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What drives mobile commerce? An empirical evaluation of the revised technology acceptance model

Jen-Her Wu[a,b,*], Shu-Ching Wang[a,c]

[a]*Department of Information Management, National Sun Yat-sen University, Kaohsiung 804, Taiwan*
[b]*Institute of Health Care Management, National Sun Yat-sen University, Kaohsiung 804, Taiwan*
[c]*Department of Information Management, National Kaohsiung Marine University, Kaohsiung 811, Taiwan*

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Abstract

This study presents an extended technology acceptance model (TAM) that integrates innovation diffusion theory, perceived risk and cost into the TAM to investigate what determines user mobile commerce (MC) acceptance. The proposed model was empirically tested using data collected from a survey of MC consumers. The structural equation modeling technique was used to evaluate the causal model and confirmatory factor analysis was performed to examine the reliability and validity of the measurement model. Our findings indicated that all variables except perceived ease of use significantly affected users' behavioral intent. Among them, the compatibility had the most significant influence. Furthermore, a striking, and somewhat puzzling finding was the positive influence of perceived risk on behavioral intention to use. The implication of this work to both researchers and practitioners is discussed.

Keywords: Mobile commerce; Technology acceptance model; Innovation diffusion theory; Perceived risk; Cost

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 application for both enterprises and consumers [25,33]. According to the MC statistics indicated at ePaynews.com [12], only 16% of 533 million Internet users were global wireless Internet users in the year 2001; however, the percentage will soar to 57% of 1460 million Internet users in 2007. In addition, the total revenue from global online trade will reach $12.8 trillion by the year 2006, as predicted by Sharrard et al. [35]. Of this amount, over $230 billion will be obtained from MC [24]. Nevertheless, insufficient user acceptance has long been an obstacle to the successful adoption of new information systems

* Corresponding author. Tel.: +886 7 525 2000; fax: +886 7 525 4799.

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(IS) and information technologies (IT). While mobile technologies and applications are rapidly and widely developed for MC; it is extremely important to understand consumer MC perceptions and acceptance.

The advantages of using Internet EC, efficiency, convenience, broader selections, competitive pricing, rich information, and diversity are well known. Consequently, the advances in modern Internet EC, 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. The number of Internet users has therefore continued to increase. Such Internet use will facilitate MC development and applications. As with ''Electronic'' business, ''Mobile'' business will experience increased transactions and probably increase profits and revenues. Yet, limited understanding of the customers' urgent demands and lack of technological infrastructure will be impediments to MC success. From the consumer perspective, the cost concern [29] is typically one of the most important issues in MC usage. As Chen and Hitt [7] stressed, when switching to different products or online services, consumers must deal with non-negligible costs. High cost will be one of essential factors considered by consumers when deciding whether to use MC.

Furthermore, Internet EC has fatal consumer privacy weaknesses and issues involving monetary transactions, product purchases and merchandise services [26]. Although Internet EC has gradually come into use in many fields, a number of users are still alarmed about personal privacy and transaction security. These issues will have a similar impact on MC, because of the similar commerce mechanism. Limited and insufficient information is provided to MC users owing to the constraints of mobile terminals, mobile networks, and content. Without physically examining and inspecting the products, consumers will perceive potential risks [48]. Thus, business concerns, privacy protection, security, and a risk free environment are the breakpoints for MC popularity.

With accelerated business competition and the popularity of Internet and mobile device use, there is an urgent need to understand the factors that would entice users to use MC. Comprehending the essentials of what determines user MC acceptance can provide great management insight into developing effective strategies that will allow enterprises to remain competitive and hold their market. Hence, we adopted the extended technology acceptance model (TAM2), integrated it with the innovation diffusion theory (IDT), perceived risk, and cost and validated the factors that determine consumer MC acceptance.

2. Basic concepts, research model and hypotheses

Here, MC refers to any transactions, either direct or indirect, with a monetary value implemented via a wireless telecommunication network [4]. Hence, network designers, service providers, vendors and application developers must cautiously take the needs and considerations of various users into account to provide better services and attract them to MC [28]. System use is recognized as a good indicator of IS and IT success; therefore, system use (i.e., MC use) is defined to be in the context of business-to-consumer (B2C) MC and involves engaging in transactions on a wireless network. Such transactions include mobile banking, investing, shopping, and services [11]. The acceptance and usage of MC mean that consumers embrace the new technology innovations. The relative constructs include behavior prediction, user acceptance, and innovation adoption.

2.1. Technology acceptance model

The theory of reasoned action (TRA), proposed by Fishbein and Ajzen [14], is a well-established model that has been used broadly to predict and explain human behavior in various domains [6]. Davis proposed a TAM derived from TRA; it has been tested and extended in [10,17,47]. The original TAM consisted of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (BI), and actual system use (AU). PU and PEOU are the two most important determinants for system use. The ATU directly predicts users' BI which determines AU.

Many researchers suggested that TAM needed to be given additional variables to provide an even stronger model [21]. Venkatesh and Davis [46] proposed an extension, TAM2, which included social influence processes (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance,

output quality, result demonstrability, and PEOU), but it omitted ATU due to weak predictors of either BI or AU. This is consistent with the prior research finding by Taylor and Todd [41,42]. Their research indicated that both social influence processes and cognitive instrumental processes significantly influenced user acceptance and that PU and PEOU indirectly influenced AU through BI. Based on this, the following hypotheses are proposed.

H1. Behavioral intention to use has a direct effect on actual use.

H2a. Perceived ease of use has a direct effect on behavioral intention to use.

H2b. Perceived ease of use has a direct effect on perceived usefulness.

H3. Perceived usefulness has a direct effect on behavioral intention to use.

2.2. IDT and TAM2

IDT is another well-known theory proposed by Rogers [31,32]. In recent decades, IDT has been widely used for relevant IT and IS researches [19,40]. IDT includes five significant innovation characteristics: relative advantage, compatibility, complexity, trial ability, and observables. These characteristics are used to explain the user adoption and decision making process. They are also used to predict the implementation of new technological innovations and clarify how these variables interact with one another. The central concept of innovation diffusion is "the process in which an innovation is communicated through certain channels, over time, among the members of a social system."

However, research has suggested that only the relative advantage, compatibility, and complexity are consistently related to innovation adoption [1]. Relative advantage is similar to perceived usefulness, whereas complexity is similar to perceived ease of use. Compatibility is the degree to which the innovation is perceived to be consistent with the potential users' existing values, previous experiences, and needs [36]. High compatibility will lead to preferable adoption.

TAM and IDT are extremely similar in some constructs and supplement one another. Some researchers indicated that the constructs employed in TAM are fundamentally a subset of the perceived innovation characteristics and, if integrated, could provide an even stronger model than either standing alone. For example, Chen et al. combined the original TAM with the compatibility construct of IDT to evaluate and explain consumer behavior in the virtual store context. Therefore, the following hypotheses are proposed.

H4a. Compatibility has a direct effect on perceived usefulness.

H4b. Compatibility has a direct effect on behavioral intention to use.

2.3. Cost and perceived risk

Much research also indicated that TAM needed integration with additional variables in order to improve its prediction of system use [37,22]. According to behavioral decision theory, the cost-benefit pattern is significant to both perceived usefulness and ease of use. As Chen and Hitt and Plouffe et al. pointed out, consumers must deal with non-negligible costs in switching between different brands of products or relative services in various markets. Transitioning from wired EC to MC implies some additional expenses. Equipment costs, access cost, and transaction fees are three important components [9] that make MC use more expensive than wired EC.

Furthermore, frustrating experiences, such as slow connections, poor quality, out-of-date content, missing links, and errors have infuriated online users. Unfortunately, consumers must pay for all these frustrations. Some researchers suggested that MC providers should find solutions that reduce the costs and entice present and new customers to access portals anytime, from anywhere [49]. Undoubtedly, the anticipation is that these early investments will lead to a long-term stream of profits from loyal customers, and that this will make up for the expense. Otherwise, MC will not thrive because users can obtain the same information or results through alternative solutions [30]. Hence, the adoption cost is essential in MC settings and the following hypothesis is proposed:

H5. Cost has a negative direct effect on behavioral intention to use.

With the increasingly high penetration rate of Internet applications, people are anxious about the

diverse types of risks presented when engaging in online activities or transactions. When customers are uncertain about product quality, brands and online services they may worry about an unjustifiable delay in product delivery, providing payment without receiving the product and other illegal activities and fraud [2]. The theory of perceived risk has been applied to explain consumer's behavior in decision making since the 1960s [39]. The definition of perceived risk has changed since online transactions became popular. In the past, perceived risks were primarily regarded as fraud and product quality. Today, perceived risk refers to certain types of financial, product performance, social, psychological, physical, or time risks when consumers make transactions online [5,15].

Credit ratings, bank balances and financial data could be changed without the owner knowing during online transactions. Some users perceive potential risks from immature technology. Others hesitate before trusting online transactions and other activities. The reliability of online transactions is still far from perfect. Cognitive and affective factors are important variables that prevent people from trusting online services. Pavlou [27] defines this as "the user's subjective expectation of suffering a loss in pursuit of a desired outcome." Other research also indicated that perceived risk is an important determinant of consumers' attitude toward online transactions [8]. Since intention to use a website for transactions involves a certain degree of uncertainty, perceived risk is incorporated as a direct antecedent of behavioral intention to use. Therefore, the following hypothesis is proposed:

H6. Perceived risk has a negative direct effect on behavioral intention to use.

2.4. Research model

Based on these arguments, our study integrated TAM2 with IDT and two additional variables (cost and perceived risk) to model user acceptance in the B2C MC context. The constructs of perceived ease of use, perceived usefulness, behavioral intention to use, and actual use were adopted from TAM2. Compatibility was elicited from IDT. Two other external variables, cost and perceived risk, were also integrated into the model, as depicted in Fig. 1.

3. Research methodology

3.1. Measurement development

Previous research was reviewed to ensure that a comprehensive list of measures were included. Those for perceived usefulness, perceived ease of use, behavioral intention to use and actual use were adapted in our model from previous studies on TAM (e.g., [13]). The construct for perceived risk was adapted from the studies of Pavlou and Eastin. The scales for compatibility were based on Chen et al. and Eastin. The measures for cost were captured using three items derived from Constantinides, Rupp and Smith, and real world experience.

The survey questionnaire consisted of two parts. The first recorded the subject's demographic information. The second recorded the subject's perception of each variable in the model. The demographic variables assessed were gender, age, level of education, income level, frequency of using a cellular phone and the degree of familiarity with using online services. The second section asked each subject to indicate his or her degree of agreement with each item. Data were collected using a five point Likert-type scale, where −2 indicated strongly disagree; −1 showed disagreement to some extent; 0 stood for uncertain; 1 was for agree to some extent; and 2 indicated strong agreement.

Once the initial questionnaire was generated, an iterative personal interview process (including faculty,

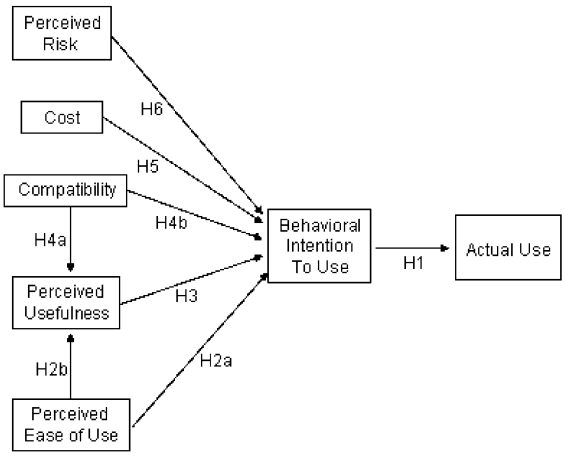

Fig. 1. Proposed research model for mobile commerce acceptance.

doctoral students, and graduate students) was conducted to refine the instrument. These interviews enabled the researchers to gauge the clarity of the tasks, assess whether the instrument was capturing the desired phenomena, and verify that important aspects had not been omitted. Changes were made and several iterations were conducted; the process was continued until no further modification was needed. Feedback served as a basis for correcting, refining and enhancing the experimental scales. Some scales were eliminated, because they were found to represent essentially the same aspects as others with only slight wording differences. Some scales were modified because the semantics appeared ambiguous or irrelevant to MC characteristics. The questionnaire consisted of 22 items measuring the seven latent variables. Table 1 summarizes the definitions of the variable.

3.2. Subjects

Data for this study were collected from the B2C MC context, where users invoked one of four general online transactions: online banking, shopping, investing, and online services. This context included four major private wireless telecommunication-service providers, two leading domestic banks, and two well-known securities investment companies in Taiwan. We sent out 850 questionnaires to customers through the companies' customer service departments and also posted the questionnaire on a university web server for online learners. The subjects for this study were users or potential adopters who voluntarily engaged in online transactions via MC for personal purpose, i.e., not for business. Two weeks seemed a reasonable period to expect most of the material to be returned. To increase the response rate, if a questionnaire was overdue by more than one week, follow-up activities were conducted by phone or e-mail. Two weeks after the follow-up activities, a reminder postcard was sent to any individual who had still not responded. The customers felt that there was no reduction in their privacy by us disclosing the results.

4. Data analysis and results

4.1. Descriptive statistics

Three hundred and seventy-three returned questionnaires were received after the follow-up activities. Sixty-three participants gave incomplete answers and their results were dropped from the study. This left 310 sets of data for statistical analysis, a 36.7% valid return rate.

We were interested in demonstrating that the responses received were representative of the population studied. A multivariate analysis of variance was therefore undertaken to determine whether differences in response time (early versus late) were associated with different response profiles. The results indicated no significant difference in any of the variables of interest. Tables 2 and 3 list the sample demographics. The data indicates that the majority of the respondents had a college education. Seventy-six percent of them

Table 1
Definition of the variables

Construct	Definition	Reference
Perceived risk	The user's subjective expectation of suffering a loss in pursuit of the desired outcome of using MC.	[26]
Cost	The possible expenses of using MC, i.e., equipments costs, access cost, and transaction fees.	[9,33]
Compatibility (C)	The degree to which engaging in online transactions via MC is perceived as being consistent with the potential user's existing values, beliefs, previous experiences and current needs.	[31,32]
Perceived usefulness (PU)	The degree to which a person believes that engaging in online transactions via MC would enhance his or her performance.	[10]
Perceived ease of use (PEOU)	The degree to which a person believes that engaging in online transactions via MC would be free of effort.	[10]
Behavioral intention to use (BI)	The user's likelihood to engage in online transactions via MC.	[6]
Actual use (AU)	The frequency of using MC and the approximate number of times the user uses MC in a given period of time.	[6]

Table 2
Demographic attributes of the respondents

	Frequency	Percent (%)	Cumulative
Gender			
Male	193	62.26	62.26
Female	117	37.74	100.00
Age			
Less than 20	18	5.81	5.81
20–29	118	38.06	43.87
30–39	118	38.06	81.94
40–49	46	14.84	96.77
Over 50	10	3.23	100.00
Education level			
Under senior high school	5	1.61	4.84
Senior high school	27	8.71	10.32
College	228	73.55	83.87
Graduate (or above)	50	16.13	100.00
Monthly income (NT$)			
Less than 20,000	85	27.42	27.42
20,001–35,000	71	22.90	50.32
35,001–50,000	93	30.00	80.32
50,001–65,000	30	9.68	90.00
Over 65,001	31	10.00	100.00
Use cellular phone			
No cellular phone	3	0.97	0.97
Use only no public phones	5	1.61	2.58
Use in urgent need	31	10.00	12.58
Use casually	70	22.58	35.16
Use for convenience only	104	33.55	68.71
Use frequently	97	31.29	100.00
Familiar with online transactions			
Completely unfamiliar	52	16.77	16.77
Familiar a little	79	25.48	42.26
Neutral	96	30.97	73.23
Familiar	64	20.65	93.87
Very familiar	19	6.13	100.00

were between the ages of 20–39. Nearly half had a monthly income over NT$ 35,000 (approximately US$ 1014 at a 1:34.5 exchange rate). Only three respondents did not own cellular phones. About one-sixth of the respondents were unfamiliar with online activities. Table 3 indicates that more than three-fifths of the respondents had online transaction experience. These findings coincide with known profiles of online users. For example, in contrast to Internet browsers aged 11–20, online consumers tend to be older, well educated and have higher level incomes; furthermore, prior research (e.g., [16]) indicated that users are more comfortable accepting new technology innovations when they have prior related experience.

4.2. Measurement model

The proposed research model was evaluated using structural equation modeling (SEM). The data obtained were tested for reliability and validity using confirmatory factor analysis (CFA). This step was used to test if the empirical data conformed to the presumed model. The model included 22 items describing seven latent constructs: perceived risk, cost, compatibility, perceived usefulness, perceived ease of use, behavioral intention to use and actual use. The CFA was computed using the LISREL software. The measurement model test presented a good fit between the data and the proposed measurement model. For instance, the chi-square/degrees of freedom (390/196) were used because of the inherent difficulty with sample size. The χ^2/d.f. value was 1.99, slightly less than Joreskog and Sorbom's suggestion [18] between two and five. The model has a good fit to the data, based on this suggestion. The various goodness-of-fit statistics are shown in Table 4. A GFI is 0.9. RMSEA was slightly greater than the

Table 3
Online transaction experience

Items	Frequency	Percent (%)	Cumulative
None	107	24.15	24.15
Online banking	61	13.77	37.92
Online shopping	72	16.25	54.17
Online investing	43	9.71	63.88
Online services	160	36.12	100.00

Note: Respondents were allowed to choose more than one items in the category.

Table 4
Model evaluation overall fit measurement

Measure	Value
Root mean square residual (RMR) (<0.05)	0.04
Goodness of fit index (GFI) (>0.9)	0.90
Normed fit index (NFI) (>0.9)	0.92
Non-normed fit index (>0.9)	0.95
Comparative fit index (>0.9)	0.96
Root mean square error of approximation (RMSEA) (<0.05–0.08)	0.06

Table 5
Assessment of the construct reliability

Variables	The composite reliability (>0.6)	Average variance extracted (>0.5)
Risk	0.93	0.79
Cost	0.86	0.73
Compatibility	0.93	0.82
Perceived usefulness	0.91	0.69
Perceived ease of use	0.92	0.75
Behavioral intention to use	0.88	0.79
Actual use	1.00	1.00

recommended range of acceptability (<0.05–0.08) suggested by MacCallum et al. [23]. Thus, the measurement model has a good fit with the data, based on assessment criteria such as RMR, GFI, NFI, NNFI, CFI and RMSEA.

The composite reliability was estimated to evaluate the internal consistency of the measurement model. The composite reliabilities of the measures included in the model ranged from 0.86 to 1.00 (see Table 5). All were greater than the benchmark of 0.60 recommended by Bagozzi and Yi [3]. This showed that all measures had strong and adequate reliability and discriminate validity. As shown in Table 5, the average variance extracted for all measures also exceeded 0.5. The completely standardized factor loadings and individual item reliability for the observed variables are presented in Table 6.

Fig. 2 presents the significant structural relationship among the research variables and the standardized path coefficients. Most of the hypotheses were strongly supported except for hypotheses H2a and H6. For hypothesis 1, the result indicated that behavioral intention to use MC has a significant effect on the actual use ($\beta = 0.48$, $P < 0.01$). This means that users' behavioral intent is an important determinant of system usage. The perceived ease of use effect on behavioral intention to use MC is not significant (H2a). However, it does have a significant indirect effect on both behavioral intention to use and actual use through perceived MC usefulness, and also has a significantly positive direct effect on perceived MC usefulness (H2b: $\gamma = 0.33$, $P < 0.01$). The data also shows that perceived usefulness significantly directly influences the behavioral intention to use (H3: $\beta = 0.33$, $P < 0.01$) and indirectly influences actual use. The result confirms that compatibility positively and directly influences both perceived usefulness (H4a: $\gamma = 0.46$, $P < 0.01$) and behavioral intention to use (H4b:

Table 6
Standardized factor loadings and individual item reliability

Item	Measure	Factor loading	$R^2 > 0.5$
RISK1	I think using MC in monetary transactions has potential risk	0.77	0.59
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	0.84	0.71
RISK4	I think using MC puts my privacy at risk	0.79	0.62
Cost1	I think the equipment cost is expensive of using MC	0.82	0.67
Cost2	I think the access cost is expensive of using MC	0.84	0.71
Cost3	I think the transaction fee is expensive of using MC	0.72	0.52
C1	Using MC is compatible with most aspects of my online transactions	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 transactions	0.91	0.82
PU1	Using MC would improve my performance in online transactions	0.72	0.52
PU2	Using MC would increase my productivity in online transactions	0.76	0.56
PU3	Using MC would enhance my effectiveness in online transactions	0.80	0.64
PU4	Using MC would make it easier for me to engage in online transactions	0.78	0.61
PU5	I think using MC is very useful for me to engage in online transactions	0.83	0.69
PEOU1	I think learning to use MC is easy	0.81	0.66
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	0.84	0.71
PEOU4	I think using MC is easy	0.86	0.74
BI1	Assuming I had access to MC, I intend to use it	0.92	0.85
BI2	Given that I had access to MC, I predict that I would use it	0.86	0.74
AU	How often do you engage in online transactions via MC?	1.00	1.00

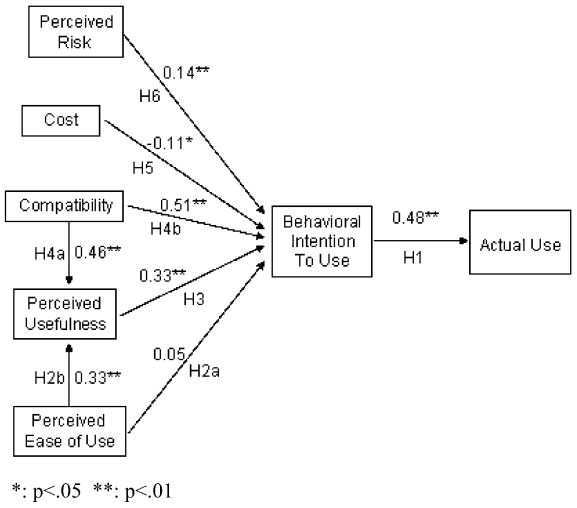

Fig. 2. The empirical results of this study.

$\gamma = 0.51, P < 0.01$). This implies that compatibility has indirect effects on both behavioral intention to use through perceived usefulness, and actual use through behavioral intention to use. For hypothesis 5, the cost has a significant negative effect on the behavioral intention to use MC (H5: $\gamma = -0.11$, $P < 0.05$); yet, except perceived ease of use, it is less effective compared to other constructs. Although the perceived risk has a significant effect on behavioral intention to use MC (H6: $\gamma = 0.14$, $P < 0.01$), the direction is contrary to the hypothesis; moreover, it also has a positive indirect effect on actual use.

5. Discussions and conclusions

This study proposed a revised TAM that integrated the IDT, cost and perceived risk with TAM2 to investigate what determined user MC perception and acceptance. The descriptive statistics indicated that cellular phones are very popular in Taiwan. Only three respondents did not have one. The most significant reason for using a cellular phone was "for convenience." This indicates that while 99.0% of the respondents had cellular phones, only 26.8% were familiar or very familiar with online transactions. This implied that the majority of cellular phone users did not know how to use MC. Thus, MC providers should emphasize the benefits and implications of using MC, and educate and motivate their customers to use it.

The results from the hypotheses testing are:

(1) User adoption and MC use can be predicted adequately from the users' intentions, which are affected significantly by perceived risk, cost, compatibility, and perceived usefulness.
(2) Perceived ease of use does not directly influence behavioral intention to use but indirectly affects behavioral intention to use through perceived usefulness.
(3) Compatibility has the most important effect on behavioral intention to use and the second most important effect on the actual use.
(4) From the consumer perspective, cost is one of the important predictors of MC adoption intent, and this has a significantly negative direct effect on behavioral intention to use.
(5) Perceived risk has a significant direct impact on behavioral intention to use.

The results show that perceived usefulness and perceived ease of use all indirectly influence the actual usage through behavioral intention to use which is consistent with work of Venkatesh and Davis. The most important determinant for behavioral intention to use is compatibility. This is supported by Plouffe et al. In their study, the constructs of perceived characteristics of innovations explained a higher proportion of the variance than TAM. Our findings suggest that MC providers and managers should improve their compatibility with various user requirements, past experience, lifestyle and beliefs in order to fulfill customer expectations.

Similarly, privacy and security problems are less than satisfactory and must be overcome for MC to become an accepted merchandizing practice. Despite most consumers being concerned with the various risks, including transaction security, merchant information, products, online privacy, and personal data, these problems are often ignored by online commerce site providers. From a theoretical perspective, it seemed reasonable that a higher perceived risk in MC will lead to a lower rate of intention to use, which will result in lower MC use. Furthermore, perceived risk was believed to be a predictor and barrier to online transactions, and expected to negatively influence consumer's behavioral intent. However, the data analysis of this study suggests a positive correction.

As presented in our findings, the most striking and puzzling, finding was the positive influence of perceived risk on behavioral intention to use. The reasons for this finding are not clear, but several possible reasons might exist. With respect to perceived risk, more than three-fifths of the respondents had online transaction experience. This might imply that they are more aware of the existence of potential risk because they use MCs more and have a better understanding of the MC context. Although consumers decide to make transactions online, they may avoid high risk associated with some MC. In addition, a number of advantages in using MC (such as competitive price, diverse products, convenience and time saving) still entice consumers to make transactions online even though they perceive some risk. Such explanations have very different implications for the MC industry. The data provides no indication which might be correct. MC merchants must provide a detailed explanation to customers about product delivery, returns or exchanges, order tracking and payment methods to fulfill customer expectations and relieve their anxieties.

Our finding shows that perceived ease of use has no significant effect on behavioral intention to use. This finding was in accord with the results of Koufaris [20], who pointed out that perceived ease of use is not a significant determinate for behavioral intention to use. This result corresponds to prior research [44,45]. They indicated that perceived ease of use had a direct and significant effect on behavioral intention to use in the pre-implementation test (little or no direct experience with a particular system), but little influence on intentions over a period (after experience with the specific system). This effect subsides over time.

In past years, customer behavior has become an important issue in Internet research. Also, customers and businesses have been transformed. Most consumers are computer users and will change their ease of use perception about a specific system over time. Most respondents experienced online transactions and frequently used cellular phones for convenience. This provides a good argument to support our finding.

Furthermore, for better understanding of consumer behavior, we interviewed (either on-site or by phone) eight professionals, five practitioners and three scholars, who were familiar with online commerce and MC. Because MC is still in its infancy, mobile devices or relative applications are still under development and in progress, yet, we found that cost is the least significant determinant in the initial MC context on any factor but perceived ease of use. Hence, our interviews focused on these two predictors of behavioral intent, i.e., perceived ease of use and cost. The perceived ease of use apparently has no significant effect on behavioral intention to use. The interview results are:

(1) According to a Taiwan Economic News report [43], the population in Taiwan in June 2002 was about 22.45 million. The number of Internet and mobile phone subscribers in Taiwan was about 8.08 million (i.e., 36% of the population) and 23.01 million (i.e., 102.5% of population), respectively. Taiwan has the world's highest per-capita ownership of cellular phones. Because of this and the high Internet penetration rate, most people in the sample had experience and essential knowledge about both cellular phones and online skills.
(2) Most of the current tools or systems provide user friendly and intuitive interface design and development. These features have significantly improved the functionality of systems, particularly ease of use. As Scarborough and Zimmerer [34] pointed out, the opening of any new technology will go through the three stages: substitution, adaptation, and revolution. In the earliest stage, people use the new technology as a substitute for existing appliances to implement the same tasks more effectively. In stage 2, people ascertain that they can do new things via the new technology. In stage 3, people begin to use the new technology in new ways. Therefore, mature innovation technology has decreased the user interface problems and users are equipped with essential skills and confidence.

Although cost is one of major concerns in the initial stage, it has the less influence on users' behavioral intent than the other three antecedents (i.e., perceived risk, compatibility, and perceived usefulness). Interviewers give some explanations for this as follows: (1) When there is an emergency or sudden need, the MC utility benefits will definitely outweigh the factor of cost. (2) Although the expenses for using MC are

higher than Internet EC, users are still able to afford it. (3) In our study, 49.7% of the respondents had a monthly income higher than NT$ 35,000 (approximately US$ 1014 at 1:34.5 exchange rate). The average salary was NT$ 23,100 (approximately US$ 670) per month for two-year college graduates, NT$ 26,100 (approximately US$ 757) per month for university graduates and NT$ 31,300 (approximately US$ 907) for postgraduate degrees [38]. Therefore, our respondents have a better financial status and can afford the use of MC.

Although our study provided interesting insights into the factors affecting the intention to use MC, it has some limitations. First, it did not determine the change in user reactions over time. Second, the exposure of MC is still in its infancy and the types of applications are limited. Insufficient understanding of MC and its applications will lower consumer intention to use it. Finally, our subjects were those who used MC as voluntary and self-reported measures and our sample may not be fully representative of the entire population (sample selection bias).

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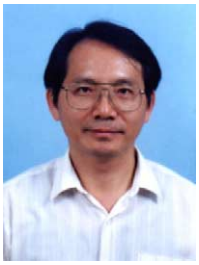

Jen-Her Wu is professor of information management at National Sun Yat-Sen University. Prior to his doctoral study at the University of Kentucky, he received a BS degree in industrial design, earned an MS degree in computer science and worked as an engineer and manager in the manufacturing industry. Professor Wu teaches a variety of information management courses. He has published a book (Systems Analysis and Design) and more than 30 journal articles. His research articles have been published in *Information & Management*, *Decision Support Systems*, *International Journal of Technology Management*, *Computers in Human Behavior*, *Electronic Commerce Research and Applications*, *Expert Systems*, *Knowledge Acquisition*, *Journal of Computer Information Systems*, *and others*. His current research interests include various aspects of information systems development and management, human computer interaction, and knowledge management.

Shu-Ching Wang is doctoral student of information management at National Sun Yat-Sen University and instructor of information management at National Kaohsiung Marine University, Taiwan. She earned her BS and MS degrees in computer science. She has participated with Professor Wu's research team for two years. Her research interests include e-commerce, e-healthcare and e-learning.