

ADOPTION OF TECHNOLOGICAL INNOVATIONS BY THE ELDERLY: A CONSUMER SOCIALIZATION PERSPECTIVE

ANIL MATHUR, *Hofstra University*

Based on a national mail survey this research examines the adoption of technological innovations by the elderly within the consumer socialization framework, focusing on the influence of younger family members, interaction with mass-media sources, and non-family sources. While previous studies have been descriptive and have focused on characteristics of older consumers who are likely to adopt new technologies, the present study focuses on the processes that lead to new product adoption. Results suggest that assistance from family members, and non-family personal sources along with socio-cultural variables may have important impact on the adoption of technological innovations by older consumers. Implications for marketers and consumer researchers are discussed.

INTRODUCTION

Despite the existence of an extensive body of literature on diffusion and adoption of innovations, the adoption of technological innovations has continued to intrigue many researchers. Although it is often suggested that technological innovations can help increase the independence and well-being of the elderly (Prisuta and Kriner 1985; Ogozalek 1991; Smither and Braun 1994; Weisman 1994; Czaja 1997; Mann 1997), studies on the adoption of new technologies have yielded mixed results (Gilly and Zeithaml 1985; Prisuta and Kriner 1985; Czaja and Sharit 1998). While some researchers suggest that the elderly are among the last to adopt technological innovations (e.g., Gatignon and Robertson 1985; Rogers et al. 1996), others suggest that the elderly may not always be the last group to adopt a new product and that the adoption of technological innovations by the elderly is related to the perceived benefits of specific innovations. The elderly may be willing to adopt only those technologies which they perceive to be beneficial (e.g., Gilly and Zeithaml 1985; Moschis 1992; Czaja, Guerrier, Nair, and Landauer 1993). Also, age-related differences in the adoption of technological innovations could be due

to several confounding factors such as income, education, and perceived need for the product. For example, Zeithaml and Gilly (1987) found education and income to be positively related to measures of adoption of technological innovations (awareness, trial, and adoption). Phillips and Sternthal (1977) suggested that perceived complexity of new products may be a factor influencing the elderly's reluctance to adopt them. Previous familiarity with the product could be another factor (Gilly and Zeithaml 1985). Morrell and Echt (1997) reported that the most important reason for low utilization of electronic devices by the elderly is the lack of instructional materials that can effectively teach older adults how to use these devices. Also, Gore (1997) found that older consumers might be willing to use ATMs if training were provided.

Thus, most of previous research on the elderly's acceptance of technological innovations is limited and has produced contradictory findings. It has focused on describing the characteristics associated with adoption but has ignored the processes leading to the acceptance of technological innovations. Furthermore, previous studies have implicitly assumed that adoption of technological innovations is an individual decision. Older consumers are assumed to go through the adoption stages in isolation from their social environment. Yet, consumer studies show that many consumer

decisions involve several family members, and that social influence on the adoption process is important even when there is no joint consumption of products with other family members (Assael 1992).

The purpose of the present research is to expand knowledge in this area by examining not only the role of older consumer characteristics (similar to those used in previous studies), but also the processes that may lead to the adoption of technological innovations by the elderly. Based on theory and research, a model is developed and tested using data from a large-scale national study. The role of the elderly's younger family members in the adoption process is examined in the context of assistance with purchases offered to their aged relatives.

BACKGROUND

Many researchers have suggested that the elderly generally resist change. For example, Kasteler, Gay, and Caruth (1968) suggest that elderly persons resist relocation. Consumer researchers have documented that the elderly are among the last to adopt a new product or an innovation (e.g., Robertson 1971). Furthermore, it has been observed that the elderly do not refuse to buy a product just because it is new; they may be willing to buy it, if the product can meet an otherwise unmet need (Lunsford and Burnett 1992). For example, many older people are learning to use computers because it helps them to keep in touch with others through e-mail and the Internet (Gross 1998). Phillips and Sternthal (1977) suggest that the elderly might resist adoption of innovative products because of their inability to learn new things associated with information processing deficiencies. However, given that the elderly are relatively more isolated from personal sources than are younger people due to factors such as an empty nest, retirement, and loss of spouse and friends (e.g., Moschis 1992), some of the age differences in adoption of technological innovations may be due to social rather than physiological factors.

The study of behavior in later life can be approached using the socialization perspective, an approach that has been used by sociologists, psychologists, and other social science researchers for several decades (e.g., Hagestad and Neugarten 1985). Recent reviews

have shown that socialization may play an important role in acquisition of important consumption-related orientations by the elderly (e.g., Moschis 1987; Smith and Moschis 1990). Since socialization has been defined as "the *process through which individuals acquire the knowledge, skills, and dispositions* (emphasis added) that enable them to participate as more or less effective members of groups and society" (Brim 1966, p.3), with many such orientations acquired from one's social environment, it can be assumed that the development of orientations toward technological innovations can be influenced by socialization processes. By interacting with various sources of consumer information (i.e., socialization agents) the elderly may develop orientations related to the adoption of technological innovations (Moschis 1987).

Although some research has focused on the role of family in consumer socialization of the elderly (e.g., Smith and Moschis 1985; Smith, Moschis, and Moore 1982), it has not specifically addressed the role of children in socializing their parents. Children play an important role in socialization of their parents, a process often termed "retroactive socialization" or "resocialization" (cf. Moschis 1987). Such influences may also be relevant to the learning of consumer orientations in later life. The need among the aged to learn from younger adults is indicated by the fact that the rate of change in society today is much faster than it was in the past, especially in view of rapid technological changes (Mead 1970).

Extended nuclear family theory provides insights into the nature and extent of social interaction with their family members the elderly experience. Within this framework, empirical evidence suggests that a vast majority of elderly Americans prefer to live near their children and have regular interaction with them (Troll, Miller, and Atchley 1979; Horovitz 1997). Families in general and adult children in particular are the primary source of informal care and support for the elderly (e.g., Shanas 1979).

The socialization perspective over the entire life cycle can be used to study the learning that takes place in old age. The concepts of socialization and

extended nuclear family suggest that it is not only theoretically possible for the old people to learn new roles, but also there are social, cultural, structural, and procedural factors that facilitate such learning (Hagestad and Neugarten 1985). Family members (especially adult children, grandchildren, and other younger relatives) in such extended-nuclear families may act as socialization agents or change agents for the elderly (Assael 1992). The pattern of social interaction and care giving within such extended families may constitute the processes through which socialization takes place with respect to the acquisition of orientations toward technological innovations.

THE MODEL

Socialization framework suggests that the outcome of socialization could be at cognitive level and/or at behavioral level (Moschis 1987). Since adoption of an innovation involves both cognitive (awareness and interest) and behavioral (trial and adoption) steps, adoption of an innovation (incorporating awareness, interest, trial, and adoption) is an appropriate outcome variable to be examined within this framework. Also, in socialization studies, two types of explanatory variables are typically examined: interaction with socialization agents (agents of change) and antecedent variables that affect socialization. The present study investigates only those agents and structural variables that are suggested by the socialization framework and empirical research as potential explanatory factors for adoption of innovations¹. A model of the adoption of technological innovations by the elderly within the socialization framework is presented in the Figure. Each variable in the model and its relationship with other variables is discussed in the following paragraphs.

¹ Since the unit of analysis in the present study was the individual adopter (and not specific innovations), innovation-related characteristics (e.g., relative advantage) were excluded from the study. Also, since the focus of the study was on the socialization process, many individual-level variables (e.g., personality traits, information processing) were also excluded from the study.

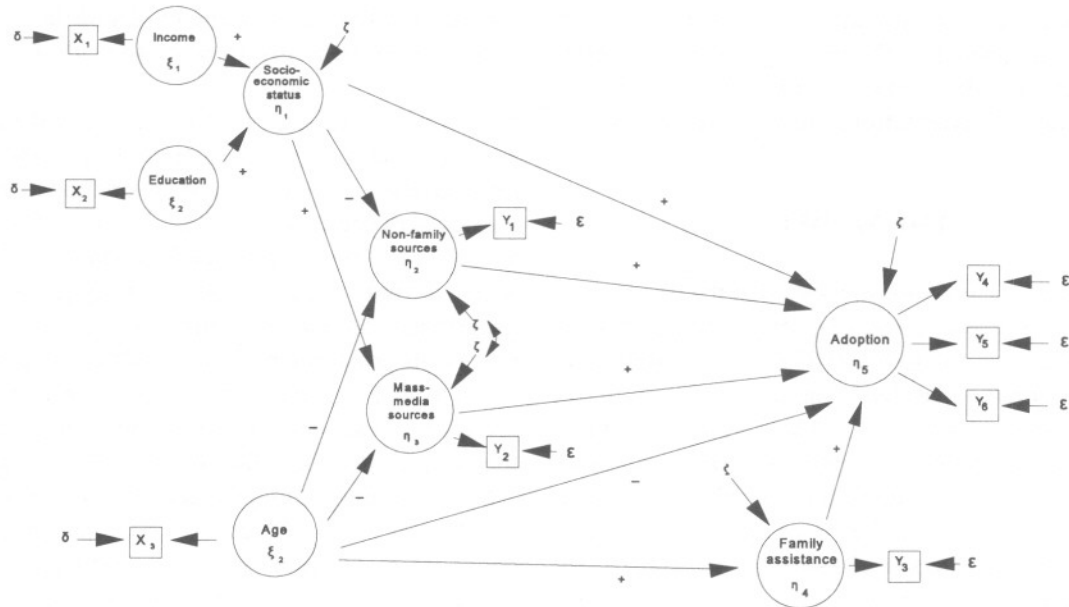
Influence of Change Agents

Researchers have investigated the role of change agents in the adoption of technological innovations (e.g., Harrer, Weijs, and Hattrup 1988). Both *mass-media* sources as well as *interpersonal sources* have been found to be important in facilitating adoption of technological innovations (Rogers 1983). Therefore, it is important to incorporate such sources of information in the model of the adoption of technological innovations by the elderly.

Rapid rate of change in the present "information age" is making it imperative to process more information for normal living. In a national study of the needs of the elderly, Cicirelli (1981) found that 56 percent of the elderly need assistance in dealing with "formal" organizations. Elderly persons who experience decline in ability to comprehend and process information might feel isolated because they are not able to understand new, high-technology products and services. In this context, they may rely increasingly on their family members for specific advice regarding such products and services before purchasing new products or services. This advice could be in reference to new product or service availability or could be related to understanding the specific features of available products and services. Thus, if they receive assistance from family members while making purchase decisions relating to new technologies they may be willing to adopt such new technological products or services. Therefore, adoption of technological innovations by the elderly is expected to be positively related to the amount of assistance received by them from their family members.

Based on his research on diffusion of innovations, Rogers (1983) suggested that early adopters tend to be more socially connected compared to later adopters. Further, it has been suggested that reduced social communication in old age affects the elderly's awareness of new technology and, consequently, their adoption of these technologies (Zeithaml and Gilly 1987). Studies have also reported that the elderly are less aware of retailing innovations (Bearden and Mason 1979) and are less likely to use different sources of information (Phillips and Sternthal 1977).

FIGURE
Model of New Product Adoption by the Elderly



- Y_1 = Importance of non-family sources of information
 Y_2 = Importance of mass media sources of information
 Y_3 = Extent of family assistance
 Y_4 = New product adoption: awareness
 Y_5 = New product adoption: interest
 Y_6 = New product adoption: behavior (trial and acceptance)
 X_1 = Income
 X_2 = Education
 X_3 = Age
 Note: Hypothesized relationships are indicated by + or - sign

Zeithaml and Gilly (1987) found that elderly people living in multi-unit dwellings (i.e., those having opportunities for social communication) tend to adopt new technologies faster than others. Based on these findings it would appear that informal social communication is an important factor in the adoption of new technologies. On the other hand, socialization research has found such informal personal and mass-media sources of information to be useful in socialization models in general and socialization of the elderly in particular (e.g., Atchley 1987; Moschis 1987; Moschis, Mathur, and Smith 1993; Smith and Moschis 1990). These sources can not only provide information about availability, features, uses, and benefits of innovative products but can also communicate consumption-role norms with respect to particular stages in life or specific product/service categories. Thus, both commercial sources of consumer information (as primary dispensers of new product information) and non-family personal communications are expected to affect the older person's acceptance of new technologies.

Previous research has suggested that interactions with mass media and interpersonal sources do not occur in isolation. For example, "the agenda setting function" of mass media (cf. Moschis 1987; O'Guinn and Faber 1991) suggests that interactions with mass media sources might stimulate interpersonal communications on specific topics. Also, "uses and gratification" theory and research suggest that interpersonal communications might condition older persons' interaction with mass media (cf. Moschis 1987; O'Guinn and Faber 1991). This line of reasoning suggests reciprocal relationship between interactions with mass media sources and interpersonal sources, i.e., interaction with mass media sources would influence interactions with interpersonal sources and vice versa.

Antecedent Variables

Adoption of technological innovations by the elderly may be influenced by several antecedent variables. The influence may be both direct and indirect through agents of change.

Socioeconomic status (social class) of a person indicates not only the position one occupies in

society also the skills, strengths, and/or weaknesses one may have. Moreover, differences based on social class develop early in life and tend to persist into adulthood (Moschis 1987). Research has found a positive relationship between social class and higher-order cognitive ability (Kagan 1977). Cognitive abilities and financial resources associated with upper-class status may predispose people positively toward technological innovations and may facilitate their adoption. Demographic variables like income, education, and occupation are often used as objective measures of social class (Schiffman and Kanuk 1994).

Ability to purchase is an important condition for the adoption of any technological innovation, especially high-priced items. As a part of socio-economic status, income can provide necessary resources for purchasing technological innovations. Results of previous studies support this line of reasoning (e.g., Prisuta and Kriner 1985; Zeithaml and Gilly 1987). Thus, people with higher incomes are expected to adopt the new technologies more readily compared to people with lower incomes.

As a component of socioeconomic status, *education* may have a direct influence on the adoption of technological innovations by the elderly. Studies have shown that one of the factors contributing to lack of adoption of technological innovations by the elderly is their inability to understand complex information (Phillips and Sternthal 1977). Empirical studies have found a positive correlation between education and measures of adoption of technological innovations (awareness, trial, and adoption) (e.g., Zeithaml and Gilly 1987). Education may facilitate understanding of the benefits of technological innovations and thereby facilitate their adoption.

Although occupation is often used as an indicator of socioeconomic status (social class), it may not be relevant for the elderly because many of them are retired. Therefore, occupation was not included as a component of social class.

In sum, education and income as components of socioeconomic status (social class) are expected to be positively associated with the elderly's adoption of technological innovations. In addition,

socioeconomic status is expected to indirectly affect adoption through agents of change. Specifically, research shows that consumers with a higher socioeconomic status are more likely to use the mass media to learn about new products than are their lower social class counterparts. Levine's life-space concept suggests that those with higher education will find a greater number of environmental stimuli accessible, more desirable, and relevant to consumer behavior compared with those with lower education (cf. Moschis 1987). Other research has shown that more educated older consumers may utilize opportunities for information gain through mass media (e.g., Gaeth and Heath 1987). Thus, socioeconomic status is expected to be positively related to interaction with mass-media sources. On the other hand, elderly people of lower socioeconomic status may not have much access to as wide a variety of sources of information and may have to use personal sources as a substitute.

Age. Age is a particularly important variable for the study of elderly populations because age-related changes in physiological and psychological processes are relatively small for younger adults. Also, there is sufficient variability in age-related changes among the elderly to enable one to test for their influence on other variables. Physiological and psychological changes associated with aging may make knowledge acquisition difficult for the elderly. For example, aging is associated with decline in the performance of sensory organs such as the eyes (Carter 1982), as well as in one's ability to perceive stimuli (Cerella 1985) which are important for knowledge acquisition. Similarly, the absence of skills necessary for consumption of certain products and services, caused by the effects of biological and physiological aging (e.g., reading product-use directions due to visual changes), may become a limiting factor for the elderly. Furthermore, age-related declines in perception, information processing, and memory may limit the elderly's ability to comprehend and effectively utilize complex information regarding technological innovations. Although age does not reflect changes only in several biological dimensions but also the effects of period and cohort, there is general agreement that it is associated with reduced physical and mental capabilities (Phillips and Sternthal 1977). To the extent it is associated with

such declines, aging will also influence adoption of technological innovations by the elderly. Similarly, age-related declines in sensory abilities might limit the elderly's ability to interact with and gather information from the mass media.

It has been well documented that elderly people experience a constriction of their social environment due to physiological reasons (e.g., loss of stamina) and social reasons (e.g., retirement, death of peers and spouse) (Atchley 1987). This constriction of social space might also lead to social isolation as suggested by disengagement theory (Cumming and Henry 1961). Therefore, age is expected to be negatively related to interaction with interpersonal sources of information.

Finally, age-related decline in physical and cognitive ability will also increase the elderly's need for assistance in coping with these declines. Therefore, to the extent, such assistance from family members is available, age will be positively related to the assistance received.

METHOD

Data Collection

Data for the study were collected as part of a larger study involving elderly people and their family caregivers. A pre-selection letter was mailed to 10,000 randomly selected heads of households requesting them to participate in the study and to identify themselves as care recipients or caregivers. In response to this mailing 108 respondents indicated they were care recipients and willing to participate. Since this sample size was not adequate an additional sample of 5,000 (ages 55 and older) was used. Respondents in the second sample were not asked to participate; they (along with the pre-selected sample) were mailed a questionnaire that included questions designed to determine the extent to which they were recipients of care or assistance from younger relatives. The samples were based on random selection of household heads by a nationally known mailing list company. Names were selected in proportion to the population of each of the 50 states, within specified age groups. For example, if a state has five percent of the total U.S. population between the ages of 55-64, one-twentieth of the sample for that age group was drawn from this state.

A total of 774 people responded to the survey. However, some of the respondents to the survey were less than 55 years of age and, therefore, were deleted from further analysis. Also, cases with item-nonresponse were removed from the analysis by listwise deletion. This reduced the sample size to 579 usable responses. Despite these procedures to obtain the sample there is no assurance that this was a representative sample of all the elderly due to the high non-response rate. Since the responses were anonymous no comparison of respondents and non-respondents could be done to assess non-response bias (cf. Armstrong and Overton 1978). However, high non-response in the present case could be due to the restrictive pre-selection procedure used. The larger study for which this data was collected focussed on only those elderly who receive some care from their younger family members. However, non-representativeness of the sample should not be a limitation because the purpose of the study was theory testing (cf. Calder, Phillips, and Tybout 1981, 1982, and 1983; Lynch 1983).

The profile of the sample used in the study is given in Table 1. The sample consisted of 57.4 percent males and 42.6 percent females. Although females outnumber males among those 55 years or older, the higher percent of males in the sample might be because of the larger proportion of males listed as household heads in the commercial database used.

Operationalization and Measurement of Variables

Adoption of Technological Innovations. In line with previous research on the diffusion of innovations and adoption of technological innovations by the elderly (e.g., Gilly and Zeithaml 1985; Rogers 1983), adoption of technological innovations was operationalized through stages of adoption (e.g., awareness, interest, trial, and adoption). Respondents were asked to indicate whether or not they were aware of, had considered using, tried, or presently have/use ten relatively new products. Trial and actual use were combined to represent the final (behavioral) stage of the adoption process. Reliability and item-to-total correlation for each index were examined and items with low item-to-total correlations were dropped. This process resulted in the retention of six technologically innovative products and services:

cordless phone, VCR, microwave oven, premium cable channels (such as HBO, Cinemax), discount or "package" long-distance telephone plan, and automated teller machines (ATM)². Awareness, interest, and behavioral stages were thus measured as three 0-to-6 point indexes. These three indexes represent the three indicators of the adoption of technological innovations construct.

Assistance from family members was operationally defined as assistance received in dealing with external organizations and making important consumer decisions. It was measured by asking the respondents to identify a younger family member, other than a spouse, and provide information about him/her (e.g., relationship, date of birth) including the amount of assistance presently received from this person utilizing a four-point scale ("no assistance at all" to "a lot of assistance") in making important purchasing decisions. Five such assistance activities included in the scale were "purchase home appliances," "make financial or investment decisions," "find someone to do home maintenance," "filling out forms and applications" and "deciding what health services to buy."

Interaction with mass-media sources was measured by asking the respondents to indicate the mass-media sources (newspaper or magazine ads, radio or TV ads, and brochures or catalogs in the mail) that had been most helpful in keeping them informed about shopping and sales, social events, household appliances, and financial services. The respondents

² Although one might argue that many of these products/services are widely used and do not reflect true innovations, at the time of data collection (Fall 1990) these products/services were relatively new. Also, since an innovation can be defined in many ways (e.g., product oriented, firm oriented, market oriented, and consumer oriented definitions) (cf. Schiffman and Kanuk 1994), a particular innovation may qualify as an innovation based on one criterion and fail to qualify on another criterion. Irrespective of the criteria used to define an innovation, if a person has not adopted it, or is in the process of adopting it, he/she is likely to consider it as new compared to the ones he/she has already adopted (with a few exceptions). Moreover, the process of adoption and the influences on adoption are not likely to change based on the criteria used to define the innovation. Since the central focus of the present study was to examine socialization influences on adoption of these innovations, the criteria used to define, whether or not they were truly innovations, should not have any influence.

TABLE 1
Profile of the Sample

			Percentage (N=579)
<u>Demographic characteristics</u>			
Age			
55-64			41.3
65-74			38.3
75-84			18.3
85+			2.1
Sex			
Male			57.4
Female			42.6
Employment status--			
Employed (PT or FT)			40.7
Education			
Some high school or less			7.9
High school graduate			23.3
Some college			37.5
College graduate or more			31.3
Income			
Less than \$20,000			30.1
\$20,000 - \$34,999			31.8
\$35,000 - \$49,999			17.3
\$50,000 or more			20.9
Occupation			
Quartile I (0-25 percentile)			19.5
Quartile II (26-50 percentile)			34.6
Quartile III (51-75 percentile)			35.2
Quartile IV (76-100 percentile)			9.7
<u>Responses to New Products</u>			
Innovations	Awareness ^a %	Interest ^b %	Adoption %
Cordless phone	93.6	62.9	52.7
VCR	91.5	72.2	65.3
Microwave oven	94.7	90.0	88.3
Premium cable channels	86.5	51.1	43.0
Discount or package long distance telephone plans	80.4	35.7	26.4
Automated teller machine (ATM)	82.2	43.3	36.0

Note: ^a By definition, percentages include those who were interested in the innovation and those who had already adopted the technology.

^b Percentages include those who had already adopted the technology

were asked to check as many sources as applicable that were helpful in keeping them informed in each area. The responses (coded 1 or 0) were summed for each source to get 0 to 4 point index for each source. Summing indexes for the three mass media sources resulted in a 0-to-12 point total index. Similarly, *interaction with non-family personal sources* was measured by asking the respondents to indicate the non-family personal sources (sales people and friends) that have been most useful in keeping them informed about the same four areas, forming a 0 to 8 point index.

Such measures of interaction with socialization agents have been found to be useful in studying the influence of socialization agents on older consumer's specific orientations toward marketing stimuli (Moschis et al. 1993). This measure is also believed to be superior to other measures that capture mere exposure or interaction because it captures the person's use of the various sources as well as the content of information that is obtained through such interactions (Moschis and Moore 1982). Finally, family sources were not included in this measure because specific interaction with family members (assistance) that could facilitate new product adoption was specifically modeled as a part of a different construct ("assistance from family members").

Other demographic variables (e.g., education, income) were measured through standard demographic questions.

ANALYSIS AND RESULTS

Analysis of the data suggests a high level of awareness for all the innovations used in the study (Table 1). Microwave oven had the highest level of awareness (94.5%) and discount or package long-distance telephone plans had the lowest level of awareness (80.2%). However, there was greater variability in the behavioral stage of the adoption process. While 87.9 percent of the respondents indicated that they owned/used a microwave oven or had at least once, only 26.3 percent indicated having either tried or using discount or package long distance telephone plans.

Maximum likelihood estimation, using the computer program LISREL 8 (Jöreskog and Sörbom 1993), was employed for model testing and for the estimation of parameters. A Pearson correlation matrix was used as input for the analysis. The use of a correlation matrix in the present instance appears to be acceptable because in this case, as in many other behavioral science applications, the measurements of the observed variables were arbitrary and scale invariant (Jöreskog and Sörbom 1989). The Pearson correlation matrix used in the analysis is given in Table 2.

In the model, socio-economic status (SES) was modeled as a higher order construct derived from two lower-order constructs representing education and income. Since education and income do not represent unidimensional measures of socio-economic status, they can not be modeled as multiple, reflective indicators of SES. Thus, following the procedure suggested by Hayduk (1987), corresponding elements in the Gamma matrix had to be fixed to represent the relative influence of income and education. Although these parameters could be fixed at any level (each with specific assumptions and interpretation) (cf. Hayduk 1987), in the present case these parameters were fixed at .84 and .43 for income and education respectively. These values imply that income has stronger influence on SES as compared to education and were empirically obtained by independently running the whole model conventionally by modeling income and education as reflective indicators of SES. Although these parameter values were obtained from the data they may appear to be arbitrary. However, sensitivity analysis conducted by changing these values from .1 to .9 (in steps of .1) did not substantively change the results.

Also, reciprocal relationship between mass-media sources and inter-personal sources was modeled by allowing the structural error terms for these constructs to correlate. This was in line with the empirical evidence that suggests it might be difficult to obtain significant paths for such reciprocal relationship in structural models involving limited number of variables. Therefore, allowing error terms for these latent variables to correlate might produce appropriate mechanisms to reflect such relationships between interactions with mass-media sources and

TABLE 2
Correlation Matrix Used for Structural Model Analysis

Y1	1.00								
Y2	0.29	1.00							
Y3	0.08	0.07	1.00						
Y4	0.19	0.16	0.06	1.00					
Y5	0.19	0.16	0.02	0.49	1.00				
Y6	0.15	0.12	0.04	0.43	0.88	1.00			
X1	0.07	0.14	-0.03	0.24	0.45	0.45	1.00		
X2	0.11	0.02	-0.05	0.16	0.27	0.21	0.36	1.00	
X3	-0.15	-0.17	0.12	-0.28	-0.43	-0.42	-0.32	-0.14	1.00
Mean	1.56	5.30	5.66	5.29	3.55	3.12	3.19	3.68	67.39
SD	1.59	2.42	1.86	1.40	1.68	1.57	1.25	1.56	8.21
	Y1	Y2	Y3	Y4	Y5	Y6	X1	X2	X3
	Non-family sources	Mass-media sources	Family assistance	Awareness	Interest	Trial/adoption	Income	Education	Age

Note: Table entries are Pearson correlations

interactions with interpersonal sources (Moschis et al. 1993).

Maximum likelihood estimates for various parameters and indicators of goodness-of-fit of the overall model are given in Table 3. Indicators of the overall fit suggest that the model fit the data quite well and warrant further interpretation ($\chi^2=52.55$, $df=19$, $p<.05$, $GFI=.98$, $AGFI=.95$, standardized $RMR=.04$, $NFI=.97$, and $NNFI=.96$).

Our main concern was with assessing the effect of family assistance as well as interaction with mass media sources and non-family personal sources on the adoption of technological innovations by the elderly. Based on the theory and research the proposed model suggested that family assistance will positively influence the adoption of technological innovations by the elderly. This hypothesis was supported by the data (Maximum likelihood estimate = .07, t -value = 2.10). As suggested by the model, interaction with non-family personal sources was positively related to the adoption of technological innovations by the elderly (maximum likelihood estimate = .09, t -value = 2.53). However, interaction with mass-media sources was not related to the adoption of technological innovations by the elderly.

The model also suggested that social cultural variables will have a direct influence on the adoption of technological innovations as well as on family assistance, interaction with mass-media sources, and interaction with non-family personal sources. As suggested by the model, socioeconomic status was positively related to the adoption of technological innovations (maximum likelihood estimate = .34, t -value = 9.37). However, socioeconomic status did not have any influence on interaction with non-family sources, and interaction with mass-media sources. As expected, age was negatively related to the adoption of technological innovations (maximum likelihood estimate=-.33, t -value=-8.32). Also, as expected, age was positively related to family assistance (maximum likelihood estimate = .12, t -value=3.01), negatively related to interaction with non-family personal sources (maximum likelihood estimate=-.14, t -value=-3.15), and negatively related to interaction with mass-media sources (maximum likelihood estimate=-.14, t -value=-3.75).

Finally, error terms for interaction with non-family personal sources and mass-media sources were positively correlated (maximum-likelihood estimate = .27, t -value=7.11).

TABLE 3
Parameter Estimates for the Structural Model

	Maximum likelihood estimate	t-value
λ_{X1}	1.00 ^a	
λ_{X2}	1.00 ^a	
λ_{X3}	1.00 ^a	
λ_{Y1}	1.00 ^b	34.00
λ_{Y2}	1.00 ^b	34.00
λ_{Y3}	1.00 ^b	34.00
λ_{Y4}	0.50	12.44
λ_{Y5}	0.97	28.17
λ_{Y6}	0.91	27.05
γ_{11} Income → Socio-economic status	0.84 ^c	
γ_{12} Education → Socio-economic status	0.43 ^c	
γ_{23} Age → Non-family sources	-0.14	-3.15
γ_{33} Age → Mass-media sources	-0.14	-3.35
γ_{43} Age → Family assistance	0.12	3.01
γ_{53} Age → Adoption	-0.33	-8.32
β_{21} Socio-economic status → Non-family sources	0.05	1.26
β_{31} Socio-economic status → Mass-media sources	0.07	1.66
β_{51} Socio-economic status → Adoption	0.34	9.37
β_{52} Non-family sources → Adoption	0.09	2.53
β_{53} Mass-media sources → Adoption	0.03	0.88
β_{54} Family Assistance → Adoption	0.07	2.10
ϕ_{21}	0.36	8.22
ϕ_{31}	-0.32	-7.39
ϕ_{32}	-0.14	-3.28
ψ_{32}	0.27	7.11
χ^2		52.55
df		19
p value		.00
GFI		.98
AGFI		.95
NFI		.97
NNFI		.96
Standardized RMR		.04

Note: t-values (absolute) of 2.00 or greater indicate a significant relationship

^a Parameter fixed at 1.00 and the error term at 0.00

DISCUSSION AND IMPLICATIONS

The present study adds to our understanding of the adoption of innovations by the elderly. As far back as 1976, Rogers noted a psychological bias in new product adoption and diffusion research. The situation has not changed much since then. While there are many studies reported in the adoption literature that have either focussed on demographic differences or on information processing (Zeithaml and Gilly 1987; Gilly and Zeithaml 1985; Phillips and Sternthal 1977), the present study has taken a sociological view of the adoption of innovations by the elderly.

Specifically, the present study focussed on adoption as socialization of elderly consumers. Within the socialization framework, the present research investigated the role of assistance received from younger family members, interaction with mass-media sources, and interaction with non-family personal sources as socialization processes influencing the adoption of technological innovations by the elderly. In the vast body of literature on consumer socialization it has been acknowledged and demonstrated that the outcome of socialization might include both cognitive and behavioral outcomes (Moschis 1987). Similarly, it has been acknowledged that adoption of innovations involves both cognitive (awareness and interest) as well as behavioral (trial and adoption) steps. Also, previous research suggests that variables other than individual characteristics (e.g., perceived risk, dogmatism) and characteristics of the innovation (e.g., relative advantage) might facilitate/influence adoption. The present study combined these two lines of research and found evidence that adoption of innovations by the elderly might be facilitated by their socialization. It is important to note that socialization applies to those aspects of one's behavior that the society considers to be important and worth learning.

Due to the rapid change in today's society, driven by technological advancements, there is a constant need to relearn the ways of proper behavior. For example, in an effort to reduce costs, banks are increasingly encouraging consumers to use

automated machine based channels (e.g., ATM, phone banking) to satisfy their banking needs rather than manual (teller) channels. As many banks have found, this task may not be so easily accomplished, especially for elderly consumers. The present study sheds some light on the processes through which the elderly might start using ATMs and other new technologies.

The findings of this research have important implications for marketers and public policy makers. Assistance from family members was related to adoption of technological innovations by the elderly. This suggests that younger family members may not only help the elderly in learning about technological innovations but also in acquiring and using them. This finding has important implications for marketers who are increasingly concerned with developing effective ways to reach this elderly market segment. The findings suggest that family-care providers may act as socialization agents for the elderly care recipients, and may serve as effective channels of reaching the mature consumer segment. Thus, marketers may target family caregivers to ultimately reach mature consumers. This may be especially useful where information is complex and the elderly may otherwise find it difficult to comprehend it due to age-related declines in cognitive abilities. The adoption of technological innovations was positively related to interaction with non-family personal sources but was not related to interaction with mass-media sources. This suggests that while mass media could function as a source of information, these media may not be effective in persuading the elderly to try and adopt technological innovations. Personal sources had a positive impact, suggesting that they might be able to not only persuade but also, through demonstration and explanation, facilitate adoption of technological innovations.

Age was negatively related to the adoption of technological innovations. This is in line with the findings reported by Gatignon and Robertson (1985), suggesting that the elderly are among the last groups to adopt technological innovations. Also, socioeconomic status was positively related to the adoption of technological innovations. This

is consistent with the notion that those with cognitive and financial resources are more likely to adopt technological innovations than those who have limited financial and educational resources.

Directions for Future Research

While this study attempted to investigate the adoption of technological innovations in the context of different adoption stages, it utilized a cross-sectional design. Future studies could analyze stages of adoption using a longitudinal design. Such a design could provide stronger evidence of the role of mass media, interpersonal sources, assistance for family members, and other variables in the adoption process. Also, future studies could focus on family caregivers and the elderly care-recipient dyad as a unit of analysis to establish stronger evidence of the same processes studied here. Dyadic data will not only provide information from both participants of the interaction process but may also help reduce the confounding effects of differences in perceived influence across family members.

Finally, additional variables derived from the socialization model could be studied in future research. The present study integrated a rather limited number of antecedents and social processes, and the study of several other antecedent variables and socialization processes could provide useful insights into the processes by which older consumers learn to adopt the new technologies.

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