inconvenient. The application of paying via low-cost IC card with the aims of security and convenience will bring great benefit to the business and the customers alike.

The purpose of this study was to investigate the demand of application of IC ticketing system in domestic retail industry by examining the needs of adoption of small amount paying method and the reasons for customers' using of IC stored value card in this industry and aimed at providing suggestions on the development of small amount paying methods for domestic retail and banking industries.

The report starts with the introduction to easy card with credit option and the commercial applications of IC card, and then goes on to the research of demands of customers, retail industry and baking sector. Finally the report leads to the results of the questionnaire investigating the effects of variables of population poll and life style on the adoption of easy card/e-money.

Conclusion

The IC Ticketing System: Taipei Easy Card

When consumers shopping with small payment, it is inconvenient that pay by credit card or cash in the transaction process. For this reason, one micro-payment way to be built now, it is called e-wallet. Bank for International Settlements (BIS) define e-wallet is stored in the consumer's electronic equipment, as money-stored or pre-paid tools (Bank for International Settlements, 1996). E-wallet is an IC chip plastic cards, and cardholder can pay with it, such as IC ticketing system.

Taipei Easy Card is an IC ticketing system that provided by Easy Card Corporation. It is a non-contact multi-function electronic ticket integration of the payment of the Taipei mass rapid transit system, buses, parking, and authorized stores. Users pass the card over the sensor area to make a transaction, avoiding hassles with finding correct change. As value can be added to the card at any time, there is no need to repeatedly purchasing new cards. Taipei Easy Card can be used for years and its ultimate aim is to allow people to travel throughout Taiwan with only one card.

People to hospitals for treatment, has a money card chargeback equipment at direct induction debit, to complete the registration fees and medical expenses to pay, eliminating the need for site preparation cash or ex-change the inconvenience of looking for change after August, 2008. The object of this study is finding the influence of the active of using Easy Card for clinic fees.

The Technology Acceptance Model

Based on the theory of reasoned actions (TRA) (Ajzen, & Fishbein, 1980), TAM addresses factors influencing a user's attitude to-ward using and intention to use technology (Davis, Bagozzi, & Warshaw, 1989). TAM has been widely adopted in studies exploring technology acceptance due to its parsimonious nature and highly reliable constructs. Examples include studies testing user acceptance of word processors (Davis, Bagozzi, & Warshaw, 1989), spreadsheet applications (Mathieson, 1991), email (Szajna, 1996), and websites (Gefen, Karahanna, & Straub, 1996).

TAM considers perceived usefulness (PU) and perceived ease of use (PEOU) as two major factors influencing a user's behavioral intention (BI). The former refers to the perceived effectiveness of improving the user's performance, while the latter refers to how effortless a user perceives using the technology to be. Prior research has found that PE mostly influences attitude and intention indirectly through PU (Hu, & Bentler, 1999). Perceived usefulness and user attitude in turn influence intention to use, which predicts actual usage of technology. Treating the application of IC ticketing system as a new technology is used in Hospital in Hong Kong. This paper proposes that the same relationships from TAM hold in relation to pay clinic fees with Taipei Easy Card. This expectation leads to the hypothesis:

H1: PU is positively associated with BI.
H2: PEOU is positively associated with BI.
H3: PEOU is positively associated with PU.

Subjective Norm

Social influence process involves behavior by one person that has the effect-or even just the intention-of changing the way another person behaves, feels or thinks about a motivation (Zimbardo, & Leippe, 1991). The motivation might be political issue, a product, or an activity. Social influence in their theory of reasoned action is as subjective norm (Fishbein, & Ajzen, 1975). Ajzen introduced social influence as subjective norm in theory of planned behavior (Ajzen, 1991). The more favorable the attitude and subjective norm toward a behavior, the stronger will individual's intention to perform or to do a behavior.

In past several years, many prior studies have proven that social influence significantly effects user behavior (Bhattacherjee, 2000; Chang & Cheung, 2001; Grandon, Alshare, & Kwun, 2005; Hsu, & Lu, 2004; Hsu, & Chiu, 2004; Liker, & Sindi, 1997; Nysveen, Pedersen, & Thorbjornsen, 2005; Song & Kim, 2006). Bhattacherjee (2000) pointed that subjective norm was an important factor in predicting intention to use electronic brokerage services. Subjective norm is as two forms of influence, namely interpersonal influence and external influence. Interpersonal influence refer to influence by family, friends, colleagues, superiors, while external influence referred to influence by mass media, expert opinion (Bhattacherjee, 2000).

In the theory of planned behavior framework, a social norm is defined as perceived social pressure that is whether or not perform a behavior (Ajzen, 1985). Social norm refers to mass media reports and expert opinions considered by individuals in performing a behavior (Bhattacherjee, 2000).

TAM indeed played an important role in the field of information technology adoption and had been applied extensively for the subsequent researches. However, more and more researchers find that there are some flaws in the model. Some studies (Taylor, & Todd, 1995) began adding some significant determinants into their model to fit the fact truly. Davis and Venkatesh (2000) revised the original model and proposed an extended model of the technology acceptance model, and it is so-called The Technology Acceptance Model 2 (TAM2).

It can be separated into two parts in this model. They are social influence process and cognitive instrumental process, respectively. Davis and Venkatesh suppose that both social influence process and cognitive instrumental process are significant factors to affect user acceptance. Social influence process included subjective norm,

voluntariness, and image. Cognitive instrumental process included job relevance, output quality, result demonstrability, and perceived ease of use.
TAM2 shows perceived usefulness is a very important driver for people to use information technology through social influence process and cognitive instrumental process. It also indicates that subjective norm has a significant impact on the behavioral intention for the mandatory user in early stage. This may explain why the determinant of subjective norm is not significant before.
Summarized, subjective norm affecting users' intention of paying clinic fee by e-wallet from perceived usefulness and behavioral intention. This expectation leads to the hypothesis:

H4: SN is positively associated with PU.
H5: SN is positively associated with INT.

Personal Prior Experience

Experience was not explicitly included in the original TAM. Davis, Bagozzi, and Warshaw (1989) indicated the relationship between a person's experiences and his or her behavior. Experience, which is the result of acquiring and processing stimulation over time, is one factor that determines how much exposure to a particular stimulus a person accepts.
Peter and Olson point out that Personal experience of a given object affects a person's behavior (Peter, & Olson, 1990). They found that the more positive a person's experience about an object is, the more positive beliefs he or she will hold about it. As a result, the more positive beliefs a person has, the more positive attitude this will create. On the other hand, according to the user behavior literature, beliefs and attitudes are principally created based on a person's personal experience of a given object.

Hartwick and Barki (1994) indicated that the direct effect of subjective norm on intentions may subside over time with increased system experience. Although subjective norm had a significant effect on intentions prior to system development, the effect became non-significant three months after system implementation. Agarwal and Prasad (1997) found that mandating the use of a system can increase initial system utilization, enabling users to overcome the hurdle of first time use, but that such pressure seems to erode over time.
Therefore, TAM2 theorizes that the direct effect of subjective norm on intentions for mandatory usage contexts will be strong prior to implementation and during early usage, but will weaken over time as increasing direct experience with a system provides a growing basis for intentions toward ongoing use. Venkatesh and Davis (2000) expect the effect of subjective norm on perceived usefulness to weaken over time, since greater direct experience will furnish concrete sensory information, supplanting reliance on social cues as a basis for usefulness perceptions. In contrast, Venkatesh and Davis (2000) do not assume the influence of image on perceived usefulness to weaken over time since status gains from system use will continue as long as group norms continue to favor usage of the target system. This expectation leads to the hypothesis:

H6: The positive direct effect of SN on INT for IC Ticketing System will attenuate with increased experience.
H7: The positive direct effect of SN on PU for IC Ticketing System will attenuate with increased experience.

Method

The theoretical model underpinning this study is presented in Figure 1. The model suggests that perceived ease of use, perceived usefulness, subjective norm and experience positively influence users' intentions. Table 1 presents definitions of constructs used in this study. The following sections elaborate on the constructs in the model and the proposed relationships among them.

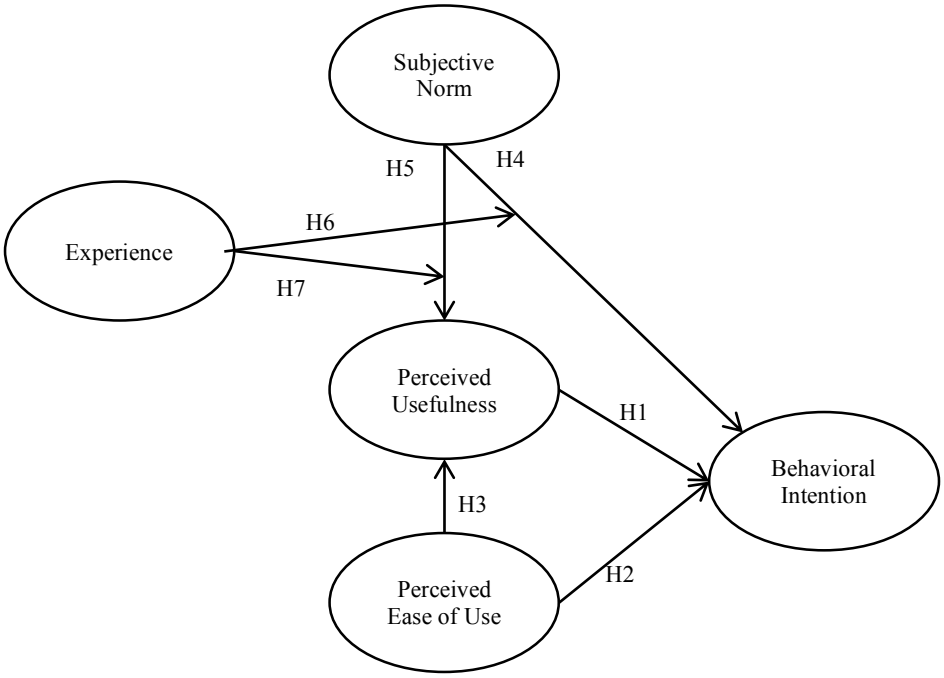


Figure 1: Theoretical model.

Table 1: Construct Definitions

	Construct	Definition
PU	Perceived Usefulness	A person believes that using the system will enhance his or her job performance.
PEOU	Perceived Ease of Use	The degree to which a person believes that using an IT will be free of effort.
BI	Behavioral Intention	A person's perceived likelihood or subjective probability that he or she will engage in a given behavior.
SN	Subjective Norm	The degree to which an individual perceives that most people who are important to him think he should or should not use the system.
EXP	Experience	Experience is knowledge a person gets by doing something or watching someone else do it.

Sample

The sample consisted of patients of a medical center in north Taiwan. Respondents completed questionnaires between December 1 and December 31, 2014. A total of 800 surveys were distributed and a total of 750 responses (93.75%) were received. Due to missing data, 501 responses (62.63%) were used in this analysis. The sample consisted of 294 females, 474 respondents whose using times less than 3 times, 341 respondents whose educational background is under graduate, and 133 respondents whose age are under 25 years old.

Table 3: Data Summarize

Variable		Frequency	%
Gender	Male	207	41.32
	Female	294	58.68
Experience (times)	0~3	474	94.61
	4~10	21	4.19
	11~	6	1.20
Age	~25	133	26.55
	26~30	106	21.16
	31~35	103	20.56
	36~40	54	10.78
	41~45	55	10.98
	46~50	23	4.59
	51~	27	5.39
Education	Primary school	1	0.20
	Junior High School	15	2.99
	Senior School	88	17.56
	Under Graduate	341	68.06
	Graduate	56	11.18
Total		501	100.00

Measures

Subjective norm was measured using 4 items developed by Venkatesh, and Bala (2008), and technology acceptance model was measured using 11 items developed by Davis, and Venkatesh (2004). Personal Prior Experience was measured using 5 items developed by Davis (1989). Construct means and standard deviations may be found in Table 2.

Table 2: Means, Standard Deviations, Reliabilities and Correlation of Constructs

					Correlation of Constructs and Average Variance Extracted			
Construct	N	Mean	S.D.	Cornbach's α	(1)	(2)	(3)	(4)
(1) PU	4	5.61	1.06	.972	.961			
(2) PEOU	4	5.37	1.04	.918	.790	.896		
(3) BI	3	5.84	1.06	.944	.745	.604	.948	
(4) SN	4	5.63	1.04	.952	.919	.784	.710	.936

Data Analysis

To test the model, partial least squares (PLS) is applied, a structural equation modeling (SEM) technique. PLS allows researchers to integrate measurement and

structural models (Bollen, 1989). The measurement model examines hypothesized links between indicators and latent constructs, whereas the structural model estimates hypothesized paths between exogenous (independent) and endogenous (dependent) latent constructs.

The structural model is investigated using SmartPLS 3.2.1. Path analysis was performed on the model using standardized maximum likelihood estimation. The path analysis method offers the advantage of testing the overall model fit with multiple endogenous variables as in the model as well as individual a priori hypotheses.

Results

Measurement Model

To assess reliability and validity using PLS, researchers typically calculate a block of indicators' composite reliabilities, average variance extracted (AVE) (Barclay, Thompson, & Higgins, 1995; Chin 1998). Interpreted like a Cronbach's alpha internal consistency reliability estimate, a composite reliability of .70 or greater is considered acceptable for research (Fornell, & Larcker, 1981). The AVE measures the variance captured by the indictors relative to measurement error (Fornell, & Larcker, 1981), and it should be greater than .50 to justify using a construct (Barclay, Thompson, & Higgins, 1995). Results indicate adequate composite reliabilities and AVEs (Table 2).

To evaluate discriminant and convergent validity, the correlation of constructs and factor loadings be examined. When the square root of each construct's AVE is greater than the correlation of the construct to other latent variables, the correlation of constructs demonstrates discriminant validity. A second way to evaluate discriminant validity is to examine each indicator's factor loadings (Chin, 1998). Indicators should load higher on the construct of interest than on any other variable. The model's correlations of constructs (Table 2) and factor loadings (Table 3) demonstrate adequate discriminant and convergent validity.

Table 3: Factor Loadings and Cross Loadings for the Measurement Model

	BI	PEOU	PU	SN
BI1	**.923**	.569	.663	.671
BI2	**.961**	.562	.724	.560
BI3	**.960**	.592	.731	.589
PEOU1	.612	**.881**	.725	.653
PEOU2	.565	**.921**	.738	.544
PEOU3	.470	**.881**	.652	.438
PEOU4	.504	**.900**	.709	.455
PU1	.717	.768	**.966**	.573
PU2	.726	.740	**.963**	.602
PU3	.714	.766	**.972**	.584
PU4	.707	.764	**.941**	.570
SN1	.424	.375	.376	**.853**
SN2	.447	.395	.397	**.897**
SN3	.454	.402	.405	**.895**
SN4	.691	.673	.703	**.761**

Structural Model

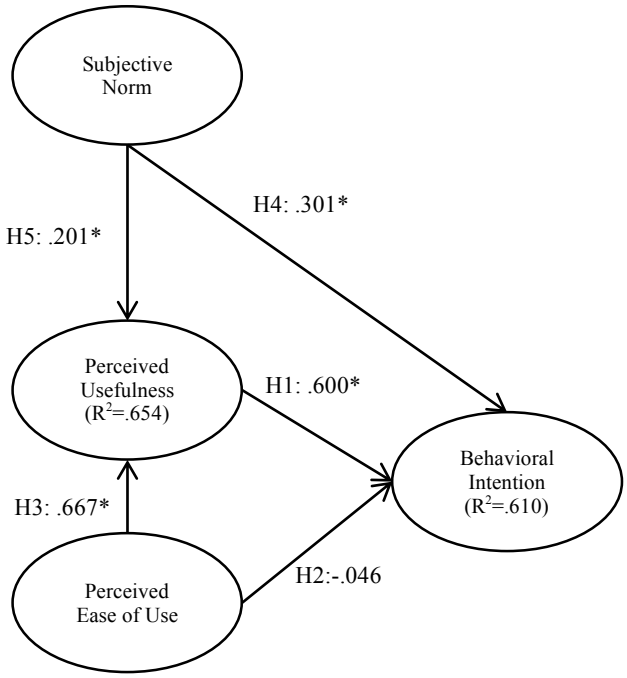
A bootstrapping procedure was used to generate t-statistics and standard errors (Chin, 1998). Interpreted like multiple regression, the R2 indicates the amount of variance

explained by the model (Barclay, Thompson, & Higgins, 1995). To evaluate the full model, R2 values were calculated for computer anxiety and computer self-efficacy. Structural model results are presented in Figure 2 and Table 4.

Perceived usefulness demonstrated a direct, statistically significant, positive relationship with behavioral intention (H1 $p < .05$). Individuals who experienced more perceived usefulness were less likely to report high levels of behavioral intention, thus supporting Hypothesis 1.

Perceived ease of use did not demonstrated a direct, statistically significant, positive relationship with behavioral intention (H2 $p > .05$), thus Hypothesis 2 was not supported. Additionally, perceived ease of use had a direct positive relationship with perceived usefulness (H3 $p < .05$). These results not support Hypotheses 3.

Subjective norm demonstrated a direct, statistically significant, positive relationship with behavioral intention (H4 $p < .05$), thus supporting Hypothesis 4. Subjective norm demonstrated a direct, statistically significant, positive relationship with Perceived Usefulness (H5 $p < .05$), thus supporting Hypothesis 5.



*: p-Value< .05

Figure 2: Structural model.

Table 4: Path Coefficients

	Original Sample (O)	Standard Error (STERR)	T Statistics (|O/STERR|)
H1: PU -> BI	.600	.055	10.980*
H2: PEOU -> BI	-.046	.054	.847
H3: PEOU -> PU	.667	.031	21.419*
H4: SN -> BI	.301	.039	7.673*
H5: SN -> PU	.211	.033	6.341*

*: p-value<.05

The moderating role of Experience

A bootstrapping procedure was used to generate t-statistics and standard errors (Chin, 1998). Structural model results are presented in and Table 5.
Increased experience did not demonstrate a direct, statistically significant, positive effect on the relationship between subjective norm and behavioral intention for IC Ticketing System will attenuate, thus not supporting Hypothesis 6.
Increased experience demonstrated a direct, statistically significant, positive effect on the relationship between subjective norm and perceived usefulness for IC Ticketing System will attenuate, thus supporting Hypothesis 7.

Table 5: The Result of Moderating Effect of Experience

	Original Sample (O)	Standard Error (STERR)	T Statistics (|O/STERR|)
H6: EXP -> (SN -> BI)	.015	.031	.502*
H7: EXP -> (SN -> PU)	.077	.028	2.779

*: p-value<.05

Limitations
Before discussing the results and the implications of this study, it is important to consider the study's limitations. The primary limitation relates to external validity. Sampling was limited to voluntary respondents enrolled in medical center in north Taiwan. Therefore, the results might have limited generalizability to the individuals outside of the sample population in the nonacademic world. Further study is needed to assess the extent to which this study's results are applicable in diverse organizational and task settings.

Discussion and Conclusion

Overall, findings of this study provide insight into the experience, subjective norm, perceived usefulness, and perceived ease of use that relate to new information technology acceptance and use.
With the exception of perceived ease of use with behavioral intention, and the experience with the relationship between subjective norm and behavioral intention, analysis supported most of the hypothesized relationships and results complement prior research on experience, subjective norm, and TAM. Where many studies focus on experience, subjective norm for new information technology acceptance (Venkatesh, & Davis, 2000), this study extends prior research by demonstrating how experience relate to perceived usefulness and behavioral intention through the role of moderator.
Consistent with Venkatesh and Davis (2000), the findings of this study suggest that perceived usefulness influence behavioral intention of information technology acceptance, perceived ease of use influence perceived usefulness.
More importantly, the findings of this study illustrate how experience relate to the relationship between subjective norm and behavioral intention, and the relationship between subjective norm and perceived usefulness. Contrary to expectations, experience did not have a significant relationship with the relationship between subjective norm and behavioral intention.
Overall, findings shed light on how subjective norm, perceived usefulness, perceived ease of use affect behavioral intention (Davis, Bagozzi, & Warshaw, 1989; Venkatesh, & Davis, 2000), and the experience affect the relationship between subjective norm

and behavioral intention, and the relationship between subjective norm and perceived usefulness (Venkatesh, & Davis, 2000). Research suggests that personal prior experience is positive with the relationship between subjective norm and perceived usefulness.

This study is a first step in developing a more robust understanding of individual differences that may inform managers' decisions, enhance trainings' effectiveness, and extend the understanding of factors linked to new information technology usage. This study articulated and tested a conceptual model that posited three traits (subjective norm, perceived usefulness, and perceived ease of use) would influenced behavioral intention individual differences. Although there were no effects for perceived ease of use, support for the relationships between subjective norm and perceived usefulness with behavioral intention, and subjective norm with perceived usefulness.

Given perceived usefulness and perceived ease of use s influence on behavioral intention (Venkatesh, & Davis, 1996), results underscore the importance of extending the theoretical surrounding individual differences in the information technology context. By identifying how dispositional traits influence more individual differences such as subjective experiences, norm, perceived usefulness, and perceived ease of use, the future studies may develop a more comprehensive model of how organizations encourage IT acceptance and use.

References

Agarwal, R., & Prasad. J. (1997). The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision Sciences*, 28, 557-582.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *Action-control: From cognition to behavior*, 11-39.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*, Englewood Cliffs, NJ: Prentice-Hall.

Bank for International Settlements (1996). *Implication for Central Banks of the Development of Electronic Money*.

Barclay, D., Thompson, R., and Higgins, C. (1995). The Partial Least Squares (PLS) approach to causal modeling: personal computer adoption and use as an illustration. *Technology Studies*, 2(2), 285-309.

Bhattacherjee, A. (2002). Individual trust in online firms: scale development and initial test. *Journal of Management Information Systems*, 19(1), 211-241.

Chang, M., & Cheung, W. (2001). Determinants of the intention to use Internet/WWW at work: a confirmatory study. *Information & Management*, 39(1), 1-14.

Chin, W.W. (1998). The Partial Least Squares Approach to Structural Equation Modeling, in *Modern Methods for Business Research*, G. A. Marcoulides (ed.), Lawrence Erlbaum, Mahway, NJ, 295-336.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of computer technology: comparison of two theoretical models. *Management Science*, 35(8), 982-1003.

Downing, R.E., Moore, J.L., & Brown, S.W. (2005). The effects and interaction of spatial visualization and domain expertise on information seeking. *Computers in Human Behavior*, 21(4), 195-209.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: an introduction to theory and research*: Addison-Wesley Pub. Co.

Fornell, C., and Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(3), 39-50.

Gefen, D., Karahanna, E., & Straub, D.W. (2003). Trust and TAM in online shopping: an integrated model. *MIS Quarterly*, 27(1), 51-90.

Grandon, E., Alshare, K., & Kwun, O. (2005). Factors influencing student intention to adopt online classes: a cross-cultural study. *Journal of Computing Sciences in Colleges*, 20(4), 46-56.

Hartwick, J., Barki. H. (1994). Explaining the role of user participation in information system use. *Management Science*, 40, 440-465.

Hsu, M.H., & Chiu, C.M. (2004). Predicting electronic service continuance with a decomposed theory of planned behavior. *Behavior & Information Technology*, 23(5), 359-373.

Hsu, C.L., & Lu, H.P. (2004). Why do people play on-line games? An extended TAM with social influences and flow experience. *Information & Management*, 41(7), 853-868.

Hu, L.T., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.

Liker, J., & Sindi, A. (1997). User acceptance of expert systems: a test of the theory of reasoned action. *Journal of Engineering and Technology Management*, 14(2), 147-173.

Mathieson, K. (1991). Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*, 2(3), 173-191.

Nunnally, J.C. (1978). *Psychometric Theory*, New York: McGraw Hill.

Nysveen, H., Pedersen, P., & Thorbjornsen, H. (2005). Explaining intention to use mobile chat services: moderating effects of gender. *Journal of Consumer Marketing*, 22(5), 247.

Peter, P.J., & Olson, J.C. (1990). *Consumer Behavior and Marketing Strategy (2nd ed.)*, R.R.Donnelley, Chicago, IL.

Song, J., & Kim, Y. (2006). Social influence process in the acceptance of a virtual community service. *Information Systems Frontiers*, 8(3), 241-252.

Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. *Management Science*, 42(1), 85-92.

Tabachnick, B.G., & Fidell, L.S. (1996). *Using Multi-variate Statistics (3rd ed.),* HarperCollins, New York.

Taylor, S., & Todd, P. (1995). Assessing it usage: the role of prior experience. *MIS Quarterly*, 19(4), 561-570.

Thompson, R.L., Higgins, C.A., & Howell, J.M. (1994). Personal computing: towards a conceptual model of utilization. *MIS Quarterly*, 15(1), 125-142.

Venkatesh, V., & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, 46(2), 186-204.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273-315.

Zimbardo, P., & Leippe, M. (1991). *The Psychology of Attitude Change and Social Influence*, McGraw-Hill.

Contact email: FL006@mail.oit.edu.tw