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Abstract

While online technologies and applications are rapidly and widely utilized and adopted in e-commerce, it is extremely important to better understand the perceptions of consumers' use, and acceptance in mobile commerce (MC). This paper adopts the extended technology acceptance model (TAM2) and integrated it with the innovation diffusion theory and the perceived risk variable to model users' acceptance of using MC. An Empirical study was conducted, the proposed research model was evaluated by structural equation modeling, and then confirmatory factor analysis was applied to test if the empirical data confirmed to the presumed model.

Keywords

Mobile commerce, technology acceptance model, innovation diffusion theory, perceived risk

1. Introduction

The rapid development of modern wireless communication technology, coupled with the increasingly high penetration rate of the Internet, is promoting mobile commerce (MC) as a significant utility and application for both enterprises and consumers in the digital age (Pascoe, Sunderam, Varshney & Loader 2002, Rupp & Smith 2002). The opportunity of MC is opening up. Rupp and Smith (2002) indicated that there will be a billion global wireless device subscribers with 70 percent of all mobile equipment having Net access by 2003. Analysts at Forrester research also predicted that the total further revenue acceleration of worldwide electronic commerce (EC) will reach $6.9 trillion by 2004, of which over $200 billion will be obtained from MC (Barnes 2002, Young 2000).

The advantages of online business, such as efficiency, convenience, broader selections, competitive pricing, rich information and diversity, are well known. Consequently, the advance of modern online commerce, including advertising, shopping, investing, banking, and other online services (e-mail, information seeking, etc.), have made it possible for people to interact with the Internet in their daily lives, and the number of Internet users is also continuing to increased as well.

"Electronic" and "Mobile" are not only to speed up businesses and activities but also to increase profits and revenues. Nevertheless, in the aspect of security concerns, "Electronic" and "Mobile" have fatal weakness for customer privacy and transaction security issues. Although EC has been gradually used in many fields, a number of consumers are still alarmed about personal privacy and transaction security. In addition, limited information is provided to consumers in online commerce. Without physically examining and inspecting the products, some buyers are afraid to trust online transactions. Also, business concerns, privacy protection, security, and a risk free environment are the breakpoints for the popularity of online commerce (Pavlou 2001).

With the accelerative competition of business and the popularity of using Internet and wireless devices, therefore, there is an urgent need to understand the factors that entice consumers to use MC. Comprehending the essentials of what determines consumer use of MC can lead to more effective and significant strategies that will allow these organizations to remain competitive and hold the market. The purpose of this study is going to validate the factors that determine a consumer's use of MC.

The rest of the paper is organized as follows. Section 2 describes the research model and hypotheses. Section 3 presents the research method used in this study. Section 4 analyzes the data and tests the model. The last section concludes with the findings, implications and limitations.

2. Conceptual Model and Research Hypotheses

Mobile commerce is defined as any transactions with a monetary value – either direct or indirect – that is conducted over a wireless telecommunication network (Barnes 2002). Both EC and MC are relative to commerce and refer to information systems (IS) and information technology (IT). System use is an important topic in both IS and IT research which is recognized as an indicator of IS and IT success. The context of business-to-consumer MC is similar to EC; therefore, system use will be defined as engaging in four activities on the wireless network, such as online banking, investing, shopping and services (Eastin 2002). This perception of system use is of great interest to this study, and exploring consumers' psychological and behavioral changes to use MC will be significant.

Pedersen, Methlie and Thorbjornsen (2002) indicated that MC users include consumers, technology users and network members. Network designers, service providers, vendors, and application developers have to cautiously take the variety of users' needs and considerations

into account to attract users to use MC and provide better services. Ott (2000) pointed out that a fundamental obstacle to the growth of EC is the lack of trust that consumers are voicing over doing business online. Three main factors cause apprehension amongst online consumers. They are inexperienced surfers, security and fraud, and privacy. The factors of security and privacy concerns in EC were also pointed out by Chen, Gillenson and Sherrell (2002) and Rock (2000). However, the benefits of online activities, such as greater flexibility, extended market outreach, broader product lines, more convenience, and customization, still lure consumers into using online commerce. Therefore, Chen et al. (2002) indicated that customers needed to be educated about the advantages and risks in online commerce. They also pointed out that most online users are well educated with better financial status.

Davis proposed the TAM that is derived from TRA and has been tested and extended by numerous empirical researches (Davis 1989, Igbaria, Zinatelli, Cragg & Cavaye 1997, Venkatesh & Morris 2000). TRA is a well-established model and has been broadly used to predict and explain any human behavior in various domains (Chen et al. 2002, Legris, Ingham & Collerette 2003). As Davis (1989) addressed, the original TAM model consists of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (ITU), and actual system use (AU). Later researches indicated that the TAM model needed to integrate with further variables since it is not completely consistent with outcomes (Szajna 1996, Karahanna, Straub & Chervany 1999, Legris et al. 2003).

In 2000, Venkatesh and Davis proposed a revised technology acceptance model named TAM2 that includes social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use). The results of their research indicated that perceived usefulness, perceived ease of use, and subjective norm (SN) all indirectly influence actual system use through behavioral intention. In other words, behavioral intention is jointly determined by perceived usefulness, perceived ease of use, and subjective norm. Subjective norm is the direct and significant determinate of perceived usefulness while perceived ease of use has a small but significant impact on PU.

The innovation diffusion theory (IDT) is another well-established theory and has been widely used for relevant IT and IS research (Chen et al. 2002, Eastin 2002, Karahanna et al. 1999, Taylor & Todd 1995). IDT includes five significant innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability; these characteristics attempt to explain the user adoption and decision making process, and to predict the implementation of new technological innovation. In other words, the central concept of IDT is that technological innovation is communicated through particular channels, over time, among the members of a social system. The essential involved stages are as follows: knowledge, persuasion, decision, implementation, and confirmation (Clarke 2003). However, research suggested, “Only relative advantage, compatibility, and complexity were consistently related to innovation adoption (Chen et al. 2002). ” Relative advantage is similar to perceived usefulness, whereas complexity is similar to perceived ease of use. Compatibility means the

degree to which the innovation is perceived to be consistent with potential users' existing values, previous experiences and needs (Karahanna et al. 1999, Sonnenwald et al. 2003).

With the increasingly high penetration rate of Internet applications, people are rightfully anxious about the diverse types of risks present when engaging in online activities or transactions. The definition of perceived risk has changed since on-line activities became popular. In the past, perceived risks of online business were regarded as fraud and product quality. Nowadays, credit ratings, bank balances, and financial data can be changed without their owners' awareness when on-line activities occur. Some users refuse to trust the immature technology, and others usually hesitate before trusting online transactions and various activities. Therefore, the reliability of on-line activities is still far from perfect in every way. That is, cognitive and affective factors are key points and prevent people from trusting online services. Pavlou (2002), defines this as "the consumer's subjective expectation of suffering a loss in pursuit of a desired outcome".

While online technologies and applications are rapidly and widely utilized and adopted, a number of researchers attempt to probe the motivations and facts behind this, as well as strive to find out better solutions to facilitate and promote business. The acceptance and usage of wireless Internet applications means end-users are accepting and using technologies and innovations.

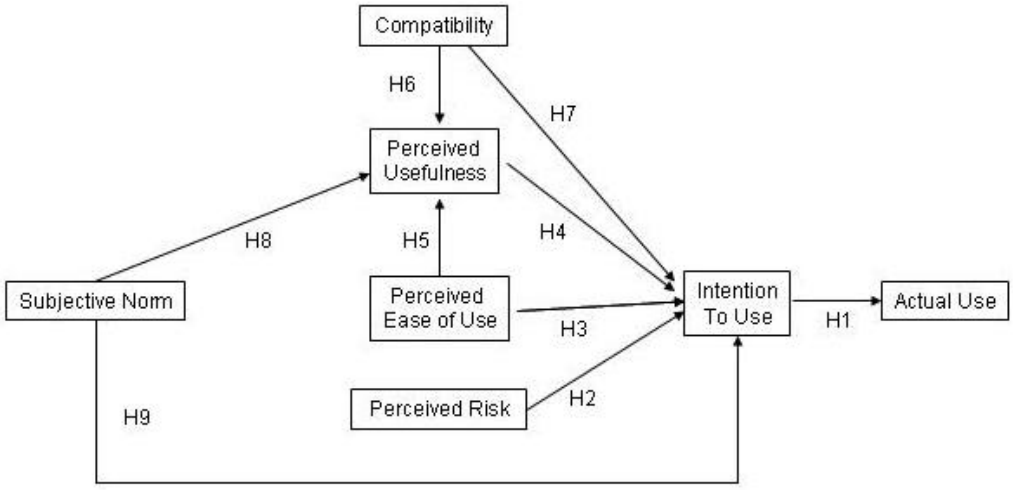


Figure 1. Proposed research model for mobile commerce acceptance

This paper adopts the extended technology acceptance model (TAM2) and integrated it with the IDT and the perceived risk variable to model users' acceptance of using MC. In the revised model as shown in Figure 1, the perceived ease of use, perceived usefulness, intention to use, actual use, subjective norm are adopted from the TAM2, and compatibility is elicited from IDT. Furthermore, an additional external variable, perceived risk is also integrated into the model based on Pavlou (2001). He stated that "Since intentions to use a website for

transactions involve a certain degree of uncertainty, perceived risk is incorporated as a direct antecedent of intentions to transact." The hypotheses based on the proposed model are described as follows:

H1. Intention to use has a direct effect on actual use.

H2. Perceived risk has a negatively direct effect on intention to use.

H3. Perceived ease of use has a direct effect on intention to use.

H4. Perceived usefulness has a direct effect on intention to use.

H5. Perceived ease of use has a direct effect on perceived usefulness.

H6. Compatibility has a direct effect on perceived usefulness.

H7. Compatibility has a direct effect on intention to use.

H8. Subjective norm has a direct effect on perceived usefulness.

H9. Subjective norm has a direct effect on intention to use.

3. Research Methodology

3.1 Measurement Development

To ensure that a comprehensive list of scales was included, the works of previous researchers were reviewed. In our model, measures for perceived usefulness, perceived ease of use, intention to use and actual use were adapted from previous studies on TAM (Chen et al. 2002, Fenech 1998, Pavlou 2001). The construct for perceived risk was adapted from the studies of Pavlou (2001) and Eastin (2002). The scale for compatibility was based on Chen et al. (2002) and Eastin (2002). The construct for subjective norms was based on Venkatesh and Davis (2000) and Venkatesh and Morries (2000). Finally, the questionnaire is composed of 21 items measuring the seven latent variables. Table 1 summarizes the definition of each variable.

The survey questionnaire consisted of two parts. The first part recorded subject's demographic information and the second part recorded subject's perception on each variable in the model. Demographic variables assessed were gender, age, level of education, income level, the frequency of using a cellular phone, and the degree of familiarity with using online services. The second section asked each participant to indicate whether he/she is strongly agrees (SA), agrees (A), neutral (N), disagrees (D), or strongly disagree (SD) with each statement. That is, a five point Likert scale, ranging from –2 to 2, was used to determine individual reactions to the scales.

Once the initial scales had been generated, an iterative process of personal interview (including faculties, doctoral students and graduate students) was conducted to refine the instrument. These interviews enabled the researchers to gauge the clarity of the tasks, to assess whether the instrument was capturing the desired phenomena, and to verify that important aspects had

not been omitted. The process was continued until no further modification to the questionnaire was found.

Construct	Definition	Reference
Perceived usefulness	The degree to which a person believes that engaging in online activities via MC would enhance his or her job performance.	Davis, 1989
Perceived ease of use	The degree to which a person believes that engaging in online activities via MC would be free of effort.	Davis, 1989
Intention to use	The user's likelihood to engage in online activities via MC.	Chen et al., 2002
Actual use	The frequency of using MC and the approximate number of times the user uses MC in a given period of time.	Chen et al., 2002
Compatibility	The degree to which engaging in online activities via MC is consistent with the potential user's existing values and beliefs, previous experiences and current needs.	Eastin, 2002
Subjective norm	A person's perception that most people who are important to him think he should or should not engage in online activities via MC.	Venkatesh & Davis, 2000
Perceived risk	The consumer's subjective expectation of suffering a loss in pursuit of the desired outcome of using MC.	Pavlou, 2001

Table 1. Definition of the variables

Several iterations were therefore conducted. Feedback served as a basis for correcting, refining, and enhancing the experimental scales, some of which were eliminated as they were found to represent essentially the same aspects with only slight wording differences and some were modified because the semantics appeared ambiguous or irrelevant to the characteristics of the MC.

3.2 Subjects

Subjects for this study were the ones who engaged in online activities via MC for personal purposes only, not for business purposes. Hence, a cluster sampling design was more convenient for the large and spread out population. However, convenience bias is a factor of impact on the outcome due to the chosen sample. The subjects are from various domains including online learners, graduate and undergraduate students, and customers of banking, investing, and mobile communication. Totally 544 questionnaires were distributed to individuals from the northern, central, and southern Taiwan, as well as posted on a web server for the 71 online learners who were taking the systems analysis and design course. Two weeks seemed an ideal period to expect most of the questionnaires to be returned. If a questionnaire was overdue more than one week, then follow-up activities were needed to be conducted to track it down either by phone calls or by e-mail.

4. Data analysis and results

4.1 Descriptive statistics

Five hundred and forty-four questionnaires were distributed. We received 340 returned questionnaires. Fifty-nine gave incomplete answers and were dropped. This left 281 for the statistical analysis, a 45.78% valid return rate. Tables 2 and 3 list the subject demographics. The data indicates that the majority of respondents are with a college educational background. Nearly half of the respondents are under the age of 30, with a monthly income over NT$35,000 (approximate US$1014.49 with 1:34.5 exchange rate), and only two do not have cellular phones. Less than one-fifth of respondents are unfamiliar with online activities. Table 3 indicates almost two-thirds of the respondents have online activities experiences, which coincides with the known characteristics of online users.

		Frequency	Percent (%)	Cumulative
Gender	Male	170	60.50	60.50
	Female	111	39.50	100.00
Age	Less than 20	18	6.41	6.41
	20-29	117	41.64	48.04
	30-39	99	35.23	83.27
	40-49	37	13.17	96.44
	Over 50	10	3.56	100.00
Education level	Under senior high school	5	1.78	5.34
	Senior high school	27	9.61	11.39
	College	216	76.87	88.26
	Graduate (or above)	33	11.74	100.00
Monthly income (NT$)	Less than $20000	83	29.54	29.54
	$20,001-$35,000	69	24.56	54.09
	$35,001-$50,000	86	30.60	84.70
	$50,001-$65,000	26	9.25	93.95
	Over NT$65,001	17	6.05	100.00
Use cellular phone	No cellular phone	2	0.71	0.71
	Use only no public phones	4	1.42	2.14
	Use in urgent need	29	10.32	12.46
	Use casually	67	23.84	36.30
	Use for convenience only	95	33.81	70.11
	Use frequently	84	29.89	100.00
Familiar with online activities	Completely unfamiliar	49	17.44	17.44
	Familiar a little	70	24.91	42.35
	Neutral	89	31.67	74.02
	Familiar	56	19.93	93.95
	Very familiar	17	6.05	100.00

Table 2. Demographic attributes of the respondents

	Items	Frequency	Percentage (%)
Online activities	None	97	34.52
	Online banking	55	19.57
	Online shopping	64	22.78
	Online investing	38	13.52
	Online services	146	51.96

Table 3. Online activity experience

4.2 Measurement Model

The proposed research model was evaluated by structural equation modeling (SEM). The data obtained were tested for reliability and validity using confirmatory factor analysis (CFA). This step used to test if the empirical data confirmed to the presumed model. The model includes 21 items describing seven latent constructs: Subjective Norm, compatibility (C), PU, PEOU, perceived risk, intention to use, and AU. The CFA was computed using the LISREL software. The test of the measurement model presented a good fit between the data and the proposed measurement model. For instance, the Chi-square for the measurement model was calculated to be 359.71 (p=0.00) with 175 d.f. X^2/df is 2.06 which is close to two and less than 5 so the model is identified as a good fit to the data based on Joreskog and Sorbom's suggestion (1993). The various goodness-of-fit statistics are indicated in Table 4. GFI 0.89 is very close to 0.9, and RMSEA is slightly greater than the recommended range of acceptability (<0.05-0.08) suggested by MacCallum, Browne and Sugawara (1996). Overall, the results showed that the measurement model is good fit of the data based on the assessment criteria such as RMR, GFI, NFI, NNFI, CFI and RMSEA.

Root Mean Square Residual (RMR) (<0.05)	Goodness of Fit Index (GFI) (>0.9)	Normed Fit Index (NFI) (>0.9)	Non-Normed Fit Index (>0.9)	Comparative Fit Index (>0.9)	Root Mean Square Error of Approximation (RMSEA) (<0.05-0.08)
.042	0.89	0.92	0.95	0.96	0.061

Table 4. Model evaluation measures of the overall fit

The composite reliability was estimated to evaluate the internal consistency of the measurement model. The composite reliabilities of the measures included in the model range from 0.89 to 1.00 (see Table 5), and all are greater than the benchmark of 0.60 recommended by Bagozzi and Yi (1988). This illustrates that all measures have strong and adequate reliability and discriminate validity. As shown in the Table 5, the average variance extracted for all measures are also exceeded 0.5. The completely standardized factor loadings and individual item reliability of observed variables are presented in the Table 6.

Variables	The Composite Reliability (>0.6)	Average Variance Extracted (>0.5)
Subjective Norm	0.93	0.86
Compatibility	0.93	0.82
Risk	0.94	0.79
Perceived Ease of Use	0.92	0.75
Perceived Usefulness	0.92	0.69
Intention to Use	0.89	0.79
Actual Use	1.00	1.00

Table 5. Assessment of the construct reliability

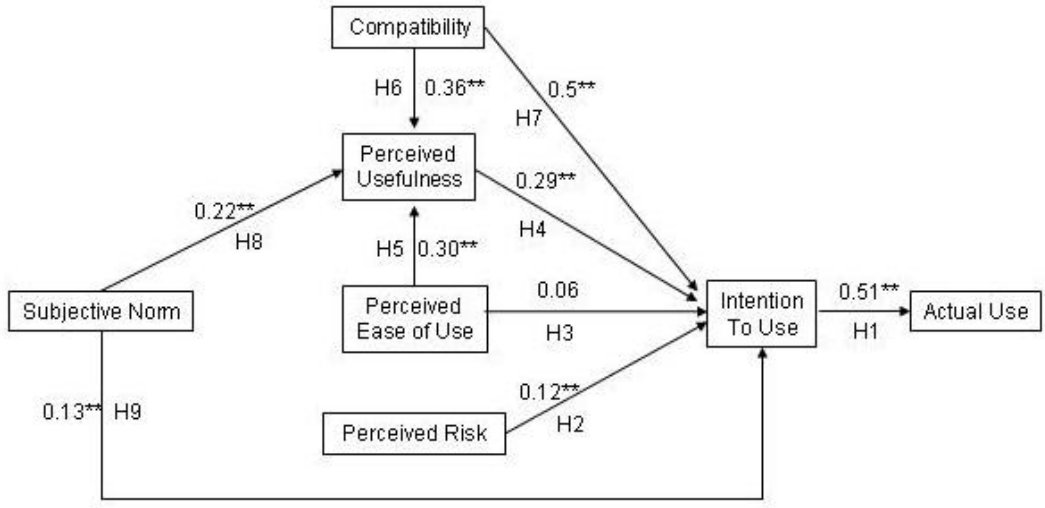
Item	Measure	Factor loading	R^2>0.5
SN1	People who influence my behavior think that I should use MC.	0.91	0.83
SN2	People who are important to me think that I should use MC.	0.94	0.88
C1	Using MC is compatible with most aspects of my online activities.	0.89	0.79
C2	Using MC fits my lifestyle.	0.90	0.81
C3	Using MC fits well with the way I like to engage in online activities.	0.91	0.82
PU1	Using MC would improve my performance in online activities.	0.72	0.52
PU2	Using MC would increase my productivity in online activities.	0.77	0.59
PU3	Using MC would enhance my effectiveness in online activities.	0.81	0.66
PU4	Using MC would make it easier for me to engage in online activities.	0.79	0.62
PU5	I think using MC is very useful for me to engage in online activities	0.83	0.69
PEOU1	I think learning to use MC is easy.	0.82	0.67
PEOU2	I think finding what I want via MC is easy.	0.81	0.66
PEOU3	I think becoming skillful at using MC is easy.	0.85	0.72
PEOU4	I think using MC is easy.	0.86	0.74
RISK1	I think using MC in monetary transactions has potential risk.	0.82	0.67
RISK2	I think using MC in product purchases has potential risk.	0.87	0.76
RISK3	I think using MC in merchandise services has potential risk.	0.85	0.72
RISK4	I think using MC puts my privacy at risk.	0.81	0.66
ITU1	Assuming I had access to MC, I intend to use it.	0.91	0.83
ITU2	Given that I had access to MC, I predict that I would use it.	0.89	0.79
AU	How often do you engage in online activities via MC?	1.00	1.00

Table 6. Standardized factor loadings and individual item reliability

The result shows that the model as a whole explained 26% of the variance ($p<.01$) in MC acceptance, i.e. actual use of MC, 51% of the variance in perceived usefulness of MC, and 71% of the variance in intention to use MC. Figure 2 presents the significant structural

relationship among the research variables and the standardized path coefficients. Most of the hypotheses are strongly supported except for hypothesis 3.

Consistent with hypothesis 1, a customer's intention to use MC has a significant effect on the actual use of MC (â=0.83, p<.01). The perceived risk has a significantly negative direct effect on the intention to use MC (H2: ã=0.16, p<.01), it also has a negative indirect effect on actual use of MC. The effect of perceived ease of use on intention to use MC is not significantly. However, it does have a significant indirect effect on both the intention to use and the actual use through perceived usefulness of MC. The data also shows that perceived usefulness is significantly directly influencing the intention to use (H4: â=0.41, p<.01) and indirectly influencing actual use. In addition, the results also support that perceived ease of use has a significantly positive direct effect on perceived usefulness of MC (H5: ã=0.28, p<.01). The data confirms that the compatibility is positively and directly influencing both perceived usefulness (ã=0.36, p<.01) and intention to use (ã=0.5, p<.01). The result also indicates that compatibility has indirect effects on both intention to use through perceived usefulness, and actual use through intention to use. Finally, the outcomes demonstrate that the subjective norm has significantly direct effects on perceived usefulness (H8: ã=0.22, p<.01) and the intention to use (H9: ã=0.13, p<.01) while it has indirect effects on intention to use and actual use.



*: p<.05 **: p<.01

Figure 2. The empirical results of this study

5. Conclusion and Implications

This study proposed a revised TAM by integrating the perceived risk with TAM2 and IDT to validate user perception and the acceptance factors for MC in Taiwan. Table 2 shows that cellular phones are very popular in Taiwan. Only two respondents have no cellular phones, and the most significant reason of using a cellular phone is "for convenience only". This will

positively contribute to the potential market for the new domain of MC. The data indicates while 99.29% of respondents have cellular phones, only 25.98% of the respondents are familiar or very familiar with online activities. This may imply that the majority of cellular phone users do not know how to use MC. MC providers should emphasize the benefits and the implication of the using MC or educate and motivate their customers to use it.

The results for the model are summarized as follows:

(1) Perceived risk is integrated with the two theories (i.e.TAM2 and IDT) to predict user acceptance, which has a significant indirect effect on the actual use of MC through the mediator, intention to use.

(2) Potential user adoption and use of MC can be predicted adequately from users' intentions, which are significantly decided by subjective norm, compatibility, perceived usefulness, and perceived risk.

(3) Compatibility has the most important effect on intention to use and has the second important effect on the actual use of MC.

(4) Perceived risk has a significantly negative direct impact on intention to use as well as a strongly negative indirect effect on the actual use of MC.

(5) Perceived ease of use does not directly influence the intention to use but indirectly affects intention to use through the perceived usefulness.

The results show that perceived usefulness, perceived ease of use, and subjective norm all indirectly influence the actual usage of MC through the intention to use which is consistent with Venkatesh and Davis (2000). The key determinant of intention to use is compatibility, which is consistent with the EC research (e.g., Chen et. el. 2002). This suggests that MC providers and managers should improve their compatibility with various user requirements, past experiences, lifestyles, perceived usefulness, and beliefs to fulfill customer expectations.

Limited understanding of customers' urgent demands and lack of technological infrastructure will be the impediments of MC's success. Some frustrating experiences, such as slow connections, poor quality, out-of-date content, missing links, and errors, have infuriated online users. Unfortunately, consumers have to pay for all these. Some researchers suggested that MC providers needed to figure out some solutions to soak up the costs to entice present and new customers to access portals anytime they need to (Rupp & Smith 2002, Young 2000); otherwise, MC will not thrive because users can still obtain the same information or results through alternative solutions with easier, cheaper, and quicker methods (Rock 2000).

On the other hand, problems of privacy and security are less than satisfactory and still have to be overcome for using MC to be brought into vogue. Despite the fact of most consumers are very concerned about various risks including transaction security, merchant information, products, online privacy and personal data, these kinds of problems are often ignored by online businesses. As the implications of this study suggested, the higher perceived risk involved in mobile commerce will lead to a lower rate of intention to use, which will result in

the lower usage of MC. To fulfill customer expectations and relieve their anxieties, MC merchants can provide a detailed explanation to customers about product delivery, return or exchange, order tracking, and payment methods.

Although this study provides interesting insights into the factors affecting intention to use MC, it has some limitations. First, the popularity of MC is still in its infancy in Taiwan so the types of MC application are limited. Insufficient understanding of MC will lead to lower intention to use it. Second, although a cluster sampling design was more convenient for the large and spread out population, convenience bias is a factor of impact on the outcome due to the chosen sample. Several issues deemed worthy of further study were mentioned in the body of this paper. For instance, does the MC introduction stage affect the MC acceptance? Does MC sophistication affect the significance of the relationships in the model?

References

Bagozzi, RP, Yi, Y (1988), On the evaluation of structural equation models, Journal of Academy of marketing Science, vol. 16, no. 1, pp. 74-94.

Barnes, SJ (2002), The mobile commerce value chain: analysis and future developments, International Journal of Information Management, vol. 22, no. 2, pp. 91-108.

Chen, LD, Gillenson, ML & Sherrell, DL (2002), Enticing online consumers: an extended technology acceptance perspective, Information & Management, vol. 39, no. 8, pp. 705-719.

Clarke, R, A Primer in Diffusion of Innovation Theory, viewed 02 January 2003, <http://www.anu.edu.au/people/Roger.Clarke/SOS/InnDiff.html>.

Davis, FD (1989), Perceived usefulness, perceived ease of use, and user acceptance of information technologies, MIS Quarterly, vol. 13, no.3, pp. 319-340.

Eastin, MS (2002), Diffusion of e-commerce: an analysis of the adoption of four e-commerce activities, Telematics and Informatics, vol.19, no. 3, August, pp.251-267

Fenech, T (1998), Using perceived ease of use and perceived usefulness to predict acceptance of the World Wide Web, Computer Network and ISDN Systems, vol. 30, pp.629-630.

Igbaria, M, Zinatelli, N, Cragg, P & Cavaye, A (1997), Personal computing acceptance factors in small firms: a structural equation model, MIS Quarterly, September, pp. 279-302.

Joreskog, KG., Sorbom, D (1993), LISREL 8: Structural equation modeling with the SIMPLIS command language, NJ: Hove and Londor.

Karahanna, E, Straub, DW & Chervany, NL (1999), Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs, MIS Quarterly, vol. 23, no. 2, pp. 183-213.

Legris, P, Ingham, J & Collerette, P (2003), Why do people use information technology? A

critical review of the technology acceptance model, Information & Management, vol. 40, no. 3, pp.191-204.

MacCallum, RC, Browne, MW & Sugawara, HW (1996), Power analysis and determination of sample size for covariance structure modeling, Psychological Methods, vol. 1, pp.130-149.

MacCallum, RC, Browne, MW & Sugawara, HW (1996), Power analysis and determination of sample size for covariance structure modeling, Psychological Methods, vol. 1, pp.130-149.

Ott, R (2000), Building trust online, Computer Fraud & Security, issue 2, pp. 10-12.

Pascoe, JS, Sunderam, VS, Varshney, U & Loader, RJ (2002), Middleware enhancements for metropolitan area wireless Internet access, Future Generation Computer Systems, vol. 18, no. 5, pp. 721-735

Pavlou, PA (2001), Integrating trust in electronic commerce with the technology acceptance model: model development and validation, Seventh Americas Conference on Information Systems, pp.816-822.

Pavlou, PA (2001), What drives electronic commerce? A theory of planned behavior perspective, viewed 18 Dec. 2002, <http://www-scf.usc.edu/~pavlou/14794.pdf>.

Pedersen, PE, Methlie, LB & Thorbjornsen, H (2002), Understanding mobile commerce end-user adoption: a triangulation perspective and suggestions for an exploratory service evaluation framework, in Proceedings of the 35th Hawaii International Conference on System Sciences.

Rock, J (2000), Mobile Commerce: The Next Big Thing or Just Plain Hype, The Weekly Corporate Growth Report, issue 1121, 18 Dec., pp.11093 & 11104

Rupp, WT, Smith, AD (2002), Mobile commerce: New revenue machine or black hole? Business Horizons, July-August, pp.26-29

Sonnenwald, DH, Maglaughlin, KL & Whitton, MC, Using innovation diffusion theory to guide collaboration technology evaluation: work in progress, viewed 01 Jan. 2003, <http://www.ils.unc.edu/sonnewald/wetice-2001.pdf>.

Szajna, B (1996), Empirical evaluation of the revised technology acceptance model, Management Science, vol. 42, no. 1, pp.85-92.

Taylor, S, Todd, P (1995), Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions, International Journal of Research in Marketing, vol. 12, pp.137-155.

Venkatesh, V, Davis, FD (2000), A theoretical extension of the technology acceptance model: four longitudeinal field studies, Management Science, vol. 46, no. 2, pp.186-204.

Venkatesh, V, Morris, MG (2000), why do not men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior, MIS Quarterly, vol. 24, no. 1, pp.115-139.

Young, D (2000), Handicapping M-commerce, Wireless Review, 01 Aug., viewed 01 Jan. 2003, <http://wirelessreview.com/ar/wireless_handicapping_mcommerce/index.htm>.