Effects of Consumers' Demographic Profile on Mobile Commerce Adoption

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ABSTRACT

This study addresses a shift, generally positive, in the acceptance and adoption of mobile commerce. The study, based on data collected using a survey questionnaire from mobile phone users in South Korea, examined the relationships using factor analysis and multiple regression analysis methods. The results showed equal positive adoption rates across all demographics of age, education, and income,except for gender, in terms of attitudes toward mobile shopping. The rate of mobile commerce adoption was relatively stronger among females than males. This finding provides new developments to mobile service providers on the effect of demographic profile on consumers'behavior and attitudes toward mobile shopping. Based on the results of the study, practical implications for marketing strategies in mobile commerce markets are suggested.

Key words: e-commerce, mobile commerce, digital divide, Internet gender issue, technology acceptance,consumer behavior, online shopping, mobile shopping, marketing strategy.

Ⅰ. INTRODUCTION

Information and communications technology (ICT) is evolving at ahigh rate. One example of the increasing penetration rate is that that of mobile phone usage has exceeded the use of personal computers in many markets. The mobile phone has become dominant as a personal device for communication and commerce. The mobile wireless Internet service refers to mobile service activities including mobile telecommunication, mobile content, entertainment service and mobile commerce on a mobile platform. The increase in mobile services has altered the way commerce is being transacted. The Internet provides a limitless source of product information and tools available to complete an exchange.

The "digital divide" has existed in ICT and mobile commence since the inception of the computer and Internet. Some groups have had wider accessto ICT than other groups. For example, a gap exists in the adoption rate of ICT and mobile commerce between male versus female, young versus old, and rich versus poor. Within the areas studied this disparity exists for a variety of reasons, including political, socio-cultural, economic, and psychological.

There is little doubt about the existence of the divide and the implications of its decrease at a high rate in all but one comparison: the rate of closing the gap in female vs. male adoption of mobile commerce. The rate of decrease lags behind the other indicators when considering closing the gender gap. Our study indicates that females accept ICT, particularly mobile commerce, at a much higher rate than males. This rapid growth in female adoption of mobile commence is due to changes in cultural norms, such as the long standing tradition of the principal breadwinner in the household (males) making all of the larger price purchases. Females, used to being involved in commerce for household goods (food, clothing, etc.), find it easier than their male counterparts to adopt a new shopping tool: mobile commerce. In addition, the number of females accepting and using ICT is increasing due to the recent emergence of ubiquitous ICT in schools, homes, and workplaces.

The present study attempts to reinforce this trend of diminishing the digital divide and, if found, seeks to examine the disparity in the perceptions toward ICT use and mobile commerce adoption, in particular, in selected demographic factors. In undertaking this research the following questions are answered: Are there any differences in terms of mobile commerce adoption among gender, age, income, and education levels? If so, what implication does this difference have upon business firms and policy makers?

The demographic factors in the introduction are incorporated and shown in Figure 1.
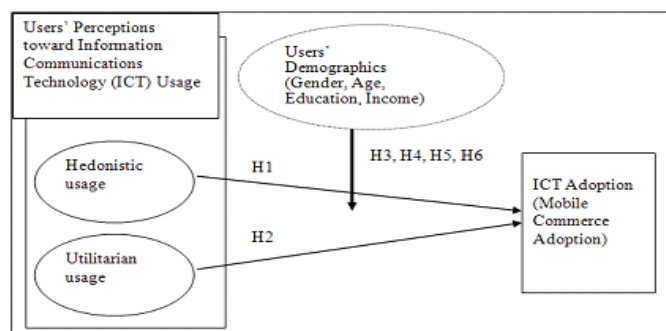
<Figure 1> Research Framework

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Hedonism is defined as the doctrine that pleasure or happiness is the sole or chief good in life and a way of life based on or suggesting the principles of hedonism (Merriam-Webster Online Dictionary, 2009). In this regard, we define the tendency of users that look for pleasure or happiness in using or adopting mobile commerce as hedonistic. Utilitarianism holds that the good is preference satisfaction (for example, people getting what they want) and that the bad is people not getting what they want (Encyclopædia Britannica Online, 2009). In this regard, we define utilitarian in the following manner: the tendency of users that look formaximizing satisfaction through using or adopting mobile commerce and maximizing the utility of mobile commerce.

Ⅱ. LITERATURE REVIEW

1. ICT Use and Adoption Models

In the past decades, many researchers have applied an attitudinal adoption determinants approach to examine ICT adoption. Attitudinal determinants stand for subjective perceptions of innovation characteristics and personality traits. The subjective perception determines one's attitude toward the technology and its adoption decision. The approach of these attitudinal adoption determinants was mainly inspired by the innovation diffusion theory(Rogers, 2003), in which innovations were supposed to have a set of five characteristics (relative advantage, complexity, compatibility, trialability and observability). These determinant assumptions often serve as the framework for methodologies to detect innovativeness and adopter segments. For example, Slyke, Lou, and Day(2002) used the innovation diffusion model in using groupware applications and found that relative advantage, complexity, compatibility, and result demonstrability were significantly related tointention. Chen, Gillenson, and Sherrell(2002) applied the innovation diffusion theory in the online store context and indicated that compatibility, perceived usefulness, and perceived ease of use were the primary determinants of user attitudes toward using online stores.

Teo and Pok(2003) examined factors influencing the adoption of WAP-enabled mobile phones. They found that relativeadvantage, ease of use, image, compatibility, and risk were the primary determinants of adoption behaviors. They pointed out that relative advantage creates positive attitudes as does ease of use. In addition, Barnes and Huff(2003) used the innovation diffusion theory to examine the diffusion of Internet access via mobile telephone (iMode in Japan). Hsu, Lu, and Hsu(2007) examined factors influencing the adoption of the mobile Internet, in particular, multimedia message service (MMS). Hong and Tam(2006) investigated factors influencing the adoption of mobile data services. Jain et al.(2007) classified 3G mobile phone customers. They also found that relative advantage, image, and user needs significantly influenced mobile ICT adoption. They confirmed that characteristics identified by Rogers and his successors explain acceptance behavior in ICT contexts.

Besides the innovation diffusion model that has been successfully used to explain intention of ICT use and adoption, there are some established theories such as the technology acceptance model (TAM), the theory of reasoned action(TRA), and the theory of planned behavior(TPB) that can also be used to predict users'behavior. TAM is tailored to ICT contexts and is designed to predict ICT acceptance and use. It focuses on perceived usefulness of a technology and perceived ease of use.

Kleijnen, Wetzels, and Ruyter(2004) used TAM to examine factors that influence the quicker penetration of mobile text messaging service. Amin(2007) used TAM in the adoption of mobile banking service. They found that the cost of services, the value to end-users, and the ease of use were important. However, Wu and Wang(2004) indicated differently that the perceived ease of use was not significant. TAM has been extended to include a third belief called perceived enjoyment(hedonistic) that separates from performance issues (Heijden, 2004). The hedonistic factors, including entertainment value, have been considered as significant in mobile services(Bauer, Barnes, Reichardt, & Neumann, 2005). To the same extent, Tsang, Ho, and Liang(2004) used TRA to examine the link between attitude, intention, and behavior in relation to mobile marketing. They found that the availability of incentives such as free calls impacted the openness toward receiving mobile marketing promotions.

As there are a number of ICT adoption models available, Venkatesh, Morris,Davis, and Davis(2003) synthesized main models in order to provide a unified view of user acceptance. The unified model suggested that intention was a predictor of user behavior. They suggested four determinants impact intention and usage: performance expectancy, effort expectancy, social influence, and facilitating conditions. They also suggested key moderators such as gender, age, experience, and voluntary use.

Standing, Benson, and Karjaluoto(2005) used the unified theory in mobile marketing schemes and found that granting permission, financial savings, and relevant information were significant factors in the decision to participate. However, the time and effort involved in mobile marketing messages were not considered important. Many studies are still evolving to integrate user satisfaction with technology acceptance constructs(Wixom & Todd, 2005). In this regard, user adoption factors can be summarized as including users' attitude toward the technology, level of involvement, trust, utility, and risk.

Nevertheless, it is unknown how readily the ICT adoption models can be applied to mobile commerce. Therefore, we intend to examine those factors that influence mobile commerce adoption by extending the ICT adoption model framework. In this regard, we focus on the ICT usage image as a determinant in adopting mobile commerce and consider demographics such as gender, age, income and education as a moderator. Therefore, we propose the following hypotheses:

H1: The perception of hedonistic usage of ICT positively influences the decision of mobile commerce adoption.

H2: The perception of utilitarian usage of ICT positively influences the decision of mobile commerce adoption.

2. Demographic Variables in ICT Use and Adoption

A recent survey by the National Internet Development Agency of Korea(2008) reports that almost all(99.8%) of the population ages 12-59 are aware of mobile wireless Internet service. Mobile wireless Internet usage rate by gender is estimated as 52.4% of male and 48.6% of female respectively. Mobile wireless Internet usage rate by age groups from 12 to 19 years old is reached 78.4%, 81.8% for 20s, 52.6% for 30s, and 31.1% for over 40 years old.

It is generally found that not everyone has equal opportunities to the ICT access and usage as a part of the digital divide problem. A studyfound that the demographics of a country have been attributed to this disparity(Barnes & Scornavacca, 2004). The problems of gender disparity in attitude toward ICT use and adoption have received considerable interest among researchers. A study has revealed that there were significant differences between men's and women's perceptions toward ICT use and adoption(Mitchell & Walsh, 2004). They found females were at a disadvantage in terms of ICT use and adoption. They indicated females had unequal access, a low rate of usage, and negative attitudes toward ICT use and adoption. Jackson, Ervin, Gardne, and Schmitt(2001) reported female have more computer anxiety, less computer self-efficacy, and less favorable andless stereotypic computer attitudes. Sherman et al.(2000) reported males used the Internet more often and had more positive attitudes than females. In this regard, Bimber(2000) claimed that gender differences in ICT use and adoption are often attributed to the gender differences in socioeconomic status.

In contradiction to most findings, the results of recent research revealed that users exhibited positive attitudes toward ICT use and adoption regardless of gender(Luan, Fung, & Atan, 2008). They reported no gender disparity in ICT usage; female users were found to spend as much time using the Internet as their male counterparts. Shaw and Gant(2002) supported that there were no gender differences in various online activities. In addition, Ono and Zabodny(2003) concluded the gender gap is disappearing as female users have more chances to experience the Internet and derive valuable service from online activities.

According to the innovation diffusion theory, young individuals are very likely to adopt a new technology because of their tendency to pursue innovativeness. In contrast, the elderly's resistance to change has been well documented in literature. They revealed that older (adult) users are among the last to adopt a product, service or idea innovation. Although numerous studies suggest that the age gap in ICT use and adoption appears to be vanishing over time, the perception persists that the age gap, in particular over 50, is decreasing(Dickinson et al., 2006; Nayak et al., 2006). Much research claimed that the effect of age groups on ICT use and adoption was not only led by a lesser chance of access, but also by the lack of social network(Iyer & Eastman, 2006; Reisenwitz et al., 2007). Older people have less opportunity to access ICT; hence, they would pursue less ICT use and subsequent adoption. Alternatively, younger age groups have an increased likelihood of using ICT and ICT related products. Therefore, the likelihood of adopting ICT and mobile commerce would decrease with age.

A user's income directly affects their likelihood ofhaving ICT products such as mobile devices and mobile wireless Internet access. Since mobile wireless Internet access and communication is still expensive, income level may affect ICT use and adoption. Lower-income people may not have the same opportunity to access mobile wireless Internet; hence, people may have unequal opportunity to experience mobile commerce by their income.

On the other hand, we posit that mobile commerce requires less knowledge of computers andInternet use than other ICT services. Mobile commerce requires only the knowledge of operating a mobile phone, which is much simpler, compared to using a computer. Thus, we believe that education will not play an important part in mobile commerce adoption. Therefore, the likelihood of adopting ICT and mobile commerce should not be related to educational attainment.

Based on the above arguments, we propose the following hypotheses:

Hypothesis 3: There is a gender difference in the decision of mobile commerce adoption.

Hypothesis 4: There is an age group difference in the decision of mobile commerce adoption.

Hypothesis 5: There is an education difference in the decision of mobile commerce adoption.

Hypothesis 6: There is an income level difference the decision of mobile commerce adoption.

Ⅲ. RESEARCH METHODOLOGY

1. Survey and Sample Characteristics

A questionnaire was developed for collecting the perceptions toward ICT use and mobile commerce adoption variables. A survey was conducted with online panel members through a web-based

<Table 1> Characteristics of Samples

Sample characteristics		N	%
Sex	Male	314	63
	Female	186	37
Age	Below 19 years old	20	4
	20-29	129	26
	30-39	181	36
	40-49	113	23
	Above 50 years old	57	11
Education	Secondary (high school)	141	28
	Junior college	80	16
	University	249	50
	Graduate	30	6
Monthly income	Less than USD1000	75	15
	USD1001-2000	144	29
	USD2001-3000	133	27
	USD3001-4000	67	13
	USD4001-5000	53	11
	More than USD5001	28	6

surveymethod during October - December 2008 in Korea. In total, a panel of 584 consumers has responded, and 500respondents were considered useable. Of these respondents, 63% were male, 26% aged 10-29, 36% aged 30-39, and 23% aged 40-49 years old. About 56% of these respondents had college or university education. The average income per capita for these respondents was $2100 US dollars per month, which is slightly higher than the average income per capita of $1900 US dollars per month for Korean employees in 2008, see Table 1 for details.

2. Measurement Scales and Factor Analysis

Perceived ICT usage image of mobile commerce was measured by using a total of 17 exploratory instruments developed by the authors. The response format for each of these items ranged on a seven-point scale, from 'strongly disagree=1' to 'strongly agree=7.' To measure mobile commerce adoption variable, we used a single item, "intent to adopt mobile commerce," with a seven point scale ranging from 'least likely=1' to 'most likely=7.'

Factor analysis with a varimax rotation procedure was employed to identify underlying dimensions of ICT usage image. Then, a reliability test was used to test internal consistency for extracted constructs. Exploratory factor analysis for ICT usage image yielded two factors based on an eigenvalue cut-off of one. The sums of squared loadings from the two components have the cumulative value of 61.348% in explaining the total variance of the data. The two components of ICT usage image are named "hedonistic" and "utilitarian."

To test the appropriateness of factor analysis, two measures were used. The Kaiser-Meyer-Olkin(KMO) overall measure of sampling adequacy(MSA) was 0.940, which falls within the acceptable level. In addition, the Bartlett's test of sphericity was 5614.389 df=136, significant at p = 0.000, which showed a significant correlation among the variables. Further scale refinement was done by examining

item-to-total correlation to improve the reliability. This led to the retention of 12 items, which represented the two factors: hedonistic factor(6 items, α = 0.903) and utilitarian factor(6 items, α = 0.866) (Table 2).

3. Multiple Regression Analysis with Demographic Variables

The measure of association applied in this study is multiple regression analysis, which is a statistical tool that analyzes the strength degree of relatedness between many independent variables and a dependent variable. To use it, we were able to divide the variables into dependent and independent variables. Since the set of independent variables to be included in the model was derived by the aforementioned literature review, we employed the following as the independent variables: perceived ICT usage image, gender, age, education, and income level.

Regression analysis is a statistical tool that should be used when all variables are metric. To comply with the requirement of regression analysis, non-metric(gender, education) data has appropriately transformed either ordinal or nominal data with dummy-coding. In addition, possible transformations of the data were examined to remedy violations of various model assumptions, such as the normality on the shape of the distribution, linearity, outliers, and multi-collinearity.

To examine the statistical significance of the model, the following measures were used. R square, or the coefficient of the determination, indicates the total amount of variability in the dependent variable explained by the independent variables. The adjusted R square takes into account the number of independent variables included in the regression equation and the sample size. The standard errors of the regression coefficients were used to test the statistical significance of the estimated regression coefficientsin the model. The partial t-values were calculated and used to test the statistical significance of the independent variables in the regression model. After identifying the

<Table 2> Results of Factor Analysis and Reliability Test for ICT Usage

Items	Factor loadings	Eigenvalue	Extracted variance	Factor name	Corrected item-total correlation	α
Upper class	0.846	**5.575**	**32.789%**	Hedonistic usage	0.765	**0.903**
Wealthy/rich	0.843				0.775	
Success	0.796				0.778	
Charming	0.718				0.695	
Competence	0.701				0.693	
Important/valued	0.665				0.703	
Honest	0.773	4.855	**28.559%**	Utilitarian usage	0.628	**0.866**
Cheerful	0.767				0.782	
Happy	0.726				0.759	
Reliable	0.705				0.633	
Beneficial	0.695				0.579	
Imaginative	0.641				0.592	
Total variance			**61.348%**			

regression model, we took the final step to ensure that it represents the general population. In this regard, we randomly created a set of 218 samples from the original sample set by using a resampling technique for a validation effort.

IV. RESULTS OF DATA ANALYSIS

Null hypothesis 1, "There is no relationship between hedonistic usage and mobile commerce adoption," and null hypothesis 2, "There is no relationship between utilitarian usage and mobile commerce adoption," were empirically tested. The results show that 1) the regression coefficient($p < 0.001$) between hedonistic usage and mobile commerce adoption, and 2) the regression coefficient($p < 0.001$) between utilitarian usage and mobile commerce adoption are statistically significant at the 0.05 level(Table 3). This result suggests that the perceptions of ICT usage image are significantly related to the mobile commerce adoption of users.

Null hypothesis 3-6, "There are no relationships between users'demographic factors (gender, age, education, income) and mobile commerce adoption" was empirically tested. The results show that 1) the regression coefficient($p < 0.05$) between users'gender and mobile commerce adoption is statistically significant at the 0.05 level. However, 2) the regression coefficient($p > 0.05$) between users'age and mobile commerce adoption; 3) the regression coefficient($p > 0.05$) between users'education level and mobile commerce adoption; and 4) the regression coefficient($p > 0.05$) between users' income level and mobile commerce adoption are statistically not significant at the 0.05 level. That is, the demographic factors of users' age, education, and income level have no or marginal effects on the mobile commerce adoption of users. However, the gender disparity in mobile commerce adoptionis still apparent.

V. DISCUSSIONS AND POLICY IMPLICATIONS

The purpose of this research was to investigate the role of demographic variables on the perceptions of ICT usage image and mobile commerce adoption. Previous studies indicated that demographic variables played a significant role in the attitudes toward ICT use and adoption where males were more likely to have more positive feelings toward ICT use and adoption than females do. We posited that demographics such as gender and age would play an important role in determining mobile commerce adoption. The results of our study revealed that gender has still played a significant role on the perception of ICT usage image and mobile commerce adoption, while many demographic variables tested in this study (age, education, and income) did not have any effect. The results indicate that the demographic gaps in the attitudes toward ICT use and mobile commerce adoption are marginal and not significant.

In fact, the nation has continued to upgrade the ICT infrastructure to enhance ICTaccessibility across the country and to offer a variety of ICT education/training programs to its citizens regardless of gender, age, and income levels. The purpose of such policies was to give all citizens equal access to ICT and hence share its benefits equally. It is certainly true that all citizens of Korea, male and female, young and old, and those that run the socio-economic gamut,have equal opportunities to use ICT. The efforts of improving the ICT infrastructure and offering ICT education/training programs by society are attributable to the benefits. With this in mind, all citizens should be able to use ICT to improve their quality of life. The digital divide should subsequently shrink as it pertains to this component.

The ubiquitous nature of ICTapplications has led to a constant permeability between the separate contexts of social demographics. The result of this research shows that an ICT innovation such as mobile commerce has touched all segments of society equally, regardless of gender, age, education level, and socioeconomic level in

<Table 3> Outputs of Regression Analysis by OLS Estimation

	Test sample N = 489		Validation sample N = 218	
	Regression coefficients (S.E.)	t-value	Regression coefficients (S.E.)	t-value
(Constant)	5.162 (0.272)		5.197 (0.417)	
H1: Hedonistic usage	**0.456 (0.065)**	**6.998*****	**0.486 (0.103)**	4.727***
H2: Utilitarian usage	**0.428 (0.066)**	**6.519*****	**0.453 (0.099)**	**4.582*****
H3: Gender of a user	**-0.305 (0.136)**	**-2.242****	**-0.341 (0.208)**	**-1.636**
H4: Age of a user	**0.006 (0.006)**	**0.964**	**0.006 (0.009)**	**0.688**
H5: Education of a user	**0.031 (0.076)**	**0.415**	**0.123 (0.117)**	**1.046**
H6: Income level of a user	**-0.091 (0.058)**	**-1.572**	**-0.173 (0.089)**	**-1.946**

** $p < 0.05$, *** $p < 0.001$, coefficients are statistically significant at a 95% confidence level.
Dependent variable: mobile commerce adoption
> Proposed Model: N = 489, R = 0.407, R square = 0.166, Adjusted R square = 0.156,
> F-value = 15.980, significance = 0.000, Standard error of the estimate = 1.423
> Validation Model: N = 218, R = 0.411, R square = 0.169, Adjusted R square = 0.146,
> F-value = 7.168, significance = 0.000, Standard error of the estimate = 1.466

Korea. That is, while ICT is going to be an essential part of everyday life, people from different demographic backgrounds should enjoy the same benefits of ICT. In the coming era of ICT ubiquity, the digital divide should be resolved in advance, and it should be done through the efforts of social welfare and policies that were exampled by Korea. We see this study as a stepping-stone to eliminating the asymmetric windows of opportunity to ICT ubiquity.

However, the gender gap in perceptions of ICT use and mobile commerce adoption was apparent and significant. Subsequent data analysis with regard to the effect of gender indicated that females put more weight on achieving valued goals(e.g., hedonistic, enjoyment, aesthetic values). Females are more likely to adopt mobile commerce than males. This result indicates females tend to show a greater interest than males in the enjoyment and aesthetic values of ICT use and adoption, while males are more externally motivated by the instrumental factors like usefulness and competence. Psychological reasons could be attributed to why females put a greater emphasis on hedonistic and aesthetic values than males.

It is likely that mobile commerce may be more of a lifestyle product than a product of necessity. In this environment, the findings suggest that it is possible to take advantage of many different social groups through fine market segmentation based on lifestyles. Recent attempts by some mobile service providers seem to bemoving in this direction. For example, KTF, a mobile service provider in South Korea, has launched two service brands targeted at specific two user groups: one targets utilitarian users(the brand name "MagicN") and the other targets hedonistic users(the brand name "SHOW"). In the same capacity, LGT also has identified two user groups: one targets male users(a brand name "Ez-i") and the other targets female users (the brand name "Oz").

VI. CONCLUSIONS

The possibility exists that the lack of demographic differences could be attributed to the sample being studied. The participants involved in this study were users of the Internet and e-commerce in Korea. They were likely to posses some experience using ICT and engaging in e-commerce transactions. This isparticularly so because they were selected from online panel groups. This online exposure prior to the study might have contributed to the similarity between demographics as observed in the results. Thus, the sample may not match the profile of the population and bias may occur. Because of this, the generalizability of this study might be limited.

Though the mobile phone is becoming a dominant media format, its commerce and marketing applications are still in early stages. The varying economic or market situations may cause different attitudes toward ICT use and mobile commerce adoption. Moreover, the different transaction and infrastructure systems of mobile commerce may help to explain how mobile commerce is utilized differently among countries. We suggest further research examine different countries and/or market environments as potential sources of variation in ICT acceptance and use. Such future studies could have significant

implications in regards to the overall issue of the digital divide.

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Abstract

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