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Full Length Research Paper

Investigation of the factors influencing the acceptance of electronic cash stored-value cards

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Electronic cash stored-value cards have been issued in Asia for a while. Few academic studies investigate the factors that influence consumers' acceptance of electronic cash stored-value cards. This study proposes an extended technology acceptance model and applies structural equation model to confirm the factors influencing consumers' acceptance of electronic cash stored-value cards. A set of 716 sample questionnaires are used to analyze and confirm the proposed conceptual framework. The empirical results find that perceived usefulness and perceived ease-of-use have a significant positive effect on the usage attitude towards electronic cash stored-value cards. Consumers may not feel that the relevant costs of electronic cash stored-value cards are an important factor influencing their usage attitude. While the social influence positively affects the behavioral intention, the perceived risk reveals significant negative effect on consumers' usage attitude. Furthermore, the usage attitude exhibits significant positive effect on the behavioral intention of electronic cash stored-value cards. Finally, issuing institutions are advised to promote electronic cash stored-value cards to younger and experienced consumers.

Key words: Electronic cash stored-value cards, technology acceptance model, moderating effects, structural equation model.

INTRODUCTION

A survey made by market intelligence center (MIC) in 2007 reveals that credit cards (35.79%) and ATMs (32.26%) took first and second market shares in retail online payment, but some studies indicate that the settlement system of credit cards is more complicated and expensive than other payment instruments. This implies that credit cards might not be suitable for micro payments (Shy and Tarkka, 2002), which are defined as a small payment taken to be under U$10, which are uneconomical to process through traditional payment instruments (BIS, 2001). Many online transactions are extremely small amounts, such as downloading a song or hearing a fortuneteller. Merchants do not like to accept credit cards, because of the high fees charged by the financial institutions. On the other hand, consumers concerned about the security of their online payment might be anxious about using credit cards for online shopping. Moreover, although teenagers frequently shop online, most of them are unable to apply for a credit card. Therefore, Internet ATM could be an ideal online payment solution for them, but the average transfer cost of Internet ATM is expensive for small transactions. Consumers with a similar concern about credit cards might be anxious about the security of using Internet ATM (Torkzadeh and Dhillon, 2002). Therefore, other solutions are being developed for micro payments.

Electronic cash stored-value cards based on smart card technology may be an efficient micro payment solution, because they can override the demerits of using cash for shopping at brick and mortar stores, such as the inconvenience of carrying, exchanging, sorting, and storage, etc. In addition, electronic cash stored-value cards can be used as payment instruments for online shopping by the card holder. Since electronic cash stored-value cards are offline payments, they do not need

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to be linked to customers' bank accounts for credit authorization. Therefore, the relevant costs of electronic cash stored-value cards are basically lower than other online payment instruments, such as credit cards, debit cards, charge cards, etc. In fact, electronic cash stored-value cards have been used as a micro payment solution since the mid-1990s. Data offered by the committee on payment and settlement systems reveal that the G10 countries have aggressively developed electronic cash stored-value cards (BIS, 2001). Good (1997,1998) indicates that if electronic cash stored-value cards can substitute for 1% of cash transactions in the U.S. or about U$1 trillion, then issuing institutions could own up to a U$100 million electronic cash stored-value card market.

Issuing institutions allow consumers to store monetary value with a credit card or by transferring their bank deposits onto a microchip. According to the issuing rules published by Taiwan's financial regulators, customers can store monetary value of no more than NT$10,000 (ten thousand New Taiwan dollars) in one day. When storing the value, consumers are required to pay a storage fee of around NT$3-7, which is smaller than the fee for transferring deposits of around NT$17. Most issuing institutions in Taiwan believe electronic cash stored-value cards can partly substitute for small cash transactions and have aggressively contracted with merchants that will accept electronic cash stored-value cards for micro payments. According to the data of Financial statistic monthly in 2007, published by Taiwanese central bank, the issued number of electronic cash stored-value cards is not only small, but also the frequency of using them is low. Therefore, how to integrate management and marketing strategies becomes an important issue for the diffusion and penetration of electronic cash stored-value cards.

It is necessary to investigate the acceptance of electronic cash stored-value cards from the consumers' viewpoint. Based on the technology acceptance model (TAM) and referring to other relevant literature (Ajzen and Fishbien, 1980; Davis, 1986; Adams et al. 1992), this study's purpose is to construct a conceptual framework and employ the structural equation model (SEM) to investigate the factors influencing consumers' acceptance of electronic cash stored-value cards. In addition, this study uses age and similar experience of stored-value cardholders as the moderating variables to conduct a moderating effect analysis. The results provide meaningful strategic implications for issuing electronic cash stored-value cards, which allows for improved application design and strategy development.

THEORETICAL FOUNDATION AND CONCEPTUAL FRAMEWORK

Theoretical foundation

The Theory of Reasoned Action (TRA) assumes that most people can control their behavioral intention and present a rational behavior. Fishbein and Ajzen (1975) indicate that intention is an immediate determinant factor influencing people to adopt a certain action and can be used to investigate consumers' adoption of certain products and services. The technology acceptance model (TAM) considers consumers' motivation towards the acceptance of new technology productions. It proposes that beliefs about usefulness and ease-of-use of a new system are essential factors in determining a user's attitude to the acceptance of technology. Attitude in turn positively affects consumers' behavioral intention (Davis, 1986; Davis, 1989; Davis et al., 1989; Adams et al., 1992; Lederer et al., 2000).

Previous studies have been empirically verified by TAM, and some of them recognize the need to adjust the model for different contexts (Karahanna and Limayem, 2000; Hong et al., 2002; Pan and Jordan-Marsh, 2010; Yen et al., 2010). There are some significant factors added to TAM such as system quality, social influence, etc. An unstable system could not convince consumers to accept definitely. Thus, some studies adopt system quality as a factor that influences the acceptance of new technological productions (Venkatesh and Davis, 2000). In addition, social influence is executed by relevant others in a consumer's environment. Previous studies about electronic commerce and e-mail reveal that social influence has a direct and positive effect on behavioral intention (Karahanna and Limayem, 2000; Fang, 1998).

A great number of studies have investigated the feasibility of electronic money since 1995, and there are several major themes discussed with regard to it. For example, some studies have examined the design of the electronic cash scheme, which focuses on the system of efficiency based on elaborate discrete logarithm (Liaw et al., 2007; Juang and Liaw, 2004; Ku et al., 2004; Yu et al., 2002). Some academic studies build a theoretic model to interpret the feasibility of electronic cash (Kahn and Roberts, 1999; Shy and Tarkka, 2002; M'Chirgui, 2006). For example, Kahn and Roberts (1999) employ early redemption cost to interpret the choice between bank notes and check deposits. Their results reveal that if early redemption cost is between the floor and the ceiling limit values measured by the model, bank notes are more feasible than check deposits. They further indicate that their analysis can be applied to electronic money due to being like bank notes.

The studies of Pippow and Schoder (2001) and Shy and Tarkka (2002) compare a variety of costs such as fees, time cost, interest cost among different payment instruments, and reach a common conclusion that electronic cash stored-value cards can partly substitute for cash in small retail transactions. M'Chirgui (2006) indicates that the acceptance of electronic cash depends on the value of the transaction, and if the cost per transaction is high, merchants possess less incentive to accept electronic cash as a payment instrument.

In addition, a few marketing studies discuss the

acceptance of electronic payment scheme (Kleijnen et al., 2004; Cunningham et al., 2005). Unlike the extended TAM studies of information system, Kleijnen et al. (2004) adds perceived cost to examine consumers' acceptance of wireless finance. Since technological systems applied to finance involve enormous investment, the financial services providers often charge fees to their users. Kleijnen et al. (2004) present that high fees seem to be not a major reason why consumers are not willing to utilize mobile services for payments. The perceived risk often is another significant factor for consumers to use payment services. When prevalently adopted, electronic cash stored-value cards might be threatened by fraud risk, operational risk, technology risk, etc. These risks endanger the operating system and could lead to bank runs and even make the whole payment system to break down (McAndrew, 1997). Consumers' first priority is the security of a payment system. They take account of many things, including whether their electronic money will disappear groundlessly. Issuing institutions can ensure the conversion between electronic money and legal tender, guaranteeing the protection of their personal privacy (Good, 1997, 1998). Therefore, perceived risk is an im-portant factor influencing consumers to adopt electronic money (Cunningham et al., 2005).

Conceptual framework

Electronic cash stored-value cards belong to the group of financial technology products. TAM can be applied to examine the factors that influence consumers' acceptance of electronic cash stored-value cards. In the original TAM, perceived usefulness (PU) focuses on the extent to which a system adds to a consumer's job performance (Davis et al., 1989). Therefore, perceived usefulness is defined as how well consumers believe that electronic cash stored-value cards can be integrated into their daily payments. When this belief increases, the consumers' attitude (ATT) to electronic cash stored-value cards become more positive, and then their behavioral intention (INT) to electronic cash stored-value cards rises. In addition, some studies indicate that perceived usefulness also has a direct effect on behavioral intention (Davis, 1989; Davis and Wiedenbeck, 2001; Kleijnen et al., 2004). Thus, the effects of perceived usefulness on usage attitude and behavioral intention are expected as follows, respectively:

H_1: Perceived usefulness has a direct and positive effect on the usage attitude of electronic cash stored-value cards.

H_2: Perceived usefulness has a direct and positive effect on the behavioral intention of electronic cash stored-value cards.

Perceived Ease-of-Use (PEU) is defined as the extent to which consumers believe a system is easy to learn or to use (Davis et al., 1989). Therefore, perceived ease-of-use may have a positive effect on usage attitude to electronic cash stored-value cards. When consumers feel that the transaction procedure of electronic cash stored-value cards is complicated, they have difficulty in recognizing the perceived usefulness of electronic money. Perceived ease-of-use hence may have a positive effect on perceived usefulness (Davis, 1989; Davis and Wiedenbeck, 2001). Therefore, the impacts of perceived ease-of-use on perceived usefulness and usage attitude are expected as follows:

H_3: Perceived ease-of-use has a direct and positive effect on the perceived usefulness of electronic cash stored-value cards.

H_4: Perceived ease-of-use has a direct and positive effect on the usage attitude of electronic cash stored-value cards.

Neuman (1995) indicates that the key to the success of micro payments is transaction costs. Some previous studies focus on transaction costs and investigate that electronic cash stored-value cards can be used to substitute for cash. The perceived cost (PC) of using electronic cash stored-value cards includes the value of lost time, the storage fee and related interest loss, which may have a negative effect on consumers' usage attitude (Shy and Tarkka, 2002). Moreover, electronic cash stored-value cards might be exposed to fraud risk, operational risk and even systemic risk. Therefore, perceived risk (PR) may negatively influence the usage attitude (Chunningham et al., 2005). Thus, two corresponding hypotheses are stated as follows:

H_5: Perceived cost has a direct and negative effect on the usage attitude of electronic cash stored-value cards.

H_6: Perceived risk has a direct and negative effect on the usage attitude of electronic cash stored-value cards.

The studies of Fang (1998), Karahanna and Limayem (2000), and Kleijnen et al. (2004) show that social influence (SI) actually affects consumers' intention to adopt new technology. Therefore, this study incorporates social influence to investigate whether it has a direct and positive effect on behavioral intention towards electronic cash stored-value cards. Thus, the corresponding hypothesis is presented as follows:

H_7: Social influence has a direct and positive effect on the behavioral intention of electronic cash stored-value cards.

Ajzen and Fishbien (1980) indicate that behavioral intention can be used to measure the adoption intension of a certain behavior, suggesting that consumers execute a certain behavior decided by their behavioral intention. Lutz (1991) presents that attitude is an appetence of behavior and suggests that belief affects attitude, which in turn affects behavior. Earlier studies on electronic channels focused on the adoption attitude to the channel

itself, but when examining the usage intensions, attitude to using the channel is considered a more accurate predictor (Kleijnen et al., 2004). Therefore, usage attitude is the valuation of consumers' perception to the usage of electronic cash stored-value cards, which in turn has a positive effect on behavioral intention. The corresponding hypothesis is depicted as follows:

H_8: Attitude has a direct and positive effect on the behavioral intention of electronic cash stored-value cards.

According to the relationships among influencing factors, attitude and intension illustrated above, Figure 1 shows the proposed conceptual framework. Figure 1 shows eight path relationships among influencing factors, attitude, and intension formulated. This study investigates these eight corresponding hypotheses mentioned above. Kleijnen et al. (2004) indicate that consumers likely have a clearer judgment for new technology as they become older. Since most of the younger generations cannot apply for credit cards, they are more likely to use electronic cash stored-value cards to substitute for cash. Moreover, Carlson and Zmud (1999) offer that a similar experience in using products and services might influence the acceptance of new technology. Consumers with a comparable experience in using products and services are able to predict or appraise the valuation of new technology products and services. Therefore, to investigate the moderating effects, this study uses the variables of age and similar experience of stored-value cardholders to respectively separate the sample into two groups. The purpose of analyzing moderating effects is to investigate whether there are different path relationships between older and younger consumers and between experienced and inexperienced consumers. Therefore, two more hypotheses are examined herein:

H_9: There are different path relationships between older and younger groups.

H_{10}: There are different path relationships between experienced and inexperienced groups.

METHODOLOGY

Structural equation model

The Structural Equation Model (SEM) includes a measurement model that investigates the relationship between manifest variables and latent variables, and a structural model that examines the relationships between latent variables (Byrne, 1998; Joreskog and Sorborn, 1989). These two models are presented as:

$$X = \Lambda_X \xi + \delta \quad (1)$$

$$Y = \Lambda_Y \eta + \varepsilon \quad (2)$$

$$\eta = B\eta + \xi + \zeta \quad (3)$$

The measurement models for x and y are specified by Equations (1) and (2), respectively. Here, x denotes a q×1 vector of exogenous manifest variables, ξ denotes a n×1 vector of exogenous latent variables, Λ_X denotes a q×n matrix of coefficients of regression of x on ξ, and δ denotes a q ×1 vector of measurement errors in x. Moreover, y presents a p×1 vector of endogenous manifest variables, η presents a m×1 vector of endogenous latent variables, Λ_Y presents a p×m matrix of coefficients of regression of y on η, and ε presents a p ×1 vector of measurement errors in y.

The structural model examines the path relationships among latent variables, which are shown by Equation (3), where B stands for a m×m matrix of coefficients of the η-variables in the structural relationship and has zeros in the diagonal. In addition, $I - B$ is required to be non-singular, stands for a m×n matrix of coefficients of the ξ-variables in the structural relationship, and ζ stands for a m×1 vector of equation errors in the structural relationship between η and ξ.

The random components in the structural equation model are presumed to satisfy the following minimal assumptions: δ is uncorrelated with ξ; ε is uncorrelated with η; ζ is uncorrelated with ξ; and ζ, ε, and δ are mutually uncorrelated. The covariance matrices include $\mathrm{COV}(\xi) = \Phi(N \cdot N)$, $\mathrm{COV}(\zeta) = \Psi(M \cdot M)$, $\mathrm{COV}(\varepsilon) = \Theta_\varepsilon(P \cdot P)$, and $\mathrm{COV}(\delta) = \Theta_\delta(Q \cdot Q)$. The covariance matrix of the observations implied by SEM is represented as follows:

$$\sum = \begin{matrix} \\ = Cov \\ X \end{matrix} \begin{matrix} Y \\ \\ \end{matrix} \begin{matrix} \Lambda_Y A(\Phi' + \Psi) A' \Lambda'_Y + \Theta_\varepsilon & \Lambda_Y A \Phi \Lambda'_X \\ \Lambda \Phi' A' A'_{,} & \Lambda \Phi \Lambda' + \Phi \\ & XX \end{matrix} \begin{matrix} \\ \\ \delta \end{matrix},$$

Where, $A = (I - B)^{-1}$.

In this study the measurement model includes 30 manifest variables, 22 exogenous variables and 8 endogenous variables. The structural model includes 7 latent variables: perceived usefulness (PU), perceived ease-of-use (PEU), perceived cost (PC), perceived risk (PR), and social influence (SI) are exogenous latent variables while attitude (ATT) and intention (INT) are endogenous latent variables.

Questionnaire survey

The empirical data are obtained through a questionnaire. The questionnaire's first part consists of gender, age, similar experience of stored-value cards holders, and acceptable amount paid by electronic cash stored-value cards. Following the study of Kleijnen et al. (2004), the age of a 25-year-old is used to separate the sample into older and younger groups. In addition, 30-question items (manifest variables) included in the questionnaire's second part are used to measure 7 latent variables of this study, shown in Appendix. A five-point Likert-type scale is used, with a range from one (strongly disagree) to five (strongly agree). The question items were reviewed in advance by two marketing professors. In addition, 48 college students and 48 EMBA graduate students participated in the pre-test. The results do not reveal any obvious problems in the questions.

This study briefly adopted a nonrandom sampling from three major groups of potential customers for using electronic cash stored-value cards in Taiwan. Since most of students cannot apply a credit card in Taiwan, they are potential customers for using electronic cash stored-value cards. Thus, the first major group of potential

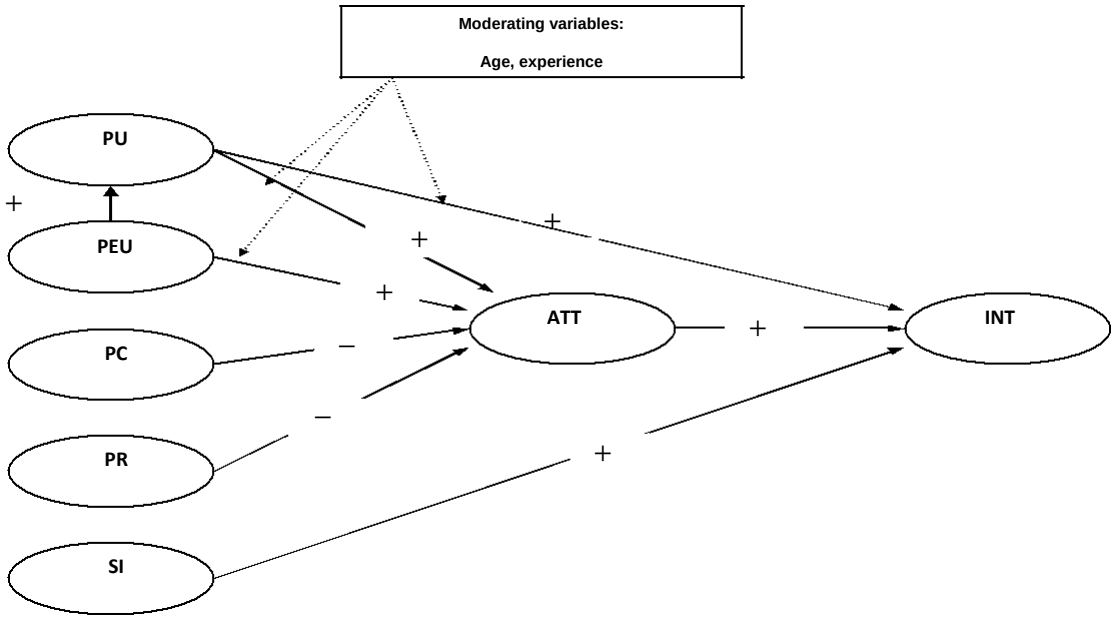

Figure 1. Relationships in conceptual framework.

customers for using electronic cash stored-value cards targeted on students consisting of senior high school, college and graduate students. On the other hand, electronic cash stored-value cards are being heavily marketed to lower-income customers in Taiwan, especially the unbanked or underbanked. Thus, the second major group of potential customers for using electronic cash stored-value cards targeted on lower-income customers in Taiwan. The last group of potential customers for using electronic cash stored-value cards targeted on consumers who may own credit cards.

A face-to-face interview is primarily employed to execute the questionnaire for respondents from the first major group of potential customers. For the rest of the two major groups of potential customers, this study adopted a mail questionnaire to collect the relevant data. To improve the response rate, this study also employs a face-to-face interview to execute the questionnaire for EMBA students who almost own credit cards. The respondents of this study were divided into two groups, i.e. early or late respondents. The t-tests are utilized to compare on their responses to the Likert scale questions for these two groups. No differences were found between the majority of the responses of early and late respondents (Connors and Elliot, 1994). Thus, the non-response bias problem would be mitigated in this study.

Finally, this study used ex ante approaches to avoid the common method variance, including question items being designed inversely (e.g., question USE5) and respondent's privacy protection (e.g., not involving the details of age, income, etc.) (Podsakoff et al., 2003). This study also executed an exploratory factor analysis to check whether most of question items account for one general factor. Results show the presence of five distinct factors with eigenvalue greater than 1.0, rather than a single factor. The five factors together accounted for 55% of the total variance; the first factor did not account for a majority of the variance (24%). Thus, the common method variance is not a significant issue herein.

RESULTS

Descriptive statistics

The study collected 785 of 1200 sample questionnaires, of which 716 respondents are valid. The respondents include graduate students, college students, senior high school students, and many other vocational adults. Table 1 shows the resulting sample for the questionnaire's first part, of which 30.2 and 69.8% of the 716 respondents are male and female, respectively. The younger group and the older group make up 76.8 and 23.2% of the sample, respectively. The results also reveal that over 60% of the respondents have similar experiences in using stored-value cards. In addition, the range of amount that most respondents would like to pay by electronic cash stored-value cards is from 100 to NT$500. This is consistent with the investigation of BIS (2001). Before executing the SEM analysis, a reliability analysis is employed to test whether the question items are reliable in explaining their respective factor construct. Table 2 shows the reliability results. Cronbach's alpha values of perceived usefulness, perceived ease-of-use, perceived cost, perceived risk, social influence, attitude, and intention are over 0.75 except for the alpha value of perceived cost at 0.51.These results reveal that the factors have high reliability (Gilford, 1954).In addition, if the question items of USE5, COS1, and INT1 are deleted, then the reliabilities of PU, PR, and INT rise further. As a result, the alpha values of factors are greater than 0.8 except for the alpha value of perceived cost at 0.62.

To examine the model-data fit, some indices, including absolute indices, incremental indices, and parsimonious indices, are applied to indicate the extent to which the data can be represented by the proposed model. Absolute indices, such as chi-square, Goodness-of-Fit Index (GFI), and Root Mean Square Residual Error of Approximation (RMSEA) are commonly used to evaluate the proposed model. In addition, incremental fit statistics,

Table 1. Descriptive statistics.

Demographic variable	Value (%)
Gender	
Male	30.2
Female	69.8
Age (Years)	
< 25	76.8
>25	23.2
Similar experience	
Yes	61.2
No	38.8
Acceptable amount	
< NT$ 30	4.2
NT$ 30-100	20.4
NT$ 100-500	49.7
> NT$ 500	25.7

Table 2. Reliability analysis.

Factor construct		Question items	Alpha if item deleted	Alpha
PU	USE1	Time saving	0.7281	0.7868
	USE2	Efficiency	0.6907	
	USE3	Rapid speed	0.7018	
	USE4	Quality improving	0.7418	
	USE5	Complications	0.8580*	
PEU	EAS1	Easy learning	0.8199	0.8458
	EAS2	Simple learning	0.7888	
	EAS3	Less time in learning	0.7992	
	EAS4	Friendly operating	0.8087	
PC	COS1	Deposit first	0.6206*	0.5079
	COS2	Fees	0.4726	
	COS3	Shops for accepting	0.3590	
	COS4	Places for storing	0.3547	
	COS5	Convertibility	0.4132	
PR	RIS1	Correct payment	0.8003	0.8515
	RIS2	Stable system	0.7897	
	RIS3	Loss	0.8147	
	RIS4	Fraud	0.8404	
SI	SOC1	Media influence	0.7599	0.8147
	SOC2	Mass influence	0.7244	
	SOC3	Peer influence	0.7744	
	SOC4	Firm image	0.8056	
ATT	ATT1	Good idea	0.8218	0.8568
	ATT2	Good payment	0.8111	
	ATT3	Right decision	0.8123	
	ATT4	Advanced payment	0.8256	

Table 2. Contd.

INT	INT1	Using e-cash only	0.8002*	0.7686
	INT2	Often using	0.6522	
	INT3	Part of daily life	0.6511	
	INT4	Recommendation	0.7357	

*: denotes that if the item is deleted, the value of α increases.

Table 3. The results for model-data fit.

Model-data fit	Indices	Statistics	Threshold
Absolute fit indices	X^2/d. f	152.73/63=2.42	<3
	RMSEA	0.045	<0.1
	GFI	0.92	>0.9
Incremental fit indices	AGFI	0.87	>0.9
	NFI	0.94	>0.9
	NNFI	0.92	>0.9
	CFI	0.95	>0.9
	RFI	0.91	>0.9
	IFI	0.95	>0.9
Parsimonious fit indices	PGFI	0.55	>0.5
	PNFI	0.65	>0.5

such as AGFI (adjusted goodness of fit), NFI (normed fit index), NNFI (non-normed fit index), CFI (comparative fit index), IFI (incremental fit index), and RFI (relative fit index), and parsimonious fit statistics, such as PGFI (parsimonious goodness fit index) and PNFI (parsimonious goodness fit index), are employed to assess the structural equation model.

LISREL 8.54 is used to estimate the parameters in SEM and to test the relationships specified in the conceptual framework. The initial results are shown as follows: RMSEA=0.047, GFI=0.79, AGFI=0.75, NFI=0.91, NNFI=0.91 and PGFI=0.66. The suggested model could be improved since GFI and AGFI are less than the recommended value of 0.9 (Anderson and Gerbing, 1988; Chang et al., 2004). Therefore, a continuous interactive process of a specification search is conducted to refine the measures. Table 3 shows the final results. Since X^2 is easily affected by a large sample, the chi-square statistic must be interpreted with caution in most applications (Joreskog and Sorborn, 1989).

This study further refers to the absolute indices. As a result, the value of X^2/d. f is less than the common value of 3, the RMSEA value is less than 0.5, and GFI is greater than the common value of 0.9. These results indicate that the suggested model is appropriate (McDonald and Ho, 2002). Furthermore, referring to incremental fit indices and parsimonious fit indices, the findings reveal that the model fits well in representing the data. Factor loadings are employed to test the validity of convergence (Anderson and Gerbing, 1988) and used to assess whether manifest variables are sufficient in representing their respective factor. The empirical results find that all factor loadings show highly significant t-statistics, as shown in Table 4. These results indicate that the convergent validity of each factor construct is satisfied. Average variance extracted (AVE) and composite reliability are used to test construct reliability. Average variance extracted (AVE) evaluates the amount of variance captured by the factor. Therefore, AVE is less than 0.5, meaning that the measurement error is greater than the variance captured by the factor. Composite reliability reflects the internal consistency of the observed manifest variables measuring each factor. The AVE and composite reliability are calculated by using the formula of Fornell and Larker (1981), with empirical results shown in Table 4. AVE values are all more the recommended value of 0.5, and the values of composite reliability are all greater than that of the common threshold 0.7 (Hair, et al., 1995, Rain-Eudy, 2000). Therefore, each factor is reliable in measuring its respective construct. Discriminant validity measures the extent to which the factors are different. The average AVE of the two factors must exceed the square of their correlation in order to satisfy the test (Al-Hawari et al., 2005). The average AVE and the squared correlation for every possible pair of factors are calculated and shown in Table 5. The empirical

Table 4. Results of the measurement model.

Factor constructs	Question items	Factor loading	AVE	Composite reliability
PU	Efficiency	0.94***	0.84	0.91
	Rapid speed	0.89***		
PEA	Less time at learning	0.80***	0.69	0.82
	Friendly to operate	0.86***		
PC	Shops that accept it	0.71***	0.57	0.73
	Places for storing	0.80***		
PR	Loss	0.84***	0.66	0.79
	Fraud	0.78***		
SI	Media influence	0.73***	0.51	0.67
	Peer influence	0.69***		
ATT	Good payment	0.86***	0.77	0.87
	Right decision	0.89***		
INT	Often using	0.88***	0.84	0.91
	Part of daily life	0.90***		

***Significant at 1%level of significance.

Table 5. Results of discriminant validity.

	PU	PEU	PC	PR	SI	ATT	INT
PU		0.765*	0.705	0.750	0.67	0.805	0.840
PEU	0.194		0.630	0.675	0.600	0.730	0.765
PC	0.123	0.336		0.615	0.540	0.670	0.705
PR	0.325	0.185	0.116		0.585	0.715	0.750
SI	0.063	0.090	0.068	0.194		0.640	0.670
ATT	0.029	0.130	0.137	0.090	0.476		0.805
INT	0.008	0.026	0.303	0.029	0.040	0.152	

*The upper level denotes the average AVE while the lower lever denotes the squared correlations for every pair.

results in Table 5 reveal that all average AVE for each pair of factors is greater than the squared correlation for the same pairs, indicating that each factor is a distinct construct. Path coefficients and standardized total effects of exogenous latent variables on endogenous latent variables are used to assess whether the suggested path relationships are substantiated. Table 6 offers the results of the structural equation model. Table 7 summarizes the direct effect, indirect effect, and total effect among factors. In addition, Figure 2 shows the whole structural equation model. The findings support that perceived usefulness has a significantly direct and positive effect on usage attitude at 0.29, implying that Hypothesis 1 cannot be rejected. Perceived usefulness also has a direct and positive statistically significant effect on behavioral intention at 0.11. However, the effect of perceived usefulness on behavioral intention is less than the recommended value of 0.2 for meaningful standardized paths (Chin, 1998), implying that there exist no strong evidence for supporting Hypothesis 2. This may be because electronic cash stored-value cards are concerned with money; consumers are more cautious with them, and hence reveal less intention. The phenomenon is consis-tent with the wireless finance study of Kleijnen et al. (2004), which also reveals that the direct effect of perceived usefulness on behavioral intention is insignificant. Nevertheless, these

Table 6. Results of the structural model.

Path relationships	Path coefficients	Measure errors	t-value	Hypotheses
PU → ATT	0.29	0.06	4.42***	Acceptance
PU → INT	0.11	0.05	2.10**	Acceptance
PEU → PU	0.57	0.06	10.10***	Acceptance
PEU → ATT	0.21	0.08	2.80***	Acceptance
PC → ATT	0.07	0.11	0.66	Rejection
PR → ATT	-0.30	0.09	-3.34***	Acceptance
SI → INT	0.47	0.05	9.71***	Acceptance
ATT → INT	0.46	0.05	8.62***	Acceptance

, * Significant at 5% and 1%levels of significance, respectively.

Table 7. Direct, indirect, and total effects.

Factors	Effect	PU	ATT	INT
	Direct effect		0.29	0.11
PU	Indirect effect			0.13
	Total effect		0.29	0.24
	Direct effect	0.57	0.21	
PEU	Indirect effect		0.17	0.24
	Total effect	0.57	0.38	0.24
	Direct effect		-0.3	
PR	Indirect effect			-0.14
	Total effect		-0.3	-0.14
	Direct effect			0.47
SI	Indirect effect			
	Total effect			0.47
	Direct effect			0.46
ATT	Indirect effect			
	Total effect			0.46

results indicate that consumers might accept electronic cash stored-value cards for micro payment if they feel that these cards are helpful for improving the transaction process. Perceived ease-of-use has a significantly direct and positive effect on perceived usefulness at 0.57 and a significantly direct and positive effect on usage attitude at 0.21, implying that Hypotheses 3 and 4 cannot be rejected. These results indicate that an easily manipulating way will help consumers to understand the merits of electronic cash stored-value cards and further increase consumers' acceptance. In addition, the significantly direct and positive effect of usage attitude on behavioral intention at 0.46 reveals that Hypothesis 8 cannot be rejected. This result indicates that if consumers strongly feel that electronic cash stored-value cards are good, ideal payment instruments with an efficient process and are easy to use, the acceptance of electronic cash stored-value cards will increase. This result is consistent with the suggestions of the original TAM.

Perceived usefulness has a total effect on usage attitude at 0.29 and a total effect on behavioral intention at 0.24, which are shown in Table 7.Perceived ease-of-use has a total effect on usage attitude at0.38 and a total effect on behavioral intention at0.24. Therefore, the total effect of perceived ease-of-use on usage attitude is stronger than that of perceived usefulness on usage attitude. This implies that an easy operation is more important than an efficient process for strengthening consumers' usage attitude towards electronic cash stored-value cards. This seems to be reasonable, because consumers cannot judge the merits of a new payment if it is not easy to use. However, usefulness is as important as the ease-of-use for consumers' behavioral intention.

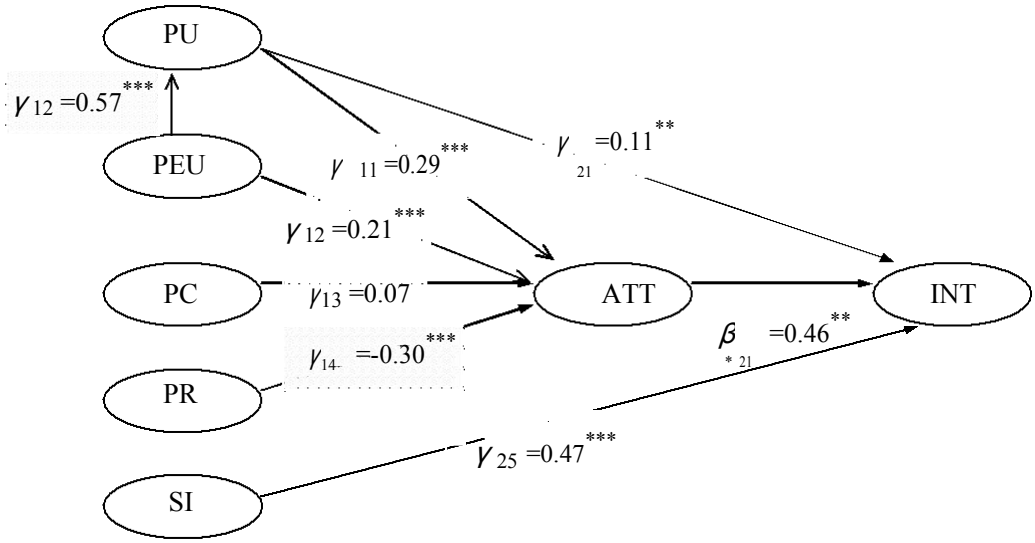

Figure 2. The results of SEM model.

Perceived cost exhibits an insignificant relationship with usage attitude, revealing that it does not seem to be an important factor influencing consumer's acceptance of electronic cash stored-value cards, which is consistent with the study of Kleijnen et al. (2004) in wireless finance. This might be in relation to the prevalence of ATM. Consumers are charged a fee when drawing deposits through an ATM owned by other banks. Moreover, consumers are also required to pay a fee for transferring deposits by ATM. Therefore, most consumers get used to paying a fee for using an electronic payment system, and the relevant costs of using electronic cash stored-value cards do not seem to be an important element for consumers' usage attitude.

Perceived risk has a significantly direct and negative effect on usage attitude at -0.3, which is consistent with the study of Kleijnen et al. (2004) on wireless finance. The total effect of perceived risk on behavioral intention is -0.14, implying that consumers are anxious about the risks generated by a new electronic payment system. Social influence has a significantly direct and positive effect on behavioral intention at 0.47, which indicates that consumers are easily influenced by surroundings. This result shows that news reports, advertising, and peer influence seem to be important elements affecting consumers' acceptance of electronic cash stored-value cards.

Moderating effects

Seven hundred and sixteen respondents are classified into younger and older groups with the threshold of a 25-year-old.The samples are also separated into experienced and inexperienced groups with a similar experience of stored-value cards. For executing the moderating effect analysis, the SEM analysis is carried out for each group. The empirical results reveal that the model-data fits are as follows: X^2/d.f =2.25 and RMSEA=0.048 in the younger group, X^2/d.f =1.30 and RMSEA=0.043 in the older group, X^2/d.f =1.47 and RMSEA=0.033 in the experienced group and X^2/d. f =1.96 and RMSEA=0.059 in the inexperienced group. Basically, these diagnostic statistics indicate that there exist appropriate data-model fits in this study.

Table 8 presents the path relationships for the older and younger groups. Using the independent-sample t-test, each pair of path coefficients is tested for significance (Kleiknen et al. 2004). The results reveal that Hypothesis 9 could not be rejected completely. The findings show that perceived usefulness and perceived risk are more important factors influencing usage attitude toward electronic cash stored-value cards in the older group than in the younger group. In addition, the effect of perceived usefulness on behavioral intention is stronger in the older group than in the younger group.

All the results imply that older consumers might have stronger usage attitude and behavioral intention if they feel electronic cash stored-value cards have more usefulness and less risk. Therefore, issuing institutions should emphasize the usefulness and security of electronic cash stored-value cards to their older consumers. The moderating results also show that younger consumers are more easily affected by surroundings than older consumers. This implies that issuing institutions could use media, advertising, and peer influence to attract younger consumers' attention and then strengthen their acceptance of electronic cash stored-value cards. Since both effects of perceived cost on usage attitude for the older and younger groups are insignificant, the difference between these two groups cannot be judged.

Table 9 shows the path relationships for the experienced and inexperienced groups. The results also

Table 8. Moderating effects for age.

Path relationship	Coefficient		t-value	Hypothesis
	Older(>25) N=166	Younger(<25) N=550		
PU → ATT	0.41***	0.24***	20.42***	Acceptance
PU → INT	0.18**	0.09	14.91***	Acceptance
PEU → ATT	0.22	0.23**	-1.09	Rejection
PC → ATT	0.20	0.08	--	--
PR → ATT	-0.49**	-0.28**	-18.72***	Acceptance
SI → INT	0.38***	0.51***	-25.05***	Acceptance
ATT → INT	0.35***	0.46***	35.40***	Acceptance

, *: Significant at 5% and 1% levels of significance, respectively; --: Both coefficients are insignificant.

Table 9. Moderating effects for experience in stored-value cards.

Path relationship	Coefficient		t-value	Hypothesis
	Experienced (N=438)	Inexperienced (N=278)		
PU → ATT	0.32***	0.21**	14.91***	Acceptance
PU → INT	0.03	0.15	--	--
PEU → ATT	0.21	0.20**	1.25	Rejection
PC → ATT	0.07	0.12	--	--
PR → ATT	-0.23	-0.43***	20.06***	Acceptance
SI → INT	0.42***	0.58***	-25.05***	Acceptance
ATT → INT	0.54***	0.35***	35.40***	Acceptance

, *: Significant at 5% and 1% levels of significance, respectively; --: Both coefficients are insignificant.

reveal that Hypothesis 10 cannot be rejected completely. The effect of perceived usefulness on usage attitude is stronger in the experienced group than in the inexperienced group, which indicates that experienced consumers seem to have a stronger usage attitude if they feel the electronic cash stored-value cards can efficiently improve the transaction process. On the other hand, the experienced group is less concerned about the relevant risks of electronic cash stored-value cards, implying that consumers with a good security experience in using stored-value cards might be easy to accept electronic cash stored-value cards. In addition, the findings reveal that the experienced group is less affected by surroundings than the inexperienced group, which is consistent with the older group. As a result, issuing institutions should provide full information with regard to electronic cash stored-value cards to convince the experienced and older consumers. Once the experienced and older consumers feel electronic cash stored-value cards have a higher usefulness and less risk, they might have a stronger usage attitude and behavioral intention.

CONCLUDING REMARKS AND MANAGERIAL IMPLICATIONS

Concluding remarks

Based on TAM, this study employs perceived usefulness, perceived ease-of-use, perceived cost, perceived risk, and social influence to examine whether these factors influence consumers' usage attitude and in turn affect behavioral intention to electronic cash stored-value cards. The results reveal that perceived usefulness and perceived ease-of-use have a significant positive effect on the usage attitude towards electronic cash stored-value cards. In other words, when consumers feel that electronic cash stored-value cards can simplify payment procedures, enhance efficiencies, and be easily learned to manipulate, they might strengthen their usage attitude and behavioral intention. Moreover, if electronic cash stored-value cards are easy to use, then consumers will easily judge the usefulness and in turn strengthen the usage attitude. These results are consistent with the suggestions of the original TAM.

Consumers may not feel that the relevant costs of electronic cash stored-value cards are an important factor influencing their usage attitude. Perhaps, consumers are less concerned about the relevant costs of electronic cash stored-value cards, because they have gotten used to paying a fee for ATM services. Perceived risk is an important factor influencing consumers' usage attitude, implying that they are strongly anxious about the security of electronic cash stored-value cards. Social influence positively affects the behavioral intention, indicating that consumers are easily influenced by peer and media - i.e., consumers consider the issuing institution's image as an

important factor for whether to accept electronic cash stored-value cards.

Electronic cash stored-value cards have been issued in Asia for a while. Few academic studies investigate the factors that influence consumers' acceptance of electronic cash stored-value cards. This study proposes an extended TAM and applies SEM to confirm the factors influencing consumers' acceptance of electronic cash stored-value cards. The results find that perceived usefulness, perceived ease-of-use, perceived risk, and social influence are significant factors as considering the acceptance of electronic cash stored-value cards. These factors also can be applied to investigate the acceptance of other financial technologies such as mobile banking, Internet banking, etc.

Strategic implications

The results of executing the respective SEM analysis indicate that there definitely exist some differences between the older and younger groups, as well as between the experienced and inexperienced groups. Compared to younger consumers, older consumers are mainly concerned about the usefulness and risks of electronic cash stored-value cards. This implies that issuing institutions may need to put forth much effort to convince older consumers to use electronic cash stored-value cards. In addition, consumers with similar experiences of stored-value cards focus more on their usefulness, but are less worried about the risks of electronic cash stored-value cards. This may be because experienced consumers relatively understand the specifications of stored-value cards. As a result, younger consumers are more likely to be convinced of using electronic cash stored-value cards versus older consumers. In addition, since experienced consumers have a clearer judgment, they may be easier to convince than inexperienced consumers. Therefore, issuing institutions may focus on younger and experienced consumers and promote electronic cash stored-value cards more to them.

As previously mentioned, older consumers do not seem to be easily convinced of using electronic cash stored-value cards. However, because of high transaction costs, merchants generally do not like to accept credit cards for retail micro payments. Thus, older consumers are not willing to use credit cards for any micro payment. As a result, there is still a high probability for older consumers to accept electronic cash stored-value cards if issuing institutions can promise the security of the payment system.

Issuing institutions use microwave sensors to increase transaction efficiency, but the most important thing for them is to enhance the number of issued cards and the frequency of usage to achieve network externality. When network externality is achieved, usefulness and easy-to-use are also intensified, while perceived cost is decreased at the same time. Therefore, issuing institutions may link the usage of electronic cash stored-value cards with the activities of daily life, such as traffic, communication, entertainment, etc. Those may be feasible ways to increase the number of issued cards and the frequency of usage. Moreover, combo cards, a card with multi purposes, could be a way to increase the number of issued cards. Depending on their options, consumers can use different payments within a combo card and further increase the frequency of usage.

LIMITATIONS AND DIRECTIONS OF FUTURE RESEARCH

Many improvements can be made in our research. There are some limitations as to the sampling process and limitations on the non-response bias problem in this study. The nonrandom sampling method makes it relatively more difficult to generalize the results obtained from the nonrandom samples. As to the non-response bias issue, significant differences still were found between some of the responses of early and late respondents. Combining the effect of the less than 70% response rate in this study, there still exists the potential problem of the non-response bias preventing the results from being generalizable to the target population.

Although this study has successfully detected the factors influencing consumers' acceptance of electronic cash stored-value cards, a more extended model is probable. In addition to perceived cost and perceived risk, financial regulation (e.g., the ceiling of stored-value) may be an important factor that influences the consumers' acceptance of electronic cash stored-value cards. In fact, when financial institutions consider the applications of financial technologies, financial regulators' attitude is a significant issue. Furthermore, if more merchants accept the payment with electronic cash stored-value cards, consumers would possess higher incentive to use those cards due to the convenience of electronic cash stored-value cards. Future extensions of this study could consider investigating merchants' attitude and intention as well.

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