Gender and Age Differences in Individual Decisions about Wireless Mobile Data Services: A Report from China

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Abstract

Incorporating SEM model comparison and hierarchical multiple regression procedures and using the survey data collected from 1,432 participants in five cities in China, this study revealed the influence nature of age and gender differences in relation to the decision pattern of WMDS adoption in China. Age had both strong direct and moderating effect on major causal relationships toward WMDS adoption intentions. Gender alone did not influence much of the decision intention pattern regarding WMDS adoption in China. Age and gender combined did not exert strong interaction on major causal relationships regarding WMDS adoption as well. This study reveals with delight that consumers in China now pay increasing attention to quality, functions and services of mobile phones in addition to brands and outlooks. They have strong desire to use more wireless mobile Internet services, when data transmission speed, content and service charges get more appealing.

Keywords: Wireless mobile data services, age, gender, China, digital divide, technology adoption

1. Introduction

Wireless Mobile Data Services (WMDS) - all types of digital data services via wireless networks accessible through any type of mobile devices - are experiencing staggering growth in recent years worldwide, and especially in China. With the largest mobile communication network and a projected number of 400 million mobile phone users (*U.S. equipment firms snag $2.3B in China contracts*, 2004), China clearly reveals its market potential for implementation of more advanced WMDS. Meanwhile, digital divide in terms of unequal Internet access against certain groups of people as classified by age, gender, physical location, economic status, and education have been repeatedly reported from that country (e.g., Bao, 2002; Lai, Arthur, and Chau, 2004; Singh, 2001). Such unequal access to the Internet for certain subgroups may prevent them from reaping a substantial amount of benefits from the global advances in information technology, even for sometime in the future.

Age and gender gap in information technology has been the worldwide concern. Advanced data services via wireless mobile channels are regarded a powerful strategy to cope with such digital divide in China (*Digital Divide*, 2002). Related studies, however, have only managed simple comparisons of users and nonusers (Zhu and Wang, 2005). Current research emphasis in the field of mobile data services implicitly suggest that demographic characteristics are less important than characteristics of the technology itself in determining user acceptance or

rejection. Presently SMS (Short Message Services) is expected to reach its peak in 2006 and advanced 3G mobile data services are planned to boom in 2008 (*2005-2006 China Mobile Value-Added Services Analysis Report*, 2006). Research of the possible associations between demographic characteristics and acceptance of WMDS will definitely help to provide useful implications for improving technology and service designs to suit the subgroups of the potential users and to attract a broader user group to achieve the expected profit.

This paper investigates a causal pattern of individual decision intentions regarding WMDS adoption in China, with a focus on potential direct and moderating effects of age and gender. To achieve this purpose, we develop three primary objectives:

1. Understand the influence nature of age and gender respectively in relation to the decision pattern of WMDS adoption in China.
2. Understand the direct and moderating effect of age and gender respectively on the major determinants and major causal relationships of this decision intention pattern.
3. Understand the direct and moderating effect of age and gender combined on the major determinants and major causal relationships of this decision intention pattern.

To attain these objectives, related theories and studies are carefully reviewed. Hypotheses are developed and tested using our survey data collected from 1,432 participants in five cities in China in the end of 2004. The findings will be compared with the relevant previous studies for providing useful implications for theory and practice.

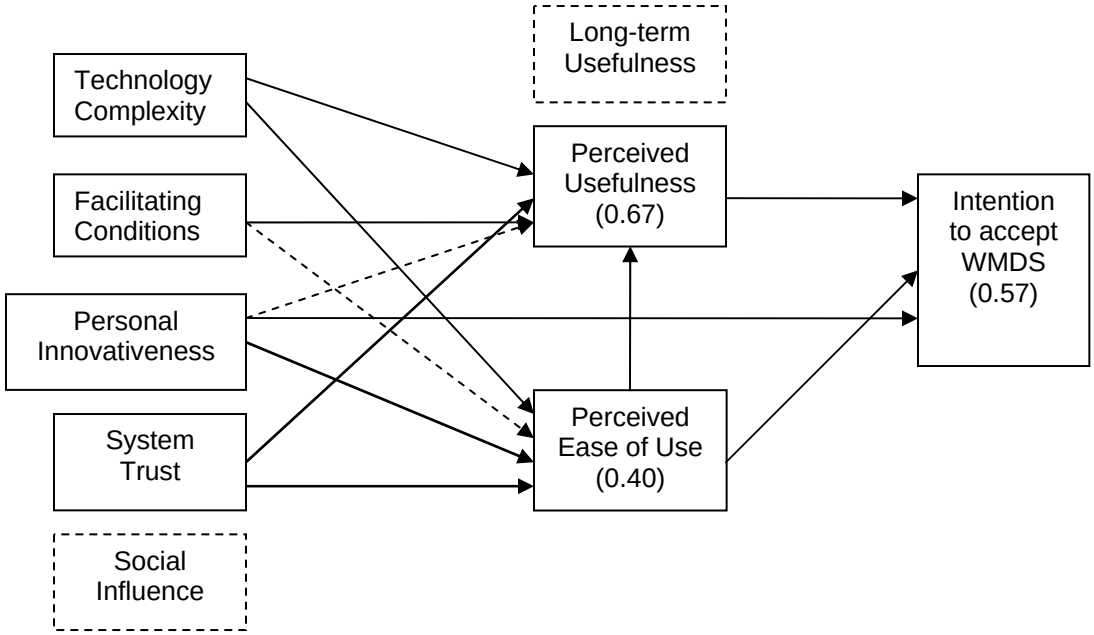
2. Research Model and Background

Rooted in the well known Technology Acceptance Model (TAM), TAM for WMDS was developed to guide exploration of important determinants for individual adoption of WMDS across five major cities in China (Lu, Yu, Liu, & Wang, 2005). Based on data analysis using SEM procedures, an alternate model – WMDS adoption model in China – emerged which identifies an interesting causal pattern (see Figure 1). The relevant survey and model testing was reported in Hong Kong Mobility Roundtable 2005. Constructs in the research model were all validated in prior research studies in the United States. Internal consistency reliability coefficients for research constructs under study are well above the commonly acceptable level of 0.70 (Nunnally, 1978), except for personal innovativeness (0.627).

The causal structure shows that the antecedents such as technology complexity, personal innovativeness, and wireless trust explained 40 percent of the variance in perceived ease of use, an important predictor of individual intentions to adopt WMDS in China. Technology complexity together with facilitating conditions, wireless trust, and ease of use accounted for 67 percent of the variance in perceived near-term usefulness, another instrumental predictor of individual intentions toward WMDS adoption. The perceptual beliefs of near-term usefulness and ease of use plus personal innovativeness collectively explained 57 percent of the variance in the major dependent variable, intention to adopt WMDS in China.

This causal structure, however, gives no attention to any possible moderating effect from any individual demographics. This paper will focus on the possible moderating effects of the two essential demographics, age and gender, over the identified model. Although we choose the identified WMDS adoption model in China as the core model for this study, one important consideration is that the arguments presented in conjunction with this model will apply quite

consistently to the TAM constructs, and the late unified model of technology adoption (Venkatesh, Morris, Davis & Davis, 2003).



Notes: Only significant relationships are displayed. Numbers represent path coefficients.
* significant at $p < .05$.
** significant at $p < .01$.
*** significant at $p < .001$.
Variance explained in dependent variables is shown in parentheses.

Figure 1. WMDS Adoption Model in China

2.1 Age

Age influence has been shown to exist in technology adoption contexts. Age was repeatedly found to have moderating effect on performance expectancy (usefulness), effort expectancy (ease of use), social influence, and facilitating conditions in many TAM-related studies. Morris and Venkatesh's study (2000) found a direct effect of age on usefulness perceptions for both short-term and long-term usage. Later, Venkatesh and his colleagues (2003) found age effect greater for older workers in terms of weaker willingness to adopt new IT products. Recently, Morris, Venkatesh, and Ackerman (2005) used Theory of Planned Behavior to examine age as a moderator of the determinants of technology use. They found older workers influenced more by attitude toward using technology, subjective norm (social influence), and perceived behavioral control (facilitating conditions).

Pioneer adopters of new ICT products are commonly believed to be young. In China, the majority of Internet users are aged below 30. A public survey shows that users aged 18-30 years total 56.3%, while those aged 31-40 years comprise 17.7% (CNNIC, 2003), users aged 50 or above make up only 2.1% of the total (CNNIC, 2003b). People attributed such an imbalance across age levels to the difficulty felt especially by the aged people in learning computers and the Internet, since majority of the computer technology and application software originate from overseas; the Chinese typing method is complex, especially for those whose education is lacking; poor health status; problems with vision, neck, hands and spinal cord; and the economic constraints (Bao, 2002).

A number of researchers contribute this phenomenon to the differences in information processing by people of different ages (i.e., Czaja & Sharit, 1993; Czaja & Sharit, 1998; Czaja, Sharit, Ownby, Roth & Nair, 2001). Increased age has shown to be associated with difficulty in processing complex stimuli and allocating attention to information (Birren, Woods, & Williams, 1980; Plude and Hoyer, 1985). Hall and Mansfield (1975) have reported that older workers attach a great deal more importance to receiving help and assistance on the job. Welford (1980) attributed such phenomenon to age-related working memory deficits more pronounced when the information presented was new, in an unfamiliar cognitive domain, or complex. Therefore, the degree to which the new technology is perceived to be easy to use, would be more important for aged people in their decision to adopt or reject that technology (Kubeck, Delp, Haslett & McDaniel, 1996).

Studies regarding the effect of age seem to indicate that age variable may influence technology use in multiple ways: directly affecting technology use, indirectly influencing technology use through perceptions, and moderating the relationships between perceptions and technology use (Yi, Wu, & Tung, 2005-2006). Mobile data services are in essence computer-based data services accessible via mobile devices including smart mobile phones. In China's mobile phone market, the same pattern emerged (http://www.ark-mr.com/CN/; Zhan, 2003). On the other hand, aged adults are reported to be willing to use modern devices and rather interested in modern technology. Computer and the Internet are becoming a popular and efficient means to help older people in China to equip themselves with modern knowledge, get themselves adapted to the changing society (Guo, Bricout and Huang, 2005).

To provide a more accurate view of age influence toward WMDS adoption in China, we have adopted a comprehensive approach by examining first the possible age impact on the entire causal model, and then by looking into the moderating effect of age on a certain causal relationships for more detailed explanation. Since the base model is found explanatory for all the respondents, we assume that age alone does not have any significant impact on this model. The following hypotheses are thus developed:

H1: The causal pattern of WMDS adoption intention in China as identified fits both the younger respondents and the aged respondents.

H2: Age has a direct effect on perceived usefulness of WMDS in China.

H3: Age has a direct effect on perceived ease of using WMDS in China.

H4: Age has a direct effect on intentions to adopt WMDS in China.

H5: Age has a moderating effect on the positive direct relationship between perceived usefulness of WMDS and adoption intention toward WMDS in China.

H6: Age has a moderating effect on the positive direct relationship between perceived ease of using WMDS and adoption intention toward WMDS in China.

2.2 Gender

Similar to age, gender is theorized to play a moderating role in IT/IS acceptance research. Gender was not included in the original TAM, but empirical evidence demonstrates that males and females have different perceptions about ease of use and usefulness toward information systems and thus have different system usage behavior (Gefen & Straub, 1997). Research on gender differences indicates that men tend to be highly task-oriented (Minton and Schneider, 1980) and, therefore, performance expectancies, which focus on task accomplishment, are likely to be especially sapient to men. Women typically experience high levels of anxiety in using computers (Morrow, Presll & McElroy, 1986) which could lead to lower level of perceived ease of use. Men's relative tendency to feel more at ease with computers has also been demonstrated in IS literature (Gefen and Straub, 1997). Similar findings emerged in technology acceptance studies (i.e.,Venkatesh and Morris, 2000; Venkatesh et al, 2003). As a predictor of intention in the short-run, men were more influenced by instrumentality, while women were more strongly influenced by social factors and environmental constraints; however, no significant gender differences in the determinants of technology use (Morris, Venkatesh, and Ackerman, 2005). Gender schema theory suggests that such differences stem from gender role and socialization processes reinforced from birth rather than biological gender per se (i.e., Kirchmeyer, 1997; Lynott and McCandless, 2000). Recent empirical studies (e.g., Kirchmeyer 2002; Twenge, 1997) have also shown that gender roles have a strong socio-psychological basis and are relatively enduring, yet open to change over time.

In terms of gender influences over mobile phones use in China, the proportion of male users was 10% higher than that of the females in four major cities in China: Guangzhou, Beijing, Shanghai and Chengdu in 2001. As the mobile phones permeating rapidly into every corner of the cities, such a difference was rapidly disappearing (*China mobile telecommunication market analysis: A report from consumers*, 2005). Both genders tend to use the foreign brands. More males prefer to use Motorola (30%), and females prefer to use Nokia (25%) (Zhan, 2003). As the results of government-engineered gender equality, one-child policy in China, and the transition from a planning to market economy in China, fundamental socioeconomic changes have taken place in that country in the form of pension arrangements, health care systems, welfare provisions, a higher level of women's education, urbanization, and increase in per capita income (Yang and Chen, 2004; Nie and Wyman, 2005). Those changes have most likely affected the demographic behavior patterns among urban, township and rural populations in that country. Urban daughters have more power than ever before to defy disadvantageous gender norms while using equivocal ones to their own advantage (Fong, 2002). Consequently, the increasing equality between the two genders naturally reflects on their technology adoption pattern and more specifically on their decision intention toward adopting WMDS. Therefore, the following null hypotheses are suggested in our study:

Ho_1: Gender alone has no moderating effect on formation of the causal structure of WMDS adoption intention in China.

Ho_2: Gender alone has no direct effect on perceived usefulness of WMDS in China.

Ho_3: Gender alone has no direct effect on perceived ease of using WMDS in China.

Ho_4: Gender alone has no direct effect on intentions to adopt WMDS in China.

Ho_5: Gender alone has no moderating effect on the positive direct relationship between perceived usefulness of WMDS and adoption intention toward WMDS in China.

Ho_6: Gender alone has no moderating effect on the positive direct relationship between perceived ease of using WMDS and adoption intention toward WMDS in China.

2.3 Gender and Age

Morris and his colleagues notice that studies of gender differences can be misleading without reference to age (i.e., Morris and Venkatesh, 2000; Morris, Venkatesh, and Ackerman, 2005). Examining gender and age separately may simplify the effect nature of demographic characteristics. A number of research studies found evidence supporting age moderation of gender differences. For example, gender differences were found moderated by age for skills requiring spatial abilities (Arceneaux et al., 1996). Gender differences in college students' values were found to vary between "traditionally aged" and "nontraditionally aged students" (Jones, 1993). Venkatesh and his colleagues found that women born in different decades are likely to have had very different educational and occupational opportunities. As a result, the observed pattern of gender differences could be expected to differ based on age (Venkatesh et al., 2003). In sum, this line of research suggests that the definitions and consequences of being male or female at different life stages varies across generations, and thus, are open to reinterpretation and change throughout the aging process (Levy, 1988). Morris and his colleagues (2005) recently examined the combined effect of gender and age in the context of information technology adoption. By focusing on the concurrent moderation by gender and age, they built a more comprehensive understanding of the interplay between age and gender. Recently a study of self-esteem and life satisfaction in Chinese people from three generations, found obvious interaction between gender and age as reflected in life task differences and social expectation differences (Zhang and Leung, 2002).

In reality, early adopters are commonly thought to be young and male in most technology-led markets. With respect to WMDS adoption in China, we also expect to see influence of gender effects to differ based on age. Recently, gender inequalities decline with economic growth and China's one-child policy. A survey in four countries - China, Japan, Mexico and U.S. shows that gender differences were small and subtle in most areas examined (Mayer and Schmidt, 2004). In China, educational expenditures show no significant differences by gender. These results seem to indicate that urban children are receiving full and equitable investments in their futures by their families, regardless of their gender (Veeck, Flurry, Jiang, 2003; Hannum, 2005). Girls enjoy unprecedented parental support and power because they do not have to compete with brothers for parental favor and investment (Fong, 2002). According to

this logic, young females should have the same opportunities and level of independence in accepting innovative products, including WMDS. When adoption of WMDS in China is in concern, gender should play a less important role in young generation than in older generation. Therefore, we develop the following hypotheses:

H_7: Gender and age combined will moderate respondents' adoption intention toward WMDS in China.

H_8: Gender and age combined will moderate respondents' perceived usefulness toward WMDS in China.

H_9: Gender and age combined will moderate respondents' perceived ease of use toward WMDS in China.

H_{10}: Gender and age combined will moderate the causal relationship between respondents' perceived usefulness and their intentions to adopt WMDS in China.

H_{11}: Gender and age combined will moderate the causal relationship between respondents' perceived ease of use and their intentions to adopt WMDS in China.

3. Method and Results

3.1 Participants and Settings

Participants in this study were individuals from five cities across China – Hangzhou (in most developed southeast coastal region), Chengdu (an important metropolitan city in Southwest region and also a well-known market for mobile phones), Xian (a metropolitan city in Northwest region), Jinan (in East coastal region), and Xiaoshan (a city close to Hangzhou). Local university classroom instructors and special questionnaire collectors were approached to collect the completed questionnaires from the university students, graduate students, business managers, and state-run organization employees between June and November 2004. All the completed questionnaires arrived at the United States by early 2005. The relevant survey questions are included in Appendix A for easy reference.

3.2 Data Analysis and Results

Descriptive analysis of the empirical data reveal that of the 1600 collected survey questionnaires, 1432 completed surveys were identified as valid which secures a return rate of 89%. Of those valid data entries, 865 (63%) were from the male respondents, 512 (37%) from the female respondents, and 55 did not provide answers. 1325 (96%) respondents provided their ages and 107 data entries are missing.

To investigate the moderating effects of the selected variables, we employed an invariance-testing strategy to test for the replicability of structural paths across various independent samples from the same population in Amos 5 (Bryne, 2001). According to this data analysis strategy, the moderating effects of gender and age on the entire causal structure of decision intention toward WMDS in our study will depend on whether the general base model

can be re-specified across two age groups and two gender groups respectively from the same pool of the empirical data.

3.2.1. Age

To distinguish the younger respondents from the aged ones, all the respondents were first ranked according to the provided ages. The mean age is 29 and the mode is 22. We deliberately left an age gap of five between the two groups, to ensure that one age group is distinctly different from the other. Those whose ages fell into the range of 25 and younger formed the Youth group which made roughly the upper 40% (N=529) of the total. Those whose ages fell into the range of 30 and older formed the Aged group which made the lower 40% (N=537) of the total.

To test the first hypothesis, we developed a full SEM model as shown in Figure 1 for a simultaneous test for the equivalence of the theoretical structure across the two age groups. To prepare for the two-group model comparison, a simultaneous test of hypothesized model was first run against the Youth group and the Aged group separately. After five pairs of measurement errors were freed to covary (one on wireless trust items, two on ease of use items and two on wireless mobile technology items), a marginal model fit was found (X^2 = 2403.948, DF = 1142, p = .000, X^2/DF=2.105, TLI = .902, CFI = .912, RMSEA=.032). Then, in testing for the invariance across age, a nested two-group model was run for cross validation with equality constraints imposed. The model comparison results show that the hypothesized causal structure for WMDS adoption is statistically significantly different for each age group at .001 alpha level for any constrained or unconstrained model in our study (X^2_{dif}=91.711, DF_{dif}=40, P=0.000). Therefore, our first hypothesis is rejected.

To identify whether age has any direct influences on perceived usefulness (PU), perceived ease of use (PEU), and intentions, mean values of six PU variables and mean values of four PEU variables and mean values of three intentions variables were calculated and used as three new dependent variables. Then three linear regression tests were performed to test Hypotheses 2, 3, 4 respectively. The test results show age having no direct effect on PU (P=.266) or PEU (P=.546) or intentions (P=.788). These three operational hypotheses (H_2, H_3, H_4) are thus rejected.

Model comparison shows a significant and direct causal path from PU to intentions to adopt WMDS for Youth group (P=0.000). This causal path is obvious but not statistically significant for Aged group (P=0.052). Therefore, Hypothesis 5 is accepted. Perceived ease of use is common for both Youth and Aged groups in determining their adoption intentions toward WMDS, and is common for both age groups in its direct influence on perceived usefulness. Since both age groups regarded perceived ease of use an important instrumental belief toward their intentions to adopt WMDS, obviously, age itself has little moderating effect on this major direct positive relationship in the core. Hypothesis 6 is, thus, rejected.

Besides, model comparison also reveals that wireless mobile technology functions and designs as an antecedent is common for both age groups in its significant direct impact on perceived ease of use, but not on perceived usefulness. Perceived usefulness and personal innovativeness seemed to be significantly more important for the Youth group in determining their WMDS adoption intentions. Personal innovativeness is also an important antecedent to their perceived ease of use. Meanwhile, their perceived usefulness seem to rely a lot on wireless trust environment and facilitating conditions. In contrast, Aged group seemed to depend much

more on wireless trust environment for their perceived ease of use. Facilitating conditions is important to the Aged group but not statistically significant (P=.062).

3.2.2 Gender

To study the moderating effect of gender differences over the entire hypothesized model, we used model comparison strategy again for the two gender groups. The hypothesized causal structure in the simultaneous test turns out a marginal fit (X^2=3056.891, DF=1222, X^2/DF=2.502, IFI=0.906, TLI=0.897, CFI=0.906, RMSEA=0.033). The nested model comparison shows that none of the constrained or unconstrained models is significantly different from the initial baseline model at .05 alpha level. This result seems to indicate that gender alone has no moderating effect on formation of the causal structure of WMDS adoption intention in China. Therefore, we can accept the first null hypothesis regarding gender.

To identify whether gender has any direct influences on PU, PEU and intentions, mean values of usefulness variables, mean values of PEU variables, and means of intentions variables were used as the dependent variables respectively in three linear regression tests. The tests revealed no significant direct gender effect on PU (P=.374), PEU (P=.214) or intentions (P=.273). Null Hypotheses 2, 3 and 4 are thus retained.

As a result of examining all the hypothesized causal relationships in the model for each nested gender group, we found that the test results evidently support the Null Hypotheses 5 and 6. However, gender still gets in the magnitude of other four causal relationships. For example, personal innovativeness was regarded by male respondents as a significant direct determinant of their intention to adopt WMDS, but not by the female respondents. And wireless trust environment and facilitating conditions were regarded by the males as important antecedents of perceived usefulness, while the female respondents put more emphasis on the wireless mobile technology as the antecedent.

3.2.3 Age by Gender

So far we've tested major direct and moderating effects of age and gender separately. The tests seem to reveal some complicated results: The hypothesized relationship between personal innovativeness differ with age groups, as well as gender groups. The same applies to the findings on causal paths between wireless trust environment and PU and between facilitating conditions and PU. It is highly possible that interplay effect of age and gender exists. To test Hypotheses 7, 8, and 9 separate hierarchical regressions were conducted in each gender group to examine any possible interactive effect of age and gender on the key constructs in the core structure. Jaccard, Turrisi, and Wan (1991) believe it a good alternative to adding multiplicative interaction terms to the equation and testing for R^2 increments, when testing for interactions. The test results apparently do not support these hypotheses, and therefore, those hypotheses are rejected.

Meanwhile, hierarchical regression test results regarding combined effect of age and gender on the causal relationship between PU and intentions to adopt WMDS in China did not show any significant interaction between age and gender. To be cautious, we performed hierarchical multiple regression tests in each age by gender group to clarify our understanding on potential age and gender interplay. We used mean intention as the primary dependent variable, gender as the initial independent variable, and mean PU as the second level variable. The test results did not find gender having any significant effect on the hypothesized relationship in either

Youth group or Aged group. Therefore, operational hypothesis 10 was rejected. The same test procedures were employed on testing Hypothesis 11. This hypothesis was also rejected.

In addition, we conducted hierarchical multiple regression analyses within each age by gender group, to further investigate the suspected interactions of age and gender on the causal path from personal innovativeness to intention to adopt WMDS, the causal path between wireless trust environment and PU, and that between facilitating conditions and PU. The suspected cross effect of age and gender is not supported by the test results. To test whether the set of linear regression parameters is equal across the groups, we conducted a number of Chow tests in SPSS in search for any significance of differences. The Chow tests did not show any significant results, which indicate that within each age group there is no significant gender difference in moderating the listed causal relations. Nevertheless, though not significant, male respondents in Youth group tended to rely more on personal innovativeness for their intentions than the other groups. Aged male respondents tended to give more attention to wireless trust environment when evaluating the usefulness of WMDS than the other groups. Aged female respondents tended to be more concerned with facilitating conditions when evaluating usefulness of WMDS.

4. Discussions and Implications

This study re-examined WMDS Adoption Model in China (Lu, Yu, Liu & Wang, 2005) by incorporating age and gender as the grouping variables for model comparisons, and as moderators of the model's major constructs and core relationships. We notice with optimism that the Chinese respondents, regardless of their age or gender, all had strong intentions to adopt more advanced wireless data services via mobile phones. The mental preparation for accepting 3G mobile data services seemed present among individual consumers in urban cities of China.

This study underscores the importance of including age and gender as key moderators to WMDS Adoption Model when applied to urban cities in China. Age in this study is recognized as an important moderator of respondents' decision intentions process toward WMDS in China. Through model comparison, we see more objectively the common antecedents, beliefs, and relationships important to individuals of all ages and gender. Easy to use seemed to be recognized as the most important strength of WMDS by respondents of all ages. Perceived ease of use contributes a lot to the respondents' perceived usefulness regardless of their age differences. Wireless mobile technology functions and designs are believed by the respondents as the most critical determinant of their level of mental efforts, but not for their perceived usefulness of WMDS. Though the relationship between perceived useful to intentions to adopt WMDS in China was a little bit below the predetermined significance level for middle and aged respondents in this study, it was still regarded important for the respondents of all ages. In a word, WMDS must be first easy to use and then useful.

Particular to the respondents aged at 30 or above, a regression test showed age having a weak but statistically significant negative impact on intentions (R^2=.015, R^2 changed = .015, Beta=-.123, p=.004). Obviously, in Aged group the younger ones had stronger intentions to use WMDS. Compared to perceived usefulness, the aged respondents attributed their intentions to adopt WMDS more to their perceived ease of use. This finding, to some extent, supports the literature that aged adults are willing to use the modern devices but more sensitive to the learning curve related to the technology aspect of a specific innovation (Ziefle and Bay, 2005). Examination of Aged group's mean scores on the four PEU items were clearly positive (straight 6s). This finding is partially expected, since ease of use, convenience, is commonly recognized a

strength of WMDS. This finding, however, differs with a study among the Singapore college students that the older an individual is, the more emphasis he or she lays on perceived usefulness of a new technology product (Yi, Wu and Tung, 2005). Their study finding is more explanatory of the behavioral decision making process among more or less mentally matured young people. In our study the aged respondents were all above 30 and more sensitive to the learning curve of using WMDS, since they are more aware of their weaker capability of mastering new functions. Hopefully, WMDS can be a good option for those who believe in their age-related declines in cognitive, sensory, and physiological abilities (Plude and Hoyer, 1985; Posner, 1996). It is also interesting to find that aged respondents in this study gave much credit to wireless trust environment for their perceived ease of use. Aged respondents seemed to have more favorable perception of data security. This probably gave them confidence in WMDS.

Personal innovativeness which is often related to confidence and bravery to try a new innovation drove the younger respondents' intention to adopt WMDS in this study. This mental confidence also drove the younger respondents to believe that WMDS were easy to use. These findings are consistent with the findings in many TAM-related studies (i.e., Venkatesh et al., 2003). Different from the aged respondents, younger ones contributed their perceived usefulness of WMDS to wireless trust. A simple comparison of the means given to the five wireless trust items from each age group reveals that respondents of both age groups had a suspicion over privacy protection in the wireless mobile sphere. Both young and aged respondents seemed to recognize the importance of facilitating conditions for using WMDS on their perceived usefulness, but significant to younger ones, when age was the only moderator used. Interestingly, when gender and age were examined as a combined effect, females and especially aged females emerged as those who regarded this antecedent more important. This somehow echoes the previous findings in the literature that currently gender plays a more subtle role, less important among young people than among aged people, which is more rooted in the educational opportunities and societal roles expected for different generations. However, the gender difference as reflected on facilitating conditions for using WMDS is still statistically insignificant.

On the whole, gender in this study did not have much moderating effect on the intention model formation in our study. In another word, respondents of both genders roughly followed the same pattern to form their intentions. Male respondents, however, found personal innovativeness a more important driver for intention to adopt WMDS than female respondents. This finding to a certain extent reflects the viewpoint in literature that men are more confident in their ability to master technical skills and are more daring to try new technology products (i.e., Watkins, Dong and Xia, 1997; Morris Venkatesh, &d Ackerman, 2005). Female respondents, on the other hand, took wireless mobile technology functions and designs as more important drive for their usefulness perceptions. Such task-orientation identified among the female respondents in our study, seemed different from Morris, Venkatesh, and Ackerman (2005)'s conclusion that resource and opportunities necessary to perform a behavior (facilitating conditions in our study), were more important to especially women and aged people, since they tend to be more influenced by situational constraints attached to a typical technology and have less confidence in their technical ability. Explanation of our finding depends on further research effort.

In this study, we did not find much interaction between age and gender either as direct impact or as moderating effect. Nevertheless, a closer look at the relevant test results helped to identify some interesting patterns: Young males tended to rely more on personal innovativeness for their decision intentions toward WMDS. Aged men gave more attention to perceived wireless

trust environment when evaluating usefulness of WMDS. Again, explanation of such finding depends on further research effort.

This study has both theoretical and practical importance. Theoretically, this research can help determine whether the established WMDS Adoption Model in China using a cross sectional design with empirical data from five cities in China will be still valid when the respondents' demographic characteristics are taken into consideration. The SEM model comparison approach helped to identify two different decision intention models for people of different age levels. Instead of reexamining the identified direct impact and moderating effects of age and gender, this study used a more holistic approach to let the possible influences caused by age and gender emerge naturally through the comparisons. This helped to provide a better understanding of the nature of demographic influences. This model only partially mediates external variables pending on the target technology, situations and user characteristics. The current findings highlight the potential dynamic nature of the WMDS Adoption Model that can be better understood by including key moderators when appropriate.

Practically, the findings of this study provide important implications for developers, operators and service providers in devising WMDS implementation strategies, with more focused attention to the special needs from people of different demographic profile. The more unisex pattern observed among the respondents provides a more optimistic view that WMDS actually are appealing to both genders, with emphasis on similarity rather than differences (Eagly, 1987). The findings about WMDS in this study suggest that supposed differences between genders should rather be interpreted with regard to age differences. The expected unisex pattern in younger respondents was apparent in this study. Moreover, strong intentions, favorable perceptions toward WMDS adoption and unisex pattern were also observed among middle and aged subjects. The gender difference among aged people noted in some recent studies (i.e., Morris et al, 2005) was not strong in our study. We attribute this mostly to the user friendly nature of WMDS by design and the popularity of mobile phones in current China.

On the other hand, this study reflects the importance of a user-centered perspective. The results in this study clearly show that individual differences are important in understanding how and why people make different choices. The findings within different age groups help us to see the different decision processes for people of different ages. Ease to use is more important to aged people. Facilitating conditions seem more important to aged females. It is still meaningful to pay continuous attention to designing mobile function, content and services more attractive to the young people in China. Meanwhile, it will make more sense, if increased attention will be given to the needs of more matured and aged people. This is especially critical since the issue of graying population has already become evident in urban China (i.e., Anonymous, 2005; *Greying Population Poses Economic Challenges*, 2005; Zhao, Rau, & Yang, 2005). In fact, a few researchers in the United States identified user age a crucial factor affecting performance when handling the interface of a mobile phone (e.g., Bay and Ziefle, 2004; Ziefle and Bay, 2005). Their experiments found older adults favoring functions within easy reach, maximal transparency and minimal ambiguity, and proposed more research to find out if and which kind of user instruction might be helpful for older adults. WMDS have strong potential for closing the digital divide gap. To make it a tool to battle digital divide in China, substantial effort is needed to give each demographic group something to like about WMDS, by improving the relevant technical functions, interface designs and services. Any progress in this aspect will be valuable for countries and regions with digital divide problems.

This study created some variables based on mean values of the original variables and used a number of hierarchical multiple regression tests in a few subsets of the empirical data. According to some statistical books, this would lose some details of the original variables. Nevertheless, since in this study we are more interested in behavioral decision patterns in particular groups of people, this strategy is considered appropriate. In fact the findings in those subsets may generate more useful information in practice for development and implementation of more WMDS in China.

5. Conclusions

This study provides a holistic view of how individual differences in terms of age and gender affect adoption intentions toward WMDS in China. We believe our study has taken a solid step toward understanding how gender and age influence information innovation adoption. Understanding of individual differences in terms of gender and age is important for reducing resistance to WMDS and forging adoption in different individual groups. This is a timely research since implementation of 3G wireless mobile data services in China is expected to start this year.

Meanwhile, we recommend that some other potential confounding factors such as Internet experience, mobile phone experience, experience of using current simple data services via mobile phones, etc. be considered in future studies. Literature has told us that users perceived a system easier to use as they gain more knowledge and confidence through direct experience in using the system (i.e., Hackbarth, Grover and Yi, 2003). It is highly possible that as did the results from this study, future studies incorporating experience related factors will yield valuable information to further our understanding of WMDS implementation in China and at large.

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Appendix A: Survey of Using Wireless Mobile Data Services

Intention to Accept WMDS
Assuming I have access to WIMD, I intend to use it.
Given that I have access to WIMD, I predict I would use it.
I intend to continue using WIMD in the future.

Perceived Ease of Use
My interaction with WIMD is clear and understandable.
Interacting with WIMD does not require a lot of my mental effort.
I find it easy to get WIMD to do what I want it to do.
Overall, I find WIMD easy to use.

Perceived Usefulness
Use of WIMD can reduce the time needed for my work/study/life tasks.
Use of WIMD can significantly increase my productivity.
Use of WIMD can increase the effectiveness of my performance.
WIMD can increase my quality of output without a significant increase in effort.
Considering all tasks, the use of WIMD contributes to my work/study/life.
Overall, I find WIMD useful in my daily life.

System Trust
When using WIMD, I am sure that I will be notified if personal information is collected (deleted).
When using WIMD, I am sure that I will be allowed to access the data collected from me.
When using WIMD, I am sure that I have a choice to opt-in and/or opt-out in the sharing of my personal information with third parties.
When using WIMD, I am sure that certain managerial and technical procedures exist to secure all the data on this system.
When using WIMD, I am sure that certain managerial and technical procedures exist to protect my personal information.
When using WIMD, I am sure of the continuous availability (i.e., no breakdown) of this system.
When using WIMD, I am sure of the consistency of information processing on this system.
Overall, I find the wireless mobile data services trustworthy (deleted).

Technology Complexity
WIMD provides email and message services.
WIMD provides strong roaming capabilities in support of mobility.
WIMD provides inter-operability to allow any mobile devices.
WIMD provides highly personalized services.
WIMD provides time and location-based services.
WIMD provides considerable commerce capabilities.
The interfaces of the wireless mobile applications are easy to use.
The screen design of the mobile devices is effective.
Mobile devices have nice input features to use wireless mobile data services.
The terminology used for WIMD is easy to understand.

Facilitating Conditions

Government/corporate policies encourage use of WIMD (deleted).
Legal protections are available for using WIMD.
Help is available for assistance with WIMD.
Specialized instruction is available to me concerning WIMD.
Training for WIMD is available to me.
The cost of owning and using WIMD is still too expensive.
Overall, the use of WIMD is very supportive (deleted).

Personal Innovativeness

If I heard about a new information technology, I would look for ways to experiment with it.
Among my peers, I am usually the first to explore new information technologies.
In general, I am hesitant to try out new information technologies (deleted).
I like to experiment with new information technologies.