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Exploring the characteristics of mobile data service users in Australia

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Abstract

Mobile data services are increasingly important as revenues from voice calling are decreasing for mobile carriers, and there are many predictions that the use of mobile data services will increase in Australia. However, there is little research on the current use of mobile data services. This study explores the characteristics of mobile data service users. We conducted a survey with over 6,000 respondents. The findings show that as in the early stage of the Internet diffusion, age is the most important demographic variable which influences the pattern of mobile data service use. In addition to age, gender and household income have a role in describing each group's consumption of mobile data services more precisely. We conclude the paper by presenting limitations of the study and outlining some possible future research.

Keywords

Mobile data service, Australia, technology adoption

INTRODUCTION

The Australian mobile industry is a fast-growing and increasingly significant part of the Australian telecommunications sector. Currently, Australia's terrestrial mobile phone networks (Global Systems for Mobile Communication (GSM) and Code Division Multiple Access (CDMA)) reach over 98 per cent of the population and cover 20 per cent of the Australian landmass (ACMA, 2005; Allen Consulting Group, 2005). In 2004-05, the total mobile telecommunications revenue reached $9.1 billion, which was approximately 30 per cent of the total telecommunications revenue, with more than 18.4 million mobile subscribers, representing approximately 90 per cent of the Australian population (ACMA, 2005). It is predicted that the Australian mobile phone industry will soon move to 3G products and services, with 3G users comprising one-third of the market and non-voice revenue constituting almost 30 per cent of total revenue by 2009 (Johnson, 2005)[1], though a concern is spreading that margins from 3G networks are shrinking (*The Australian*, 2006a). It is also reported that globally mobile data revenues exceeded $US 100 billion ($AU 132 billion) for the first time in 2005. The growth in mobile data subscriptions worldwide is attributed to deployment of advanced technologies and handset improvements (*The Australian*, 2006b).

As indicated above, it is expected that use of non-voice services, that is mobile data services, will increase. There is little research on the current use of mobile data services in Australia, although there have been some studies

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[1] Recently in October 2006 Telstra launched an aggressive campaign for a new 3G network called Next G using HSDPA (high-speed packet download access).

conducted in other countries (Hyvönen and Repo, 2004; Kim et al., 2004; Carlsson et al., 2005). This study explores the use of mobile data services in Australia. There are some widely accepted descriptions surrounding the use of mobile data services: 'mobile data services are more used by young people than old people', 'females use mobile data services mainly for personal purposes, whereas males for work-related purposes' and so on. One of the contributions of this study is to examine these descriptions through a survey of over 6,000 mobile phone users. This paper aims to characterise the use of mobile data services in Australia by some demographic variables including gender, age and education.

The rest of the paper is organised as follows. In the following section, we present a description of current mobile data services in Australia. Then we describe the data collection process, present and discuss the survey findings. To conclude the paper, we discuss some implications and limitations of the study, and suggest some future studies.

MOBILE DATA SERVICES IN AUSTRALIA

The use of mobile data services by Australian consumers continued to expand in 2004–05. SMS has remained the most popular non-voice application for mobile phone users, although consumers are also using other data applications such as accessing mobile internet, exchanging emails and downloading ring tones (ACMA, 2005; Nelson and Wilson, 2005). The growth in SMS usage remained strong. There were 6.736 billion SMS messages sent during 2004–05, compared to 5.078 billion in 2003–04. SMS continues as an important sector of revenue growth (ACMA, 2005; Trivedi, 2006). Strong growth in premium SMS and multimedia messaging service (MMS) usage are also reported (ACMA, 2005; Allen Consulting Group, 2005).

Another rapidly growing sector of the mobile data services is content services, which has become prominent with the extra functionality of 2.5G and 3G mobile networks and customer handsets (ACMA, 2005). A report cited by ACMA (2005) estimates that the Australian mobile content market was worth $129 million in 2004 and high growth is expected over the next five years to achieve $1 billion annual revenue, driven by entertainment (including the adult services sector), followed by enterprise applications and productivity services (email and instant messaging services).

Australia's four network operators (Telstra, Optus, Vodafone and Hutchison) all have specific service offerings focusing on the delivery of content over mobile phones. For example, Telstra's mobile content service uses the i-mode platform developed by NTT DoMoCo, which provides contents such as news, sports, entertainment and games. Under its licence agreement with NTT DoMoCo, Telstra has exclusive rights to market i-mode in Australia for five years, provided that it attracts at least one million customers in the first three years (Anderson, 2004).

i-Mode is one of the leading platforms that supports a range of m-Commerce. M-commerce refers to the use of wireless telecommunications in carrying out commercial transactions (ACMA, 2005). M-commerce examples include paying for car parking and soft drinks and paying for airline and concert ticket reservations. According to Teo et al.'s (2005) study on inhibitors and facilitators in the adoption of mobile payment in Australia, mobile payments are still not a commonly accepted method in Australia. Great efforts are still needed to promote the growth of m-commerce in Australia.

METHOD

The Survey

The survey was conducted within the framework of an international research consortium, called the World Mobile Internet Survey (WMIS). Academics and industry researchers from over ten countries conduct an annual survey on the trends and use of mobile data services worldwide. The 2006 survey is the fifth one. The merit of the WMIS survey is to obtain consistent information across the participating countries because they use the same questionnaire (though some modifications are allowed considering the differences in service offerings and market maturity among the countries). In Australia the survey was conducted in 2006 through university-industry collaboration. The research team at the University of Melbourne and the researchers at m.Net – a mobile service enabler based in Adelaide – jointly coordinated the survey and data analysis.

The survey was administered electronically by m.Net Corporation via email and selected web sites. The survey was posted on 20 web sites. Some are magazine sites like Marie Claire (http://www.marieclaire.com.au/) and Men's Health (http://www.menshealthmagazine.com.au/); others include radio station sites (2DayFM http://www.2dayfm.com.au/) and a university site. In addition, the survey was emailed to all members of the Australian Interactive Media Industry Association (AIMIA) and opted-in participants of an in-house research database held by m.Net Corporation. There was an incentive to encourage respondents to complete the survey. The survey was 'live' from Monday 27 February 2006 to Monday 13 March 2006. The total of 6116 respondents completed the questionnaire.

Questionnaire Design

The 2006 version of the WMIS survey was designed by a panel of participating researchers. The questionnaire consists of three sections: use of mobile data services, respondents' views on mobile services and demographic questions. This paper draws on the questions on mobile data service use combined with demographic variables.

In this survey, mobile data services (MDS) refer to an assortment of digital data services that are accessed through a mobile phone (e.g. SMS, e-mail, Multimedia Messaging Service (MMS), news/weather information, ringtone downloads, audio/video clip downloads). We limit the device under study to mobile phones, excluding laptop computers and PDA (e.g. using wireless LAN for mobile access via laptops and PDAs).

Four types of mobile data services are identified and included in this survey:

- commerce: buying goods/tickets, making reservations, bill payment

- communication: e-mail, SMS, MMS, mobile chatting, push-to-talk

- information: news/weather/sports/stock market info, shopping info, schedules, product info, maps, location-based info

- entertainment: downloading games, graphics, cartoons, music, betting, ringtones, adult content

For each service, the 'how often do you use' question was asked. Five responses (not at all; not often; somewhat often; often; very often) were given, and they were recoded into three ([not at all; not often]=1, [somewhat often]=2 and [often; very often]=3).

Data processing and the profile of the sample

Data with inconsistent responses were excluded from the analysis. For example, some respondents answered that they were retired while categorizing their age as under 24; others answered that they were postgraduates while under the age of 18. We also excluded the category "other" in some questions as many respondents who chose this option did not specify the nature of the 'other'. After exclusions, out of 6116 responses, 5531 were analyzed. Table 1 shows the profile of the sample.

Before we look at data analysis and its interpretation, it is worth noting that 78.4% of the respondents are female. This unbalanced proportion of the gender is due to the fact that we used some magazine sites for recruitment whose main readers are females. Female respondents are also younger than male respondents (Table 2 and Figure 1). This affects the education level and the employment status of the sample. The education level of female respondents is generally lower than that of male respondents, and more males are employed than females. Interestingly, on household income, which has no reason to be different by gender in theory, our study indicates that female respondents have a lower household income than that of male respondents.

Age	
below 18 yrs	1156 (20.9%)
18-24 yrs	1113 (20.1%)
25-34 yrs	1513 (27.4%)
35-49 yrs	1361 (24.6%)
50-65 yrs	360 (6.5%)
over 65 yrs	28 (0.5%)
Total	5531 (100.0%)
Gender	
Female	4335 (78.4%)
Male	1196 (21.6%)
Total	5531 (100.0%)
Education	
Postgraduate Degree Level	479 (8.7%)
Graduate Diploma and Graduate Certificate Level	263 (4.8%)
Bachelor Degree Level	1078 (19.5%)
Advanced Diploma and Diploma Level	562 (10.2%)
Certificate Level	883 (16.0%)
Secondary Education	2054 (37.1%)
Primary Education	166 (3.0%)
Pre-primary Education	4 (0.1%)
Other Education	42 (0.8%)
Total	5531 (100.0%)
Household income	
under $24K	905 (16.4%)
$25-50K	1414 (25.6%)
$51-100K	2053 (37.1%)
$101-149K	708 (12.8%)
$150K or higher	451 (8.2%)
Total	5531 (100.0%)
Employment	
Student	1793 (32.4%)
Retired	119 (2.2%)
Full time parent	514 (9.3%)
Unemployed	217 (3.9%)
Employed	2888 (52.2%)
Total	5531 (100.0%)

Table 1. The profile of the sample

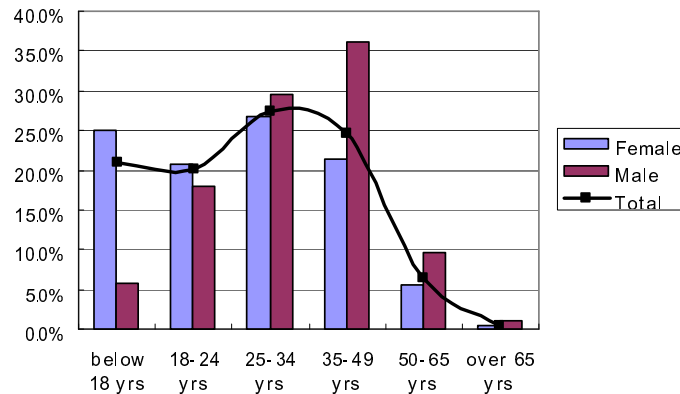|	Female	Male	Total
below 18 yrs	1088 (25.1%)	68 (5.7%)	1156 (20.9%)
18-24 yrs	899 (20.7%)	214 (17.9%)	1113 (20.1%)
25-34 yrs	1159 (26.7%)	354 (29.6%)	1513 (27.4%)
35-49 yrs	929 (21.4%)	432 (36.1%)	1361 (24.6%)
50-65 yrs	244 (5.6%)	116 (9.7%)	360 (6.5%)
over 65 yrs	16 (0.4%)	12 (1.0%)	28 (0.5%)
Total	4335 (78.4%)	1196 (21.6%)	5531 (100%)

Table 2. Distribution of the sample: age by gender

Figure 1. Distribution of the sample: age by gender

Because of these characteristics of the sample, we paid special attention to distinguishing the effects of age from those of gender. Although the results of statistical tests show that there are significant differences between males and females, we should be careful in concluding that the results come from the gender factor. For example, if a statistical test shows that females use mobile data services more, we have to check the possibility that the result may reflect the effects of age.

DATA ANALYSIS AND FINDINGS

One-way ANOVA and Crosstab Analysis

We first performed One-way ANOVA and Crosstab analysis to find out if the sample shows different usage patterns of mobile data services by the demographic variables. Those statistical tests are generally used to find out if there is a difference of the means between two or more groups. When the dependent variable is categorical, Crosstab analysis is applied and if continuous, then One-way ANOVA is used. Table 3 shows the significances of the analyses[2]. It shows that most of the test results are statistically significant at the level of 0.01.

	gender	age	education	employment	income	payer
Commerce	0.013	0.000	0.299	0.002	0.003	0.000
Communication	0.000	0.000	0.001	0.000	0.005	0.001
Information contents	0.000	0.000	0.002	0.000	0.005	0.000
Entertainment contents	0.083	0.000	0.000	0.000	0.000	0.000
Personal/Work	0.000	0.000	0.000	0.000	0.000	0.000
Minutes	0.000	0.000	0.001	0.000	0.000	0.000

Table 3. Significance of the analysis results

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[2] The item "Do you use wireless data services more for personal activities or more for work-related activities?" is a categorical variable, and Crosstab analysis was performed for this variable only. The table shows the significance of ANOVA and the significance of Pearson Chi-square in the case of Crosstab analysis.

According to the results, it appears that there are different usage patterns of mobile data service by gender, age, education, employment status, income level and payer ('who pays the bill?). However, as we noted above in the profile of the sample, we cannot conclude that every demographic variable can possibly be used for classifying users or predicting use of mobile services.

For example, among the three groups classified by 'who pays for the mobile phone bill', the shared payer group responded that they use mobile data service more often than the groups of 'self payer' and 'others'. We should not conclude that mobile data service users who share their payment with others (e.g. parents) are the frequent users. Considering Table 4, it is evident that it is not 'who the payer is' but 'how old they are' that makes the difference in mobile data service use because 55.2% of the shared payer group are under 18 and 16.3% of them are in the age group 18-24.

Who pays	below 18 yrs	18-24 yrs	25-34 yrs	35-49 yrs	50-65 yrs	over 65 yrs	
Self	11.1%	21.5%	31.0%	28.1%	7.6%	0.7%	100.0%
Shared	55.2%	16.3%	14.9%	10.0%	3.6%	0.0%	100.0%
Other	47.6%	15.8%	17.2%	16.2%	3.2%	0.0%	100.0%

Table 4. Who pays the bill by age

In the demographic variables examined, age was found to be the most significant variable which can be used for classifying users by the degree of mobile data service use. This corresponds to results from Finland (Hyvönen and Repo, 2004) where age predicts usage patterns. This also sheds light on the next stage of data analysis.

Two-way ANOVA

We found that age was the most promising variable to classify mobile data service users in the first stage of analysis. However, the results only show the strong effects of age on the mobile data service use. Younger people use mobile data services more. The results are as expected, and do not give many implications to both researchers and practitioners. The result from the first stage of analysis brought us to the second stage of the analysis, Two-way ANOVA, including not just one factor but two factors to identify meaningful groups. In this analysis, we basically included age as an independent variable because we identified its strong effects, and use other variables in turn as a second factor.

Table 5 shows means of each mobile data service use. As the usage is coded into three point scale ([not at all; not often]=1, [somewhat often]=2 and [often; very often]=3), the result shows that except for communication, mobile data services are not much used in Australia. This also coincides with the fact that there are few mobile commerce service offerings in Australia. High usage of communication services is mainly due to SMS.

	commerce	communication	information contents	entertainment content
means	1.43	2.79	1.75	1.83

Table 5. Means of each mobile data service use

Although the usage level is generally low, we can still identify differences among demographic groups. For example, in the use of mobile commerce, direct significant impacts of age (significance of 0.000), household income (significance of 0.000), and compounding effects of age and gender (significance of 0.048) are found. Other factors, when combined with age, do not appear to be significant. The mean of mobile commerce use in each age group is significantly different from each other. In general younger people use mobile commerce more. At each level of age, gender difference is shown to have effects on mobile commerce use. In general, males use mobile commerce services more than females at each level of age. This is observed in other types of mobile data services. Here we present the result for communication use in detail.

In the use of mobile communication services, we found direct significant impacts of age (significance of 0.000; Figure 2), household income (significance of 0.016; Figure 3) and gender (significance of 0.002; Figure 4). As expected, the younger they are and the more household income they earn, the more they use mobile communication services.
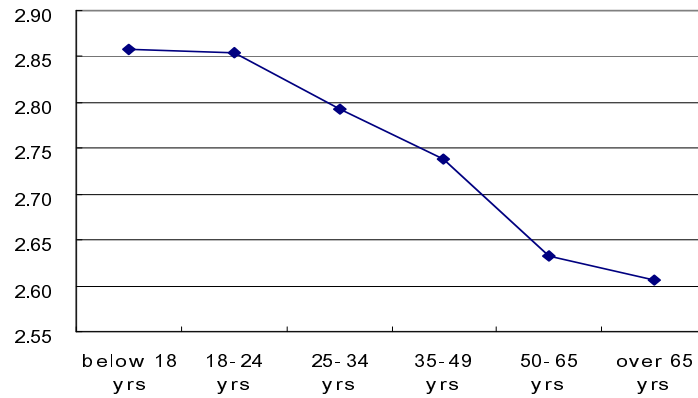
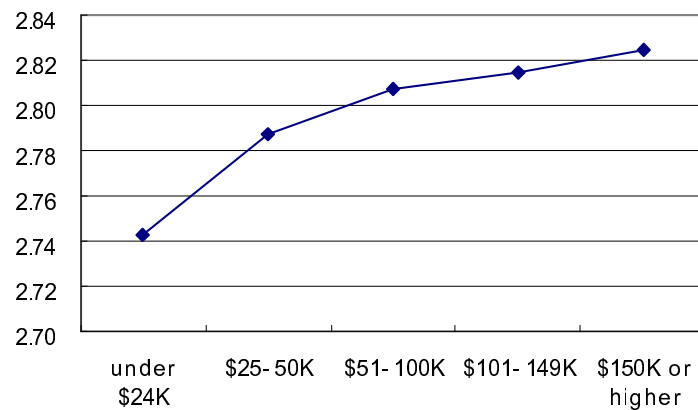Figure 2. Mean of each age group on mobile communication use

Figure 3. Mean of each household income group on mobile communication use

Interestingly, different from mobile commerce use and information content use, where males consistently show higher scores than females, females use more mobile communication services (Figure 4; significance of 0.002). Then we analysed for what activities each gender use mobile data services. As seen in Figures 5, 6 and 7, females used mobile data services more for personal purposes in most of age groups (the number of '65 years old' is very small; Figure 5; Significance of Pearson Chi-square, 0.000), while males use them more for work activities (Figure 6; Significance of Pearson Chi-square, 0.045). For those who ticked using mobile data services for both purposes, there are still more males than females in each age group (Figure 7; Significance of Pearson Chi-square, 0.000).
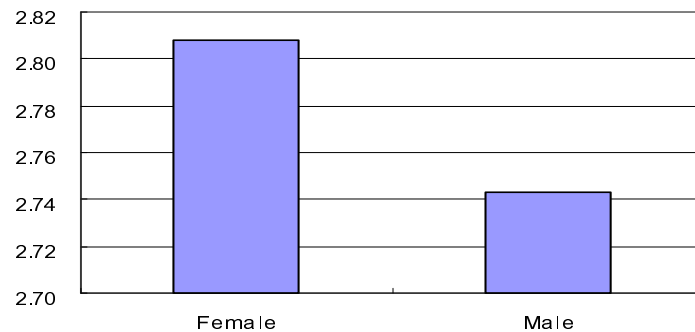
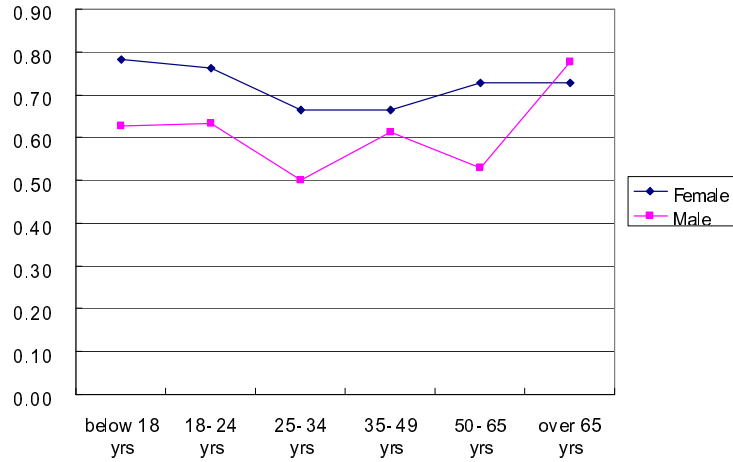Figure 4. Mean of each gender group on mobile communication use

Figure 5. Percentage of each age by gender on the use of MDS for personal purposes
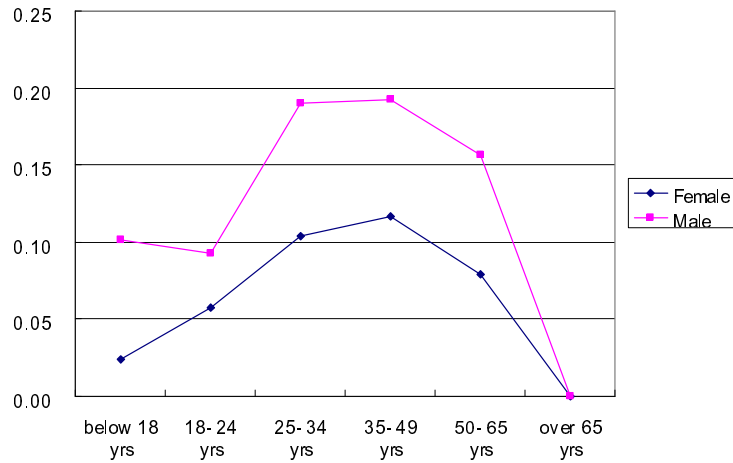

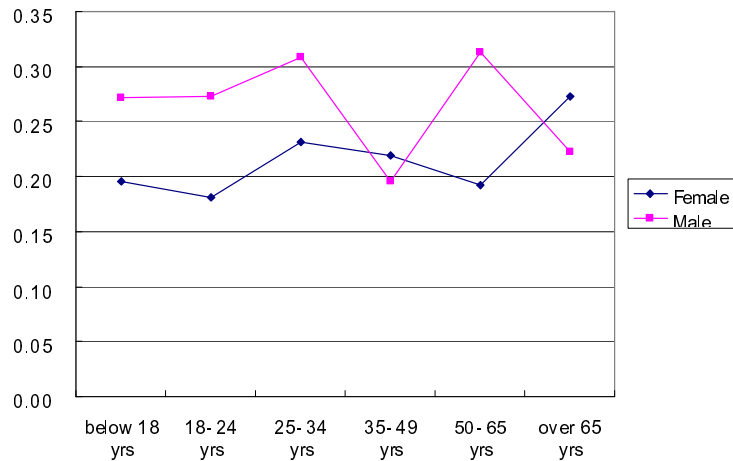Figure 6. Percentage of each age by gender on the use of MDS for work purposes

Figure 7. Percentage of each age by gender on the use of MDS for both work and personal purposes

We could not find any compounding effects except that of age and household income. At each level of age, household income affects mobile communication service use as well (significance of 0.009; Figure 8).
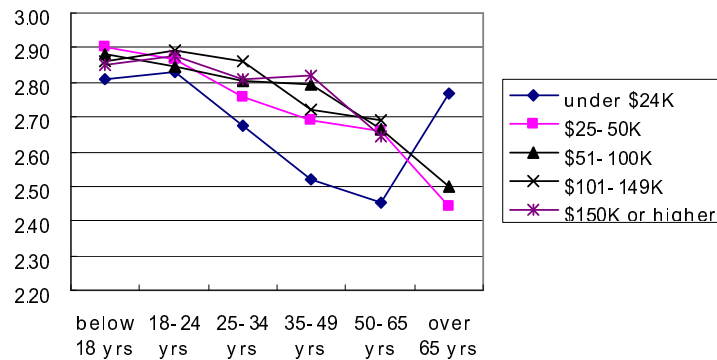
Figure 8. Mean of each age by household income group on mobile communication use

DISCUSSION AND CONCLUSION

According to the results of the analysis, a commonly accepted perception is confirmed that the behavior of mobile phone users in using mobile data services is greatly dependent on age. The result of the survey is almost the same as the findings of previous studies on the Internet use in its early stages (GVU Center, 1994-1998). Those studies concluded that young people are generally more willing to adopt new technologies than older people. For every aspect of mobile data services, younger people tend to use and enjoy them more than older people.

Therefore, at least in the short term, it is primarily the younger age group that needs to be targeted for the development of innovative mobile data services. For this, mobile carriers need to have a more sophisticated segmentation of younger age groups who may have different thoughts, attitudes and behaviors.

In a sense, the differences between age groups imply that the development of mobile data services is still in its infancy. If we think of the trajectory through which the Internet has developed, the age gap will diminish as time goes on; young people become older and mobile data service will increasingly penetrate into everyday lives. In the long run, we expect mobile data services to evolve to incorporate the needs of individuals across all the age groups.

We have found that there is a difference between males and females on the types of mobile data services they use. Whereas females show more mobile data use for communication purposes, males use mobile data services more for the commercial purposes, information content and entertainment content. It seems that the expectations of males and females for mobile data services are different. The results show who the main user group of each service is and who should be considered more in the development of particular mobile applications.

We also find partial or full effects of household income from the analysis. Again, this is similar to the effects of household income during early stages of the Internet's development. The more income people earn, the more they use mobile data services. The observation that the level of household income has a relationship with mobile data service use, makes sense if we understand that it is still expensive to use mobile data service, and wealthier individuals have easier access to mobile data services.

To summarize, age is the most important demographic variable when attempting to classify groups by degree of mobile data service use and for predicting use of mobile data services in the population. In addition to age, gender and household income have a role in providing more details for describing each group's consumption of mobile data services. We also explored other demographic factors, such as employment status, which has a compounding effect with age on mobile data service use. However, further inquiry is required before we are able to come to definitive conclusions.

The limitations of the study are mainly the result of the nature of exploratory research. We started the study to find out and understand – that is, explore – the demographic characteristics of mobile data service users in Australia. We were not guided by theory because the purpose was to explore, rather than to test any hypotheses drawn from theories. During the process of research we depended more on the rule of thumb, and took the 'heuristics approach' to figure out which demographic factors were most effective in describing mobile data service users. Based on the findings of this study, more rigorous studies are to follow.

The size of the sample is sufficient for reliable analysis, but the sample is biased towards females, with younger age and lower household income. This may have been caused by the fact that the survey was administered on the Internet. The sampling bias does not undermine the statistical results of the study. However, more could have been

achieved if stratified sampling had been employed. Moreover, this exploratory study gives only a rough profile of the use of mobile data services. If the research objective is narrowed down to a detailed level, a factorial research design with two or more factors would be a preferable method, and then stratified sampling techniques could be applied.

We divide people into five age groups in this research and this is just to show how users differ by age. As the findings show, age is the most influential variable. In media and communication services like mobile data services, different age groups (e.g. lower teens, upper teen and early twenties even among young people) may have distinguishable needs for different services. By having more precise criteria for classification, we will be able to identify age-group-specific needs and wanted services. We can also find more homogeneous age groups using other statistical techniques in follow-up studies. The same applies to other demographic factors. This information will be useful for service providers in developing new services targeting a specific homogeneous group.

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