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**Australian Consumers' Adoption of Mobile Phones:  
A Five-Year Study of the Market and its Structure**

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## **Australian Consumers' Adoption of Mobile Phones: A Five-Year Study of the Market and its Structure**

### **Abstract:**

This study aims to examine characteristics of Australian households which had mobile phones, and to test two of Rogers' generalised descriptions of the 'earlier adopter'. The study is based on data collected in two nationally representative Household Expenditure Surveys conducted by the Australian Bureau of Statistics in 1998-99 and 2003-04. Findings indicate that the number of households with mobile phones increased by 80%, and market penetration increased from 37% to 60% of all households during the five year period. Propensity to own a mobile phone was higher among younger household heads, and seemed to increase with the household income and the number of credit cards. The use of mobile phones was somewhat lower among female headed households. Rogers posited that 'earlier adopters' would have higher incomes. This was supported in both surveys. Rogers also posited that there is no relationship between age and adoption. However, both surveys demonstrated consistent relationships indicating that 'earlier adopters' tend to be younger. Some of the managerial implications of the findings are also discussed.

**Keywords:** Adoption, Cell Phones, Consumers, Demographics, Diffusion, Innovators, Mobile Phones

**Suggested Track:** Marketing in the Asia-Pacific

## Introduction

The diffusion of innovations is widely accepted as an important area of research for marketers, particularly for its ability to increase the efficiency of new product marketing endeavours (Rogers, 2003). One aspect of this area is the identification of those consumers most likely to adopt a new product soon after its introduction, the early adopter or consumer innovator. The profile of these 'earlier adopters', *ie* those characteristics that facilitate the identification of this person, is a matter of managerial and academic interest, yet this issue remains unresolved. On the one hand, innovators are regularly reported as being younger, more educated and possessing higher levels of education (McDonald *et al.*, 2003) yet some studies have reported no such significant relationships (see Table 1). The managerial importance of this issue increases as product life-cycles decrease, suggesting that it is more important than ever to reconcile this matter

This study utilises two nationally representative surveys to examine the relationship of age and income to the adoption of mobile phones by consumers in Australia and general characteristics of this market

## Innovators and the diffusion process

McDonald *et al.* (2003) found that, at that time, all marketing management and consumer behaviour text books contained sections on the diffusion of innovations. Examination of current equivalent student texts revealed that this situation has not changed, highlighting again the importance of the diffusion of innovations as an area of study. A standard element in discussions of the diffusion of innovations is the work of Rogers, and in particular, what some authors refer to as the "Rogers' curve" (Rogers and Shoemaker, 1971; Rogers, 2003). This theoretical curve has a normal distribution, and is divided into five discrete sections along the time (x) axis: Innovators (2.5%); Early Adopters (13.5%); Early Majority (34%); Late Majority (34%) and Laggards (16%, the late adopting counterparts of the Innovators and Early Adopters).

The Innovators, and, in particular, their general characteristics or profile, have attracted a substantial body of research which continues to grow (*e.g.*, Lin, 2006; McDonald *et al.*, 2003). Notionally, expediting penetration of the Innovators may help expedite later segments of the Rogers' curve. The potential for substantial benefits to a firm in terms of reduced adoption time, and consequent reductions in marketing investment and time (and investment) to break-even readily justify the attention this area has received

## Critical comments

Despite the general acceptance of Rogers' model (2003) evidenced by its widespread inclusion in student texts, some criticisms have arisen. Steffens and Murphy (in Schiffman *et al.*, 2001, p 495) have suggested that the Rogers' curve should not be considered in isolation, but would be more properly considered as part of the product life cycle. Implemented in this way, the categories of Rogers' (2003) model would be overlayed on the product life cycle phases, without necessarily having common boundaries. Peterson (1973) questioned the use of only one type of curve, *ie*, a normal curve, suggesting that skewed curves may be more appropriate in some circumstances. Given that the Innovators represent the area under the normal curve more than

two standard deviations from the mean (in one tail), questioning the shape of the curve implicitly questions the size of adopter categories. The relative sizes of the various adopter categories was explicitly questioned by Mahajan *et. al* (1990). It should, however, be noted that empirical evidence supports the normal distribution curve as the appropriate model for a substantial range of products (Rogers, 2003).

### **Identifying innovators**

Rogers' (2003) approach to categorising product adopters has received substantial attention in the research literature, with the majority of research focussing on the Innovators. Midgley and Dowling (1978) note that in 23 studies of innovativeness, implicit in all was the notion of innovativeness as relative time of adoption, with 70% citing the work of Rogers (1962) or Rogers and Shoemaker (1971). Yet they also note that these studies generally adhered to one of two techniques for measuring innovativeness, either "defining as innovators those individuals who purchase in the first *X* weeks, months, years, etc , after product launch" (Midgley and Dowling, 1978, p. 230) or, alternatively, determining how many new products (from a predetermined list) a particular individual has purchased at the time of the survey, and identifying innovators from their score. These approaches seek to identify individuals' adopter categories based on their actual behaviour, rather than intention

While the above approaches are founded on a reasonable assumption that individuals will exhibit behaviour consistent with their adopter category, other approaches to identify individuals' adopter categories assumes that individuals will possess particular characteristics or traits, which will be reliable indicators of adoption behaviour. One line of research has been to identify "innovativeness" as a personality trait. Lent credence by its implicit recognition by Rogers (2003) in describing the characteristics of innovators, it has nonetheless not reached its potential. A recent review by McDonald *et. al.* (2003) noted that problems with this line of research included a lack of consensus regarding the conceptualisation of "innovativeness", and the equivocal results of trait-based studies (see also Kassarian and Sheffet, 1991). They concluded that "for the process of identifying innovators to be managerially useful it needs to be correlated to observable characteristics. Since we cannot measure the personality traits of the entire market, in order to find our desired segment, researchers have always sought to link personality traits to more readily identifiable variables" (McDonald *et. al.*, 2003 p 87) and that this, too, has proven difficult.

An alternate approach to identifying Innovators has been the use of socio-economic or demographic indicators. Rogers (2003, pp. 287-92) proposed several sets of general characteristics of Innovators, including socio-economic characteristics. Table 1 lists some socio-economic generalisations put forward by Rogers (2003) and the results of a range of studies regarding socio-economic characteristics. It is readily concluded that the identification of reliable socio-economic indicators as predictors of product adoption is also yet to reach a definitive conclusion. One possibly useful factor in clarifying these issues is the level of analysis. Rogers' curve was framed around a population, either the market for the product being considered or the whole population if one includes those who do not adopt. Academic research, however, has typically focussed on just one fragment of that population, *i.e.* innovators. Consideration of these issues in the context of an entire population may produce useful insights.

Table 1. Studies of socio-economic indicators and adoption

Study	Unit of study	Age	Education	Social status/ income	Product
Rogers, 2003	Earlier adopters	Not related	Positively related	Positively related	Various products
Goldsmith and Flynn, 1992	Innovators	NS*, weak	NS*, weak	S*, weak	Womens' fashion
Flynn and Goldsmith, 1993	Innovators	NS*	NS*		Travel service
Goldsmith <i>et al.</i> , 1998	Innovativeness	US/German: NS*, French: S*			Wine consumption
Lin 2006	Adoption				Web casting
McDonald <i>et al.</i> , 2003	Innovators	Middle aged or older: S*	S*, weak, positive	NS*	Energy saving light globes
Steenkamp <i>et al.</i> , 1999	Innovators	S*	NS*	NS*	

\* S: Significant; NS: Not significant

### Objectives of the study

This study has two objectives. One objective is to characterise the Australian mobile phone market (also known as cell phones). The celebration of the 20th anniversary of the first mobile phone call in Australia on February 23, 2007, suggested that this product might be sufficiently developed to provide data from both early and late adopters.

The second objective is to examine two of Rogers' (2003) generalisations of what Rogers refers to as the "earlier adopter," *i.e.*, that age is not related to adoption, and that income is positively related to adoption. In stating the socio-economic generalisations (Rogers, 2003, p 288) of 'earlier adopters' rather than Innovators or Early Adopters, it is considered that Rogers is suggesting a general trend across the range of individuals who adopt, and possibly those who do not adopt. In other words, this study considers whether there is a relationship between the ages and incomes of those who adopt sooner and those who adopt later. This study examines these characteristics in the context of a nationally representative sample, a novel approach compared to recently published diffusion literature.

Consideration of Rogers' (2003) two generalisations, *i.e.*, that age is not related to adoption, and that income is positively related to adoption, is performed by testing five hypotheses. Assuming that the generalisations are true, there should be consistent relationships between adoption and income, which should hold within and between the two data sets. Within each data set, if income

is positively related to adoption, then those who have adopted at any given time, will have a higher average income than those who have not adopted.

Hypothesis 1: In 1998-99, the average income of adopters will be higher than the average income of those who have not adopted.

Hypothesis 2: In 2003-04, the average income of adopters will be higher than the average income of those who have not adopted.

Also, those who adopt during any given time period will be the higher income members of the group who had not adopted at the beginning of the time period. As these consumers leave the ranks of non-adopters and become adopters across the time period, their re-classification will lower the average income of both adopters (as these lower income members join) and those who have not adopted (as what were higher income members leave). An inflation rate of 17.1% over the five-year period was used to adjust the dollar figures to a standard year.

Hypothesis 3: When adjusted for inflation, the average income of adopters in 2003-04 will be lower than the average income of adopters in 1998-99.

Hypothesis 4: When adjusted for inflation, the average income of those who have not adopted in 2003-04 will be lower than the average income of those who have not adopted in 1998-99.

Rogers' (2003) generalisation that age is not related to adoption, has been generally supported, although some studies have found contrary results (see Table 1). If supported, there will be no consistent relationship between the ages of adopters and those who have not yet adopted.

Hypothesis 5: There will be no consistent relationship between the average age of adopters and the average age of those who have not yet adopted. This will be manifested by disparate findings among the following characteristics:

- (i) the average age of adopters and the average age of those who have not adopted in 1998-99,
- (ii) the average age of adopters and the average age of those who have not adopted in 2003-04,
- (iii) the average age of adopters in 2003-04 and the average age of adopters in 1998-99, and
- (iv) the average age of those who have not adopted in 2003-04 and the average age of those who have not adopted in 1998-99.

### **Data and methods**

The Australian Bureau of Statistics (ABS) carries out Household Expenditure Surveys (HES) every five years. Data pertaining to the last two surveys done in 1998-99 and 2003-04 have been

used in this study. In both surveys, a household was defined as “a person or group of persons living together and having common provision for food and other essentials of living” (Australia, 2006). The scope of the surveys included usual residents of private dwellings in Australia, except foreign diplomatic or defence force staff and people living in remote areas. The sample sizes were 6,893 and 6,957 households for the 1998-99 and 2003-04 surveys respectively. Both samples were selected using a multistage, stratified probability sample design. Personal interviews were conducted in the selected households to obtain data on characteristics of households and their members, and various items of income and expenditure. In addition, identified spenders in the households were each issued with a diary to record expenditure on every item over the two weeks’ period immediately after the interview. In each household a person, aged 15 or over was selected as the “reference person”, if they were the first sole person in the household to fulfill one of the following criteria applied in order: was a partner in a registered or *de facto* marriage, or a lone parent with dependent child(ren), or the person with the highest income or the eldest person. In this paper we have designated such reference persons as the “household head”. Appropriate weighting factors were assigned by the ABS to each household to enable the estimation of the number, characteristics and expenditure patterns of all households in Australia. Although the sample was large enough to allow estimates for each State and Territory, only national data are presented in this paper. The weighted estimates using the survey data have been reported as averages or counts.

For the purposes of this research any household which reported expenditure on mobile phones was considered to be a user of mobile phones. It may be noted that in this study it is not possible to determine the total number of mobile phone users in Australia as it was only possible to identify households which had at least one mobile phone account. It should also be noted that this study only covered mobile phones in private use by households, *i.e.*, this study examines the consumer market.

Three variables were considered. Rogers’ characteristics of age and income were tested using the age groups less than 30 years, 30-59 years and 60 years and over, and the intervening years split into three groups of ten years each, all based on the age of the household head. Income was identified by income quintile groups. A third variable, the number of credit cards held by the household was investigated to provide further information to characterise the market. It could be argued that the number of credit cards is positively related to income, as those with higher incomes will presumably have greater access to credit, however, while a significant (at 5% level) positive relationship is evident, it only produces an  $R^2$  of 0.09 in 1998-99, although this increases to 0.16 in 2003-04. Given that the number of credit cards has limited correlations with income, it would seem valuable to investigate this variable in its own right.

## Findings

### *Characteristics of households*

Based on the two surveys, it was estimated that the total number of households in Australia in 1998-99 was 7.12 million which increased to 7.74 million by 2003-04, an increase of just under 2% per annum. While 61% of Australian households reported a male household head in 1998-99, this proportion had declined marginally, *i.e.*, half a percentage point, by 2003-04.



Table 2 shows, for both surveys, the distributions of all households and those having a mobile phone by age of the head, income quintile and the number of credit cards the household had. Considering all households, it appears that there were proportionately more female headed households in the youngest and oldest age groups - this was true in both surveys. Overall, the average age of the household heads was 47 years for males and 49 years for females in the 1998-99 survey and it increased marginally to 49 and 50 years respectively in the 2003-04 survey.

Female headed households were over-represented in the two lowest income quintiles in both surveys. The average weekly income from all sources was AUD1013 for male headed households in the first survey and it increased to AUD1276 by 2003-04, an increase of about 26%. On the other hand, the corresponding averages for female headed households were AUD659 and AUD890 respectively – an increase of 35%. Thus, although there was a significant gender gap in the income of households, the gap seemed to be narrowing slowly, even allowing for inflation. Female headed households were also over-represented in the “none” and “one” credit card categories. Again the gender gap seemed to have decreased in 2003-04 compared to 1998-99.

Table 2 Characteristics of all households and those with mobile phones:  
Australia, 1998-99 and 2003-04 Household Expenditure Surveys.

Characteristic	All households				Those with mobile phones			
	1998-99		2003-04		1998-99		2003-04	
	M*	F**	M*	F**	M*	F**	M*	F**
Households (in millions)	4.35	2.77	4.68	3.06	1.76	0.86	2.97	1.67
	%							
<i>Age of the head of household</i>								
<30	13	16	11	14	16	24	14	18
30-39	23	21	22	19	26	23	24	23
40-49	23	20	23	20	27	26	24	24
50-59	18	14	19	17	19	18	21	19
60+	23	29	24	30	12	11	17	15
<i>Income quintile</i>								
First	14	31	14	29	7	13	9	15
Second	16	25	17	25	10	21	12	24
Third	21	18	22	18	20	23	22	21
Fourth	24	14	22	16	27	22	26	21
Fifth	25	12	25	13	37	21	31	18
<i>Credit cards</i>								
None	31	39	26	35	19	20	18	24
One	35	32	39	36	37	36	39	38
Two	19	17	22	19	22	26	25	24
Three	8	7	8	6	11	10	9	9
Four or more	7	5	6	4	10	8	8	6

\* Male headed households; \*\* Female headed households

The total number of households with mobile phones increased from 2.61 million in 1998-99 to 4.65 million in 2003-04 – an increase of just under 80% over the five year period. Similarly the female proportion of mobile phone households increased from 33% to 36% over the same period.

The last four columns of Table 2 show characteristics of households which had mobile phones. In both surveys, the proportionate age distributions by the gender of the household head were quite similar, except for the <30 age group where the proportion of female headed households exceeded that of male headed households. Comparison over the two surveys indicated that there was a drop of six percentage points in the under 30 proportion and a considerable increase among those 50 years or older. Overall it appears that with the passage of time mobile phones were becoming more popular among older people.

Table 3. Market penetration of mobile phones: Australia, 1998-99 and 2003-04 Household Expenditure Surveys

Characteristic	Market penetration per 1,000 households			
	1998-99		2003-04	
	M*	F**	M*	F**
All households	404	311	635	548
<i>Age of the head of household</i>				
<30	488	448	785	729
30-39	452	340	693	660
40-49	467	401	672	664
50-59	436	401	690	609
60+	215	113	436	281
<i>Income quintile</i>				
First	222	131	385	291
Second	235	254	473	529
Third	369	404	637	661
Fourth	454	483	737	719
Fifth	596	543	798	793
<i>Credit cards</i>				
None	253	156	449	380
One	424	350	649	576
Two	466	474	737	700
Three	569	478	764	732
Four or more	619	490	801	726

\* Male headed households; \*\* Female headed households

A positive gradient in the proportion of households with a mobile phone(s) classified by household income quintile and the number of credit cards was interesting. The proportional increase in mobile phone households among the bottom two income quintiles indicates the increasing affordability of mobile phones for lower income households. Similarly, there was an

indication of an increase in the proportion of mobile phone households which had no credit card and those which had one credit card. It is interesting to note that in the lowest two household income quintiles and households with no credit cards, female headed households exceed, in proportional terms, the male headed households

#### *Market penetration of mobile phones*

In 1998-99 nearly 37% of all Australian households had one or more mobile phones; this figure increased to just over 60% by 2003-04. During the five year period, the male headed households with mobile phones experienced an increase of 57% *vis-à-vis* 76% for the female headed households. As expected the mobile phone penetration among the younger households (those with household heads <30) was highest, and among the older age groups (60+) it was at its lowest level. A positive association between the market penetration of mobile phones and the household income quintile and the number of credit cards the household had is worth noting from Table 3.

Comparison of the data for the two surveys revealed that in all categories of age, income and credit cards, there were monotonic increases in the mobile phone penetration of Australian households

#### *Testing Rogers' generalisations*

It is readily apparent from Table 4 that the average income of adopters was higher than that of those who had not yet adopted in both 1998-99 and 2003-04. The 2003-04 average income for adopters, adjusted for inflation (AUD1128) was lower than the adopters' average income in 1998-99. The equivalent comparison of those who were yet to adopt produced the same conclusion. Hypotheses 1-4 are therefore upheld, indicating that Rogers' (2005) general characteristic of 'earlier adopters' having higher incomes holds true for mobile phone products in Australia, for at least two points in time, across the 17 year period between their introduction in Australia and 2003-04

With regard to consumers' ages, Table 4 indicates that:

- (i) The average age of adopters was less than the average age of those who had not adopted in 1998-99, *i.e.*, adopters tend to be younger.
- (ii) The average age of adopters was less than the average age of those who had not adopted in 2003-04, *i.e.*, adopters tend to be younger.
- (iii) The average age of adopters in 2003-04 was higher than the average age of adopters in 1998-99. This is consistent with adopters tending to be younger. If an element of those who were yet to adopt in 1998-99 (an older group) combine with that year's adopters (a younger group), the average age of the combined group will be higher than that of the former group of adopters. Therefore, the average age of adopters in 2003-04 would be higher than the average age of adopters in 1998-99, if adopters tend to be younger.
- (iv) The average age of those who had not adopted in 2003-04 was higher than the average age of those who had not adopted in 1998-99. This is consistent with adopters tending to

be younger. If the youngest component of those who were yet to adopt in 1998-99 left that group, the average age of the remainder of the group would be higher than it was before the younger component left. Therefore, the average age of those who were yet to adopt in 2003-04 would be higher than in 1998-99, if adopters tend to be younger.

Rogers (2003) proposed no general characteristic of the 'earlier adopter' with regard to age, noting that around half of the studies demonstrated no relationship between adoption and age, while some supported a positive relationship, yet others supported a negative relationship (p. 288). Yet, from the analysis presented in this paper, it is evident that 'earlier adopters' tend to be younger, and to have higher incomes, at least for mobile phones in the Australian market.

Table 4. Average weekly income of households and average age of household heads: Australia, 1998-99 and 2003-04 Household Expenditure Surveys.

Mobile phone adoption status	Average weekly household income (in AUD)		Average age (in years)	
	1998-99	2003-04	1998-99	2003-04
Adopters	1136	1321 (1128)*	43	45
Non-adopters	723	827 (706)*	51	55

\* Figures in brackets represent the income in 1998-99 AUD. These were calculated by discounting the 2003-04 income by the increase in CPI between the two surveys.

## Discussion and Conclusion

The above results have implications for a number of areas. Clearly, given the disparity of research findings listed in Table 1, it is reasonable to seek assurance that Rogers' characteristics of the 'earlier adopter' are accurate if educators are to continue to commend them to students. This study has produced clear but mixed results with regard to this issue. Rogers' socio-economic characteristics of 'earlier adopters' state that 'earlier adopters' are no different to 'later adopters' with regard to age, but that 'earlier adopters' have more years of formal education, are more likely to be literate, have higher social status, a greater degree of upward mobility and are involved with larger sized units (e.g., farms, schools, companies). Status was "indicated by such variables as income, level of living, possession of wealth, occupational prestige, self-perceived identification with a social class, and the like" (Rogers 2003 p 288). The results of this study for income corroborate Rogers' general characteristic, however the results for age are contrary. The high degree of reliability provided by the rigorous sampling suggests that, given this quality of data, definitive results are obtainable. There are, however, a range of other characteristics that are yet to be examined. While one result in support, and one contradictory result may provide some measure of comfort for those of us who have continued to teach Rogers' (2003) model and

general socio-economic characteristics, they do not provide a platform for endorsing Rogers' characteristics of the 'earlier adopter', and so research addressing further characteristics is commended.

Managers and marketing practitioners will be drawn to the growth in this market, an increase in the number of households of around 80% in five years. While Rogers' advocates an S-shaped curve to describe the cumulative number of adopters in a market (Rogers 2003 pp. 272-3), the data provides only two points on the curve, and so it is not possible to identify where on this curve the market was in the survey years. Perhaps of more interest is the relatively stable nature of the composition of this market despite its prodigious growth. Table 2 shows that the mobile phone market in Australia has been dynamic in terms of growth, yet, at the same time, it has been relatively stable in terms of its composition, at least in terms of the demographic characteristics studied. Few characteristics varied by more than four percent over the five-year period (the proportion of males aged 60+ and females <30, and the proportion of males in the fifth income quintile). Given this relative stability, practitioners may be able to finalise demographic segmentation quite early in the diffusion process. This raises a particularly interesting question, namely at what point does the market composition become stable? While the limited nature of this study does not permit conclusions to be drawn, the inherent contradiction between the quest to identify the distinctive characteristics of 'earlier adopters' and the recognition of an essentially similar schema of consumers studied is a matter of interest. The value to practitioners in being able to plan with more certainty if market compositions are stable is self-evident.

The fundamental purpose of identifying those who adopt early, be they 'earlier adopters' or Innovators, is to be able to present them with a tailored marketing mix, *i e*, we wish to identify this segment. This study has examined a population, conducting four tests for each of age and income, identifying consistent results across each set of tests. This degree of consistency is in contrast to the variability of results demonstrated in Table 1, studies which have not examined a population, but rather sought to capture individual consumers. The consistency evident when studying the population, it would suggest, is lost when studying the individual. The differences in these two approaches, one taking a population and seeking to characterise a group from population data, and the other taking individual members of a group and seeking to characterise the group from members' characteristics, would seem to produce different results. However, there is a strong case for examining the individual Innovators, as the use of general characteristics to identify these consumers does not illuminate the characteristics of the individuals any more than an average represents a population. Despite this, we know that an average has some meaning, which we would expect to be able to translate into our understanding of the individual members of the population. However, research such as that listed in Table 1 suggests that the translation from the general to the specific, from the population to the individual, is not a straightforward matter. Further research is commended to confirm the findings of this paper and investigate a broader range of general characteristics of the population. Additionally, research investigating the characteristics of the individual and their relationship to the characteristics of the population is commended.

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