

**Relationship between Cognitive Age and Technology Readiness:
An Exploratory Analysis of Mature Consumers**

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Abstract

Cognitive age is an important concept in the study of mature consumers. The present study examines the association between cognitive age and technology readiness and adoption of technologies among mature consumers. Findings suggest that mature consumers perceive themselves to be cognitively younger than their actual age. Cognitively younger mature consumers are more likely to be Explorers holding more positive feelings towards technology readiness. Adoption of self-service banking technologies and other technologies appear to decrease, with an increase in cognitive age. The inclusion of cognitive age in this study has provided an alternative insight into the mature consumer market.

Keywords: cognitive age, technology readiness, chronological age, mature consumers

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Introduction

Chronological age is a frequently used measure in marketing and consumer behaviour research (Sudbury and Simcock, 2009; Wei, 2005). While easy to measure, making inferences about people's attitudes and behaviour intentions based on a chronological age does pose problems (Barak and Schiffman, 1981). The beliefs people hold and how they feel towards technology can vary and thus lead to different behaviour patterns emerging for people of the same age. The relationship that mature consumers have with technology is influenced by differences in their ageing process, which includes physiological, social and psychological ageing (Moschis, 2003). Mature consumers face difficulties associated with vision, hearing, motor functions and cognitive capabilities that may influence technology interaction (Mayhorn *et al.*, 2004). Psychological ageing resulting in changes in attitude, personality and needs (Kennett, Moschis, and Bellenger, 1995) may influence mature consumers' willingness to accept change and adapt to using new technologies. Mature consumers who perceive themselves as younger in age and outlook, more in control of their lives, and more self-confident (Mathur, Sherman, and Schiffman, 1998) are likely to be more accommodating of technology. Therefore our understanding of the behaviour of mature consumer towards technology readiness will be more informed through an analysis of mature consumers 'self-perceived age or cognitive age' than chronological age.

The purpose of this paper is to investigate the association between cognitive age and technology readiness and adoption of technologies among mature consumers over 50 years of age. Prior research has found cognitive age to be associated with a range of consumer behaviour variables, including motivation to travel (Cleaver Sellick, 2004; Gonzalez *et al.*, 2009), fashion consciousness (Birtwistle and Tsim, 2005), new brands (Stephens, 1991), values (Sudbury and Simcock, 2009) segmentation and targeting (Gwinner and Stephens, 2001; Reisenwitz and Iyer, 2007; Szmigin and Carrigan, 2000). However research that has investigated the association of cognitive age with technology readiness or adoption is limited, with the exception of a study by Eastman and Iyer (2005). Findings from this study concluded that mature consumers with lower cognitive age will use the Internet more, while women will have a lower cognitive age than men. These findings are limited to just the adoption of one technology, thus providing an opportunity in this study to investigate the association of cognitive age and technology readiness and adoption of a range of technologies among mature consumers.

Background to Study

While the mature consumer market is often referred to as the over 50's market, more recent literature acknowledges that they are a diverse group of consumers in terms of factors such as attitudes, behaviour, social lifestyles, and their self-concept (Mathur and Moschis, 2005; Moschis, 2003; Sudbury and Simcock, 2009). The concept of cognitive rather than chronological age is thus a more appropriate indicator of mature consumer's self-perceived age and possibly their behaviour intentions (Gonzalez *et al.*, 2009; Szmigin and Carrigan,

2000). Barak and Schiffman (1981) define cognitive age in terms of four dimensions (the age people feel they are, look age, interest age and do age) providing a way of capturing the differences in mature consumers. Furthermore, mature consumers are more likely to have a lower cognitive age than their chronological age. Chau, Cote and Leong (1990) found that those who are younger cognitively show greater satisfaction with life, more active and socially involved. Those mature consumers that are cognitively younger are proposed to have a greater likelihood of being ready to embrace and use technologies. They are expected to have relatively stronger positive feelings about technology than negative ones.

Parasuraman (2000) captured the range of positive and negative feelings towards technology in the Technology Readiness (TR) scale which comprises four dimensions: optimism, innovativeness, discomfort and insecurity. As a combined measure technology readiness does not predict intention or behaviour, but merely provides a measure of how ready a market is to adopt technologies.

The first two dimensions of TR, optimism and innovativeness, are related to positive feelings towards adopting technology. Optimism refers to 'a belief that technology offers people increased control, flexibility and efficiency in their live'; while innovativeness is defined as 'a tendency to be a technology pioneer and thought leader' (Parasuraman, 2000, p. 311). These two dimensions are regarded as drivers of technology readiness. The final two dimensions of TR, discomfort and insecurity are referred to as inhibitors of technology readiness. Discomfort is defined as 'a perceived lack of control over technology and a feeling of being overwhelmed by it', while insecurity refers to 'distrust of technology and scepticism about its ability to work properly' (Parasuraman, 2000, p.311).

Based on the scores of these four dimensions of TR, consumers are classified into one of five segments that display their degree of technology readiness. Those consumers with higher scores on optimism and innovativeness dimensions are more likely to be early adopters of new technologies and belong to either the Explorers or Pioneers' segments (Parasuraman and Colby, 2001). Consumers high on the other two TR dimensions, discomfort and insecurity belong to either the Paranoids or Laggards segments. The Skeptics segment represents the middle segment in the five segment profile. Skeptics are not against technology, they just lack enthusiasm, and are less likely to believe technology offers them more control over their lives (Parasuraman and Colby, 2001).

Given that cognitive age is a preferred method of measuring self-perceived age among mature consumers, there is a need to investigate how this construct is aligned with technology readiness and adoption. The remainder of the paper outlines the method, key findings and implications.

Method

The primary data for this study were collected from mature consumers (over 50 years of age) who were selected using a proportional stratified sampling method from a large Australian Seniors database that had greater than 300,000 members across Australia. To ensure the findings were representative of all age groups in the population of interest, eight age categories were closely aligned with the population age categories provided by the Australian Bureau of Statistics. For each age group, names were selected at random from the database to the size of each state/territory's population in the corresponding age bracket. Based on the

type of information that was required for the analysis, the wide dispersion of respondents across Australia, and confidentiality and privacy issues, a mail self-administered questionnaire was considered most appropriate. A total of 6000 questionnaires were sent to selected respondents and a total of 2076 (35%) usable questionnaires were returned.

Cognitive age (Barak and Schiffman, 1981) was measured using a multidimensional scale which asked respondents to identify with one of seven age decades (20's; 30's etc) along the dimensions of feel, look, interest and do. A composite measure of cognitive age was computed by averaging the mid-point value on each dimension. The reliability of the cognitive age scale was more than acceptable (Cronbach's alpha 0.93). The technology readiness of each respondent was assessed using 10 items selected from the original 36 item scale that were recommended in instructions provided by Colby and Parasuraman (pers. comm.). The items were measured using a five-point scale ranging from 1 'strongly disagree' to 5 'strongly agree'. Each dimension was measured using two or three items. Questions relating to the use of technologies including self-service banking technologies were also included in the questionnaire.

Results

Respondents ranged in age from 50 to over 85 years of age with 42% of the sample aged 50-59, 31% aged 60-69 and 27% were over the age of 69 years. There were slightly more female (55%) than male respondents. The annual gross household income (before tax) varied from less than A\$9,000 to greater than A\$60,000, with approximately 30% of respondents in the A\$20,000 to A\$39,000 category. Highest education achieved ranged from primary/some secondary (approximately 20%) to degree/postgraduate qualification (approximately 15%). Respondents who completed the questionnaire lived in city, regional and rural areas of Australia.

The mean cognitive age of respondents was 55.7 years with a standard deviation of 9.92 years, while their chronological age was 63.3 years with a standard deviation of 9.35 years. Respondents perceived themselves to be seven and a half years younger than their actual age. The proportion of respondents in each age decade is displayed in Table 1.

Table 1: Cognitive and Chronological Age

n = 2076	30's (30-39 years)	40's (40-49 years)	50's (50-59 years)	60's (60-69 years)	70's (70-79 years)	80's (80-89 years)
Cognitive Age	2.4%	24.2%	39.8%	23.5%	8.5%	1.6%
Chronological Age	-	-	42.1%	31.1%	20.7%	6.1%

Females were found also to have a younger cognitive age than men ($\chi^2_{(2)} = 80.26, p < .05$). Across all four dimensions females had a self-perceived age younger than men. These findings support results reported in prior studies (Eastman and Iyer, 2005; Szmigin and Carrigan, 2000).

The analysis of the data to determine the technology readiness consumer segments was undertaken by Rockbridge Associates, USA. Cluster analysis technique was used to determine distinctive segments followed by multiple discriminant analysis to examine group differences. Results from this analysis confirmed five dominant technology readiness segments in the mature consumer market in Australia and these are reported in Table 2. Of

the 2076 respondents in this study, 341 (16.5%) were assigned to the Explorers segment. The size of the remaining segments is reported in Table 2.

In examining the results for the first cognitive age decade, the 30's reported on the far left of the table, we can see that the largest percentage of respondents (38%) are classified in the Explorers segment. Moving across the table a smaller percentage of respondents are classified in each of the remaining four segments for the youngest cognitive age category. Moving to respondents with a cognitive age in their 70's and 80's, results show that the largest proportion of these respondents as classified as either Skeptics or Laggards. At a more formal level, the results of a chi-square test indicated there was a significant relationship effect ($\chi^2_{(8)} = 60.67, p < .05$). These findings indicate that those respondents cognitively younger (30's and 40's) are more likely to be Explorers with more positive feelings towards adopting technology and those that are cognitively older are more like to be Laggards, respondents least likely to adopt technology.

Table 2: Relationship between Cognitive age and Technology Readiness Segments

Cognitive Age	Explorers % <i>n</i> = 341	Pioneers % <i>n</i> = 271	Skeptics % <i>n</i> = 709	Paranoids % <i>n</i> = 268	Laggards % <i>n</i> = 487
30's (30-39 years)	38	12	24	10	16
40's (40-49 years)	25	14	33	10	18
50's (50-59 years)	17	14	33	14	22
60's (60-69 years)	11	11	36	14	28
70's (70-79 years)	6	12	37	15	31
80's (80-89 years)	0	19	38	9	35

Across nearly all cognitive ages a fair proportion of respondents are classified as Skeptics. These respondents don't have strong positive or negative feelings towards adopting technology, they wait until the benefits of a technology are proven. From a cognitive age perspective these finds could indicate respondents don't have a strong cognitive interest in technology and may even feel they don't have the emotional desire to learn new ways of doing things. How respondents perceive themselves relative to others will influence their self-perceived age.

With the population ageing and more services delivered with the aid of technology, findings presented in Table 3 indicate that there are varying levels of adoption among mature consumers across the cognitive age categories. In terms of self-service technologies, adoption is generally higher among those that are cognitively younger across all banking services. The results for Internet banking indicate that 50% of respondents with a cognitive age in their 30's use Internet banking. The proportion of Internet banking decreases as cognitive age increases. This similar pattern is evident across EFTPOS, ATM's and Phone Banking. One exception is respondents in their 30's have a lower proportion of Phone banking than those in their 40's. This could be due to many in their 30's moving to Internet banking where more services are offered and Phone banking becomes redundant.

In terms of mature consumers use of computers, Internet and mobile phones, greater use of these technologies is evident however the proportion using each technology decreases as cognitive age increases. It is worth noting that respondents in their 70's and 80's are not averse to using the Internet, they are just not as keen on using it for the purpose of Internet banking.

Table 3: Usage of self-service technologies and general technologies by Cognitive Age

Cognitive Age	Internet Banking %	Phone Banking %	ATM's %	EFTPOS %	Internet %	Computers %	Mobile Phone
30's (30-39 years)	50	42	84	76	88	82	94
40's (40-49 years)	46	51	87	78	90	82	87
50's (50-59 years)	36	46	81	66	84	73	82
60's (60-69 years)	19	38	70	54	65	52	66
70's (70-79 years)	13	29	53	38	46	34	54
80's (80-89 years)	6	22	38	44	34	18	35

Discussion and Conclusions

This study examined cognitive age, a concept that reflects a person's life experiences, reactions to and related changes and thus providing a more meaningful approach to segmenting the mature consumer market than chronological age. The average cognitive age of mature consumers in this study was 55.7 years, some seven and a half years younger than their chronological age, findings that are consistent with previous research (Mathur and Moschis, 2005). An individual's self-perceived age is shaped by how they feel, the way they perceive they look, the way they do things and their interests relative to other people. The self-perceived age is influenced by life events thus influencing their outlook, self-confidence and control they have of their life.

For these reasons, mature consumers that are cognitively younger are more likely to be ready to embrace new technologies. An examination of the five technology readiness segments as identified in this study indicate that cognitively younger mature consumers were more likely to be a part of the Explorer segment. This segment was based on mature consumers that were more positive in terms of innovativeness and optimism and held less negative feelings of discomfort and insecurity towards technology. Given that one of the findings of this study is that 50% of mature consumers that use internet banking are of a cognitive age of 30-39 and that this figure reduces over age, managers in the banking industry should investigate whether there are strategies that could be employed to have more than 50% of mature consumers of a cognitive age 30-39 use internet banking. Managers can also formulate appropriate marketing strategy for preventing this figure from reducing over age.

Further findings suggest that cognitively younger mature consumers welcome technology and have a high level of technology readiness. Opportunities exist to further extend self-service banking and offer other financial services, entertainment and information via a technology interface. Cognitively younger mature consumers trying these services are likely as opinion leaders to spread positive word-of-mouth. However it is important to not forget the Skeptics and those that are resistant to technology and ensure that traditional services of a face-to-face nature are offered, along with traditional forms of communications remain in use.

Finally, this study has contributed to providing a much richer insight into the association between cognitive age and technology readiness in the mature consumer market, a market that was previously considered to be homogeneous. As the mature consumer market grows and ages, this study needs to be replicated to ensure the reliability of these findings. In terms of future research, cognitive age could assist in improving the explanatory power of the extended technology acceptance model.

References

- Barak, B., Schiffman, L. G., 1981. Cognitive age: A nonchronological age variable. *Advances in Consumer Research* 8, 602-606.
- Birtwistle, G., Tsim, C., 2005. Consumer purchasing behaviour: An investigation of the UK mature women's clothing market. *Journal of Consumer Behaviour* 4(6), 453-464.
- Chau, C., Cote, J. A., Leong, S. M., 1990. The antecedents of cognitive age. *Advances in Consumer Research*, 17, 880-885.
- Cleaver Sellick, M., 2004. Discovery, connection, nostalgia: Key travel motives within the senior market. *Journal of Travel and Tourism Marketing* 17(1), 55-71.
- Eastman, J. K., Iyer, R., 2005. The impact of cognitive age on internet use of the elderly: An introduction to the public policy implications. *International Journal of Consumer Studies* 29(2), 125-136.
- Gonzalez, A. M., Rodriguez, C., Miranda, M. R., Cervantes, M., 2009. Cognitive age as a criterion explaining senior tourist's motivation. *International Journal of Culture, Tourism and Hospitality Research* 3(2), 148-164.
- Gwinner, K. P., Stephens, N., 2001. Testing the implied mediational role of cognitive age. *Psychology and Marketing* 18(10), 1031-1048.
- Kennett, P. A., Moschis, G. P., Bellenger, D. N., 1995. Marketing financial services to mature consumers. *Journal of Services Marketing* 9(2), 62-72.
- Mathur, A., Moschis, G. P., 2005. Antecedents of cognitive age: A replication and extension. *Psychology and Marketing* 22(12), 969-994.
- Mathur, A., Sherman, E., Schiffman, L. G., 1998. Opportunities for marketing travel services to new age elderly. *The Journal of Services Marketing* 12(4), 265-277.
- Mayhorn, C. B., Stronge, A. J., McLaughlin, A. C., Rogers, W. A., 2004. Older adults, computer training, and the systems approach: A formula for success. *Educational Gerontology* 30, 185-203.
- Moschis, G. P., 2003. Marketing to older adults: An updated overview of present knowledge and practice. *Journal of Consumer Marketing* 20(6), 516-525.
- Parasuraman, A., 2000. Technology readiness index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research* 2(4), 307-320.
- Parasuraman, A., Colby, C. L., 2001. *Techno-ready marketing: How and why your customers adopt technology*. The Free Press, New York.
- Reisenwitz, T., Iyer, R., 2007. A comparison of younger and older boomers: Investigating the viability of cohort segmentation. *Journal of Consumer Marketing* 24(4), 202-213.

Stephens, N., 1991. Cognitive age: a useful concept for advertising? *Journal of Advertising* 20(4), 37.

Sudbury, L., Simcock, P., 2009. Understanding older consumers through cognitive age and the list of values: A U.K. based perspective. *Psychology and Marketing* 26(1), 22-38.

Szmigin, I., Carrigan, M., 2000. The older consumer as innovator: Does cognitive age hold the key? *Journal of Marketing Management* 16, 505-527.

Wei, S. C., 2005. Consumers' demographic characteristics, cognitive ages, and innovativeness. *Advances in Consumer Research* 32, 633-640.