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# Seek or Provide: Comparative Effects of Online Information Sharing on Seniors' Quality of Life

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# Communications of the Association for Information Systems

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### Abstract:

Seniors' social activities are critical in assuring their quality of life, and seniors' quality of life (QoL) declines with the deterioration of their social activity. Social support from online social relationships has been considered to be important determinants of QoL, and is an important goal of the design of online health communities to support patient-centered e-health initiatives. In this study, we find that, rather than attempting to improve seniors' quality of life through interventions and online community platforms that are designed directly to increase social interactions and focus on social relationship formation, it is more effective for such online health communities to be designed to facilitate information sharing. Information sharing may be an easy way for seniors to become familiar with the online environment and pave the way for subsequent online social relationships. This study investigated seniors' online information sharing behaviors and the impacts on their quality of life. Survey data from 130 seniors was used to test our research model. Seniors' online information seeking and provision indirectly affect their quality of life, and the relative importance of information seeking and information provision varies depending on the seniors' perceived subjective age, i.e., cognitive age.

**Keywords:** online information sharing, senior Internet usage, quality of life, cognitive age

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### I. INTRODUCTION

As people age, a number of factors, such as children leaving home, death of one's spouse, deterioration of physical health, or economic hardship after retirement, may contribute to a decrease in seniors' quality of life [Collins, 2003; Harwood and Lin, 2006; Penninx et al., 1999]. Thus, seniors are faced with increased vulnerability to various illnesses and maladies, resulting in a constant need for access to health-related information. Therefore, seniors actively search for such information on a daily basis in order to maintain a healthy life and, as a result, maintain a high quality of life [Karavidas, Lim and Katsikas, 2005; Mitzner, 2010]. Academics from diverse fields such as psychology [Slegers, Boxtel and Jolles, 2008], gerontology [Blit-Cohen and Litwin, 2004; Gatto and Tak, 2008], and human computer–interaction [Artz, 1996; Blit-Cohen and Litwin, 2004; Dickinson, Newell, Smith, and Hill, 2005; Gatto and Tak, 2008; Harley, Kurniawan, Fitzpatrick and Vetere, 2009; Lindley, Harper and Sellen, 2009a; Lindley, Harper and Sellen, 2009b; Slegers et al., 2008] have also devoted increasing research attention to help promote the quality of life of seniors. A major finding from this body of work is that social relationships are an important factor affecting seniors' quality of life and general well-being [Gabriel and Bowling, 2004]. But seniors who maintain active social relationships online through email, instant messaging, and participation in online communities experience higher overall quality of life [Dickinson et al., 2005; Lindley et al., 2009a, 2009b; Slegers et al., 2008; Xie, 2008], as active online social relationships may offset the negative impact of decreased offline social relationships. In short, enabling seniors to engage in active online community participation is likely to lead to healthier lifestyles because it leads to an increase in the range of social relationships. Healthy lifestyle maintenance and promotion are important elements of the patient-centered approach that stresses a move away from focusing on specific health conditions to a more holistic health management and prevention approach [Bauman, Fardy and Harris, 2003; Little et al., 2001]. Thus, a better understanding of the factors that lead to increased senior participation in online communities in general and online health communities in particular are important aspects of patient-centered e-health.

Online social networking can be an effective method to alleviate seniors' problems in managing their social relationships. As the number of older adults who use the Internet has grown significantly in recent years, an increasing number of these seniors are going online to make use of social networking sites [Zickuhr and Madden, 2012]. However, seniors' participation in social networks has been limited by the lackluster welcome from young SNS (social network sites) users unwilling to share their private life with older generations [Pfeil, Arjan and Zaphiris, 2009]. Seniors are more likely to engage in active participation in online health care communities if the majority of users are seniors [Demiris, 2006]. Seniors actively engage in online communities to expand their knowledge of health-related issues; thus, they are acquiring useful information for maintaining their health. While seniors actively seek information, a majority of seniors have yet to engage in any type of online social relationship activities due to an innate "technology anxiety" and reluctance to engage in new relationships [Dyck and Smither, 1994]. There is, therefore, a gap in the type of activities that seniors naturally engage in—information seeking—and the type of online activities, such as social relationship building, that have been found to be conducive to improved well-being and health. Thus, establishing and maintaining online communities for seniors as part of a patient-centered e-health initiative must depart from an understanding of the core motivations for seniors' participation in such communities. Online communities that are explicitly designed for the purpose of social relationship building may be less effective than one that is geared toward satisfying seniors' need for health-related information as discussed above.

Thus, in order to encourage active social activities by seniors in online communities, we argue that the communities must be designed to cater first and foremost to the seniors' utilitarian motives for Internet use—information sharing [Gatto and Tak, 2008; Godfrey and Johnson, 2009]. In particular, seniors participate in a variety of online health communities with the explicit goal of sharing health-related information. Seniors may feel less inhibited in engaging in online information sharing as these activities do not explicitly require engaging in social relationship building. However, the social relationships that are critical antecedents of improved quality of life may stem from repeated episodes of such information-sharing activities, as information sharing online is accomplished only through social interactions. Thus, as seniors voluntarily engage in repeated online information sharing of health-related information in particular [Karavidas, 2005], their anxiety regarding overall online activities within their frequently visited communities may diminish. Repeated online interactions in the process of seeking and providing information may increase seniors' familiarity of the medium and, hence, lead to increased social trust in the online setting. With increased trust in the medium, seniors may feel less anxiety toward establishing new social relationships online, which, in turn, may have a positive impact on their quality of life by increasing their range of social relationship activities.



The preceding discussion suggests that one way to improve the general well-being of senior citizens is to provide increased opportunities in the form of online groups and forums within which they may actively engage in information sharing in order to provide opportunities for cultivating social relationships [Pfeil, 2007]. A number of studies have found that online forums and social networks for senior citizens with the explicit goal of supporting social relationships have positive effects on their perceived social support and QoL [Karavidas et al., 2005; Pfeil, 2007; Wright, 2006]. Such online forums and communities designed for seniors introduce chronological age as the basis for membership and online activities. SeniorNet, for example, was founded in 1986 and enables adults mainly over the age of fifty to find information about using technologies; the site offers courses related to Internet and computer use [Pfeil, 2007]. The site also hosted over 500 forums for seniors to discuss a myriad of topics ranging from technical topics to health-related issues where seniors could discuss their symptoms and provide encouragement and social support [Pfeil, 2007]. While sites such as SeniorNet use chronological age as the basis for membership and activities, research on people's subjective age perceptions suggests that seniors of the same chronological age may behave differently due to differences in their perceived cognitive age, i.e., how old they actually perceive themselves to be [Barak and Schiffman, 1981]. While some seniors perceive themselves as younger than their chronological age, others may perceive themselves as older. This may account for research that finds that a subgroup of older adults are as proactive as the younger age group in actively cultivating new social relationships online [Gatto and Tak, 2008].

Most studies of seniors' use of technologies, however, do not allow for diverse subgroups within the senior population, assuming them to be a homogeneous group when explaining generational differences in technology use patterns [Artz, 1996; Blit-Cohen and Litwin, 2004; Gatto and Tak, 2008; Slegers et al., 2008]. Online communities and forums for senior citizens may need to account for such subjective age-perception differences in order to meet the potentially diverse needs of subgroups among seniors who are in the same chronological age group. The cognitively young and cognitively old may have different motivations and behavioral patterns in online forum participation. Hence, understanding these differences is important in attracting a critical mass of members to ensure that the community is sustainable.

This article focuses on seniors' quality of life through online communications. More specifically, we examine how information sharing affects seniors' online social relationships. We address two main research questions: (1) How does online information sharing affect seniors' satisfaction with online social relationship activities and affect their quality of life? (2) How does the impact of online information sharing differ according to the seniors' self-perceived age? The article proceeds as follows. The next section presents the theoretical background and research hypotheses. In Section III, we present the research method and results. In the final section, we discuss the study results, limitations, and implications.

## II. THEORETICAL BACKGROUND

### Seniors' Quality of Life

Quality of Life (QoL) is a direct measure of one's overall satisfaction with his or her life [Vokes and Golomb, 2003]. QoL can be measured by its sub-elements: happiness, or the degree of depression and loneliness [Gabriel and Bowling, 2004]. QoL is also intricately tied to one's social relationships. Such social relationships are difficult for seniors to maintain due to a number of factors such as physical constraints [Gabriel and Bowling, 2004; Lindley et al., 2009b]. Exploiting the Internet may be one effective way to alleviate this problem. Establishing and maintaining social relationships on the Internet using various communication means such as email or instant messaging reduces negative feelings like depression and loneliness to which seniors are susceptible [Dickinson et al., 2005; Karavidas et al., 2005; Xie, 2008], and online community participation in general increases perceived social support by enabling participants to build and maintain social capital from the online relationships [Wellman, Haase, Witte and Hampton, 2001; Ryan, 2010]. Social support from relationships in online communities enhances one's QoL [Wright and Patterson, 2006]. Pfeil [2007] found that online communities were a source of social support for seniors, which thereby enhanced their QoL. Recent research also found that online social activities supported by the use of mobile Internet services enhance perceived quality of life [Choi, Lee, Im, and Kim, 2005; Contarello and Sarricaa, 2007]. In short, the collective results of prior research suggest that older adults may reap emotional health benefits from online social relationship activities. In the subsequent sections, we examine how attitudinal differences among seniors may affect the perceived benefits of such online activities.

### Social Trust

*Social trust* is defined as the recognition of whether someone is trustworthy, has no intention of harm, and is respectful of others' well-being [Beaudoin, 2008]. Social trust is different from interpersonal trust in that the latter is based on direct relationships, while the former is broader in scope, encompassing one-to-many relationships in addition to interpersonal trust [Abdul-Rahman and Hailes, 2000], as well as trust in one's environment [Abdul-Rahman and Hailes, 2000; Subramanian, Kim and Kawachi, 2002]. We define *social trust* as ongoing trust toward

the online environment where information is exchanged and social relationships are formed. More specifically, social trust is ongoing trust in the online environment [McKnight, Choudhury and Kacmar, 2002]. While initial trust may be formed based on first impressions alone without actual interactions with a trustee, ongoing trust is the result of repeated interactions with the trustee and, hence, is formed gradually over time [Lewicki and Bunker, 1995]. Ongoing trust may form as a result of frequent interactions during which people learn more about each other as they share personal concerns and mutual interests [Ellison, Steinfield and Lampe, 2007; Tidwell and Walther, 2002; Walther, 1995]. Repeated interactions with others breed familiarity with and trust in others [Welch et al., 2005].

Because seniors in general tend to exhibit mistrust in the online environment and are less likely to actively engage in new relationship formation [Dyck and Smither, 1994], they may have difficulty in forming high levels of social trust that enable them to form new relationships online [Gray, 2009]. Prior studies on seniors' online social activities were mostly conducted after they had already formed social trust toward the online environment [McCloskey, 2006; Wagner, Hassanein and Head, 2010]. However, providing more social network services designed for seniors may not be sufficient in improving the overall well-being of the general population because some seniors will not even attempt to participate in online social activities due to lack of social trust. In short, while prior research has focused on investments in online social forums in order to improve seniors' QoL and general well-being, a digital divide may form between those who are able to participate in forming social relationships in these forums and those who have not overcome the initial hurdle of social trust. However, research suggests that even seniors who are reluctant to engage in social activities online are active in pursuing utilitarian goals online—searching for information on issues ranging from hobbies to the maintenance of health in the face of various illnesses [Mitzner et al., 2010]. Such utilitarian need-fulfillment may serve as a way of lowering the perceived barrier to participating in online forums. The subsequent section examines how seniors may be able to overcome their reluctance to engage in social activities by initially pursuing utilitarian information needs online.

### Seniors' Online Information Sharing

One of the most important motives for seniors' use of the Internet is to seek information about a wide range of topics, including health and education, in order to improve their productivity as well as their health [Bonisteel, 2000; Dorin, 2007; Tak and Hong, 2005; Wagner et al., 2010]. Beyond the informational value of information seeking activities online, seniors also enjoy the psychological benefit of feeling active while looking for the information via the Internet [Gatto and Tak, 2008]. A few studies found a positive relationship between Internet use and social trust [Beaudoin, 2008; Shah, Mcleod and Yoon, 2001; Tidwell and Walther, 2002; Valenzuela, Park and Kee, 2009]. In the course of sharing information online, one may also share mutual interests and thus become more familiar with one another [Tidwell and Walther, 2002]. However, there is a paucity of research that explicitly examines the effect that seniors' online information sharing has on social trust toward the Internet.

Online information sharing has generally been regarded as a single integrated activity. A single cycle of information sharing actually consists of two distinct activities—information seeking and information provision. Prior research indicates the need to distinguish between the two distinct phases of information seeking and information provision that comprise information exchange and sharing [Bao and France, 2007; Krauss and Fussell, 1991; Weick, 1995]. Participants in information sharing take on the dual role of provider or seeker of information, with the specific role varying based on changing needs. Because these two types of activities are driven by different motives, we examined the two phases of information seeking and information provision separately in our study.

### Cognitive Age

In general, one's subjective age may be different from one's chronological age. Cognitive age refers to one's subjective perceived age [Barak, Stern and Gould, 1988]. For the elderly, this discordance between actual age and cognitive age may be severe [Barak and Schiffman, 1981; Barak et al., 1988; Barak, Mathur, Lee and Zhang, 2001]. Cognitive age is thus considered a more effective measure than actual age when studying seniors' behavior and characteristics in the fields of gerontology, psychology, and marketing, among others [Barak et al., 1981; Eastman and Iyer, 2005; Iyer, Reisenwitz and Eastman, 2008]. According to Barak and Shiffman [1981], cognitive age consists of four subcategories as presented in Table 1: Feel-age, Look-age, Interest-age, and Do-age.

Categories	Example
Feel-age	<i>I feel as though I am in my forties.</i>
Look-age	<i>I look as though I am in my....</i>
Interest-age	<i>My interests are mostly of those of people in their....</i>
Do-age	<i>I do things as though I am in my....</i>

For example, if a senior shares the same tastes and interests with those whose age is much younger than the senior's, it can be said that his cognitive age is lower than his actual or chronological age. The cross-cultural reliability of the cognitive age construct has been validated in studies conducted in multiple countries [Auken, Barry and Bagozzi, 2006; Iyer et al., 2008; Wilkes, 1992]. Cognitive age thus accounts for seniors' activities, behavioral patterns, and attitudes. The younger one's cognitive age is, the more likely it is that he participates in a wide range of activities that improve QoL [Chua, Cote and Leong, 1990]. Seniors who are cognitively younger make more active use of the Internet [Eastman and Iyer, 2005] and of high-tech products [Wei, 2005] than cognitively older seniors do. Seniors who are cognitively young have higher self-confidence, are better managers of their lives, and are more interested in new experiences, individual challenges, and adventures [Eastman and Iyer, 2005; Schiffman and Sherman, 1991]. Seniors who are cognitively younger also experience lower technology anxiety [Wei, 2005].

In this article, we examine how seniors' cognitive age affects the impact of their online information seeking and provision activities on the development of social trust toward the online environment and, subsequently, affects their perceived QoL. Chronological age is often criticized as insufficient in explaining the behavioral and attitudinal changes due to aging. Because seniors may differ in their attitudes toward technology adoption even among their cohorts, we examine how cognitive age affects seniors' behavioral patterns in online settings. We elaborate on our research model in the following section.

### III. RESEARCH MODEL AND HYPOTHESES

The research model is presented in Figure 1.

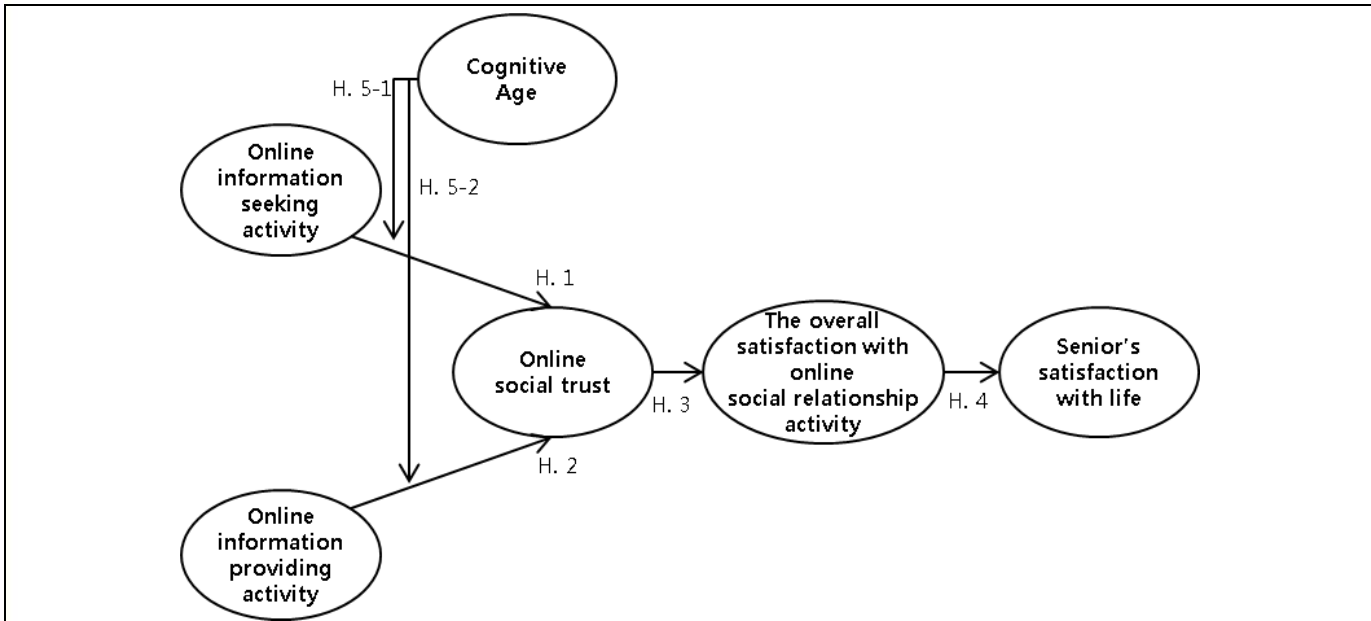


Figure 1. Research Model

#### Online Information Sharing and Social Trust

Seniors' social trust in online environments will increase as a result of active engagement in online information seeking, as such information-seeking activity is itself a form of social interaction [Burnett, 2000]. Prior research suggests that frequent social interactions will result in increased social trust [Shah, Kwak and Holbert, 2001; Valenzuela et al., 2009]. As a byproduct of active information seeking within an online community, seniors may become familiar with other community members' personal interests and information, leading them to greater social trust toward the people they encounter online and increased belief in their benevolence and competence [Cho, 2006]. We thus hypothesize as follows:

*Hypothesis 1:* Perceived information-seeking activity level will have a positive effect on online social trust in other people.

Information provision is another distinct phase of information sharing and, thus, is similarly likely to have a positive effect on social trust. Participants who have provided information to others in the past may have a higher probability of obtaining responses and reactions from others in the online community [Wasko and Faraj, 2005] and also a lower perceived probability of being attacked or flamed by other community participants [Franco et al., 1995]. Such positive experiences within online communities will result in an increased tendency to sustain participation online,

further resulting in increased levels of social trust. Moreover, information providers may also have an increased chance of witnessing others' competence and benevolence via replies to their information. Through increased confidence in others' competence and benevolence, a frequent information provider's social trust will increase [Cho, 2006]. Thus, we hypothesize as follows:

*Hypothesis 2:* Perceived information-provision activity level will have a positive effect on online social trust in other people.

### **Social Trust and QoL**

There has been much research regarding the relationship between general social trust and satisfaction [Hennig-Thurau, Gwinner and Gremler, 2002]. In offline settings, it is widely accepted that high social trust reduces anxiety toward establishing new social relationships and thus increases the satisfaction with social-relationship activities [Gwinner, Gremler and Bitner, 1998; Hennig-Thurau et al., 2002; Swanson, Davis and Zhao, 2007]. Chiou, Droge and Hanvanich [2002] further argued that negative past experiences with other people will lead to distrust and decreased levels of satisfaction with future relationship activities. Several studies have further found a direct link between social trust and perceived QoL offline [Delhey and Newton, 2003; Dolan, Peasgood and White, 2008; Huppert et al., 2009]. Because online social interactions replicate offline interaction dynamics [Dickinson et al., 2005; Ellison et al., 2007; Karavidas et al., 2005; Pfeil, 2007], a similar mechanism will be evident online.

Indeed Karavidas et al. [2005] found that seniors in a computer class reported that their improved knowledge of computer use increased their self-efficacy level by enabling new online social relationship building. Satisfaction in social relationship in turn leads to increased QoL [Gwinner et al., 1998]. Xie [2008] also found that communication via the Internet enhances seniors' QoL. In short, online relationships positively affect one's QoL much in the way that offline relationships do. We thus hypothesize as follows:

*Hypothesis 3:* Social trust will have a positive effect on overall satisfaction with online social relationship activities of seniors in online settings.

### **Perceived Quality of Life and Online Social Relationship**

Social support from social relationships that provide increased opportunities for social and leisure activities reduce feelings of loneliness and depression that have negative effects on perceived QoL. Thus, overall satisfaction with offline social relationships is positively related to QoL [Becker et al., 1998; Ellison et al., 2007; Gabriel and Bowling, 2004; Hansson and Carpenter, 1994; Pavot and Diener, 1993]. Seniors' life satisfaction is determined to a large extent by social relationship activities [Borglin, Edberg and Hallberg, 2005; Gabriel and Bowling, 2004; Lindley et al., 2009a]. For example, seniors derive life meaning through continuous and regular social relationship activities with their grandchildren [Lindley et al., 2009a]. Actively maintaining social relationship activities and engaging in hobbies and religious activities enable seniors to stay active, build self-esteem, and eventually enhance their QoL [Borglin et al., 2005].

Similar benefits also have been reported for online social relationship activities [Dickinson et al., 2005; Ellison et al., 2007; Karavidas et al., 2005; Pfeil, 2007; Wright, 2006; Xie, 2008]. For example, social relationships on the social network service Facebook, resulted in increased social capital and life satisfaction [Ellison et al., 2007]. In sum, we assume that overall satisfaction with social relationship activities has a positive effect on seniors' life satisfaction, in both offline and online settings.

*Hypothesis 4:* The overall satisfaction with online social relationship activities of seniors in online settings will have positive effects on seniors' Quality of Life.

### **Cognitive Age**

One who perceives his age to be younger than his chronological age, i.e., the cognitively young, will be affected more by information-providing activity than information-seeking activity in building social trust. This is because the cognitively young experience less technology anxiety and are more likely to have the skills required for active online participation and thus for providing information. Moreover, information provision may entail greater effort and perceived risk relative to information seeking. People value more gains obtained from higher levels of effort [Kahneman, Knetsch and Thaler, 1991]. Moreover, the cognitively young are more willing to take the risks of new experiences [Chua et al., 1990; Eastman and Iyer, 2005]. Therefore, the cognitively young will prefer to provide information over passively consuming information. Therefore, information provision will have a greater effect on social trust for the cognitively young.

*Hypothesis 5-1:* For seniors who perceive their cognitive age as young, information provision will have a stronger effect on social trust than information seeking does.



In contrast, seniors who perceive their age to be older than their chronological age will prefer to seek and passively consume information online. Information seeking is generally less challenging compared to information provision. Moreover, the outcomes of information seeking are relatively specific and well-defined—one is either successful or not in finding the information required. In contrast, information provision may result in unexpected outcomes. The cognitively old are reluctant to engage in new experiences and suffer from technology anxiety [Eastman and Iyer, 2005; Wei, 2005]; they will prefer to participate in information seeking rather than information provision, because the former has predictable results and is easier to perform. Moreover, to avoid experiencing negative emotions [Chua et al., 1990], they will avoid engaging in information provision. We thus hypothesize as follows:

*Hypothesis 5-2:* For seniors who perceive their cognitive age as old, information seeking will have a stronger effect on social trust than will information provision.

#### IV. RESEARCH METHOD

We adopted the survey method in order to secure a larger sample to produce more generalizable results, due to the difficulties of controlling for desirability biases when subjects are seniors [Mitzner et al., 2010; Wagner et al., 2010]. Below we describe in more detail the survey items and survey administration procedures.

##### Item Development

The constructs in our research model were measured using a total of sixteen items from prior related work. Perceived quality of life [Pavot and Diener, 1993] and cognitive age [Barak and Schiffman, 1981] were measured with items from prior studies that were adapted and modified to reflect the online context. Cognitive age was measured as the average of responses to four items that tap into one's subjective age perception [Barak and Schiffman, 1981]. The average score of answers from the Cognitive Age questionnaire was used for model testing. Online social trust was measured using three items based on an examination of prior studies measuring social trust [Cho, 2006; Chow and Chan, 2008]. We adopted existing items to measure general social trust and modified the items to measure social trust in online settings. The perceived activity levels of online information seeking and provision were measured with three items each. All items except cognitive age were measured using a 7-point Likert scale.

All items were validated in two phases: First, we assessed the face validity of all items by administering the survey to six subjects—graduate researchers and some members of our target study population group of seniors. Second, a pretest of the survey instrument was conducted with thirty seniors who were active in pursuing online social relationships. Several items were modified as a result of these two phases. The final set of construct measure items is shown in Appendix A.

##### Survey Respondents

We tested the hypotheses with survey data collected from the seniors over the age of sixty-five who actively used online services that support social activities via the Internet, such as online community services, blogs, and social network sites. Our survey sample was restricted to seniors who had established personal accounts in any of these services for a period greater than six months and who used the service several times and stayed active for over a month. This is because the focus of our study is not in the Internet adaption of seniors but in the usage and perception changes once seniors start using computers and the Internet. In order to meet these selection criteria, we recruited participants from computer classes in senior welfare centers in South Korea, which aim to help seniors learn how to use a computer and, more specifically, the Internet.

Researchers visited those welfare centers at computer class hours and conducted the survey offline because most seniors have difficulties in responding to online questionnaires [Dickinson, Arnott and Prior, 2007]. Questions or problems in understanding the survey questions were explained on site. Survey respondents responded to survey items measuring our model constructs and basic demographic data, including their chronological age. After completing the survey, each participant received a token monetary compensation of 30,000 Won (approximately USD30).

We gathered responses from 137 seniors, but excluded seven responses from further analysis due to incomplete survey responses or the subject's lack of Internet skills (less than six months of use). Our final research model was tested on a sample of 130 respondents. To divide the survey respondents into the cognitively younger and older groups of respondents, the average score from the four items measuring cognitive age were compared to the respondent's chronological age. Average cognitive age scores were then normalized and served as a criterion to distinguish between the cognitively young and old groups: people with a cognitive age greater than 0 after normalizing were grouped into the cognitively old. Similarly, people with a normalized score below 0 were grouped into the cognitively young. The demographic profile of the survey respondents is shown in Table 2.

Table 2: Respondent Sample Demographic Data			
Combined (n = 130)		Male	98 (75.4%)
		Female	32 (24.6%)
		Age (chronological)	73.24 (5.63)
		Internet Experience	5.46 years
Cognitive age	Younger cognitive age (n = 79)	Age (chronological)	70.25 (4.21)
		Internet Experience	6.15 years (3.06)
		Age (cognitive)	55.19 (7.06)
	Older cognitive age (n = 51)	Age (chronological)	77.86 (4.26)
		Internet Experience	4.39 years (3.12)
		Age (cognitive)	68.70 (4.59)

## V. RESULTS

The survey data were analyzed using the partial least squares (PLS), which is appropriate for small sample sizes. We used Smart PLS Version 2.0 M3 to conduct the analyses [Chin, 1998]. Our sample size of 130 satisfies the empirical rule of thumb that requires the sample size to be greater than tenfold the number of constructs [Gefen, Straub and Boudreau, 2000; Goodhue, Lewis and Thompson, 2006]. A second rule of thumb requires the sample size to be at least tenfold the maximum number of incoming paths to a construct [Chin and Newsted, 1999]. In our study, the minimum sample size to satisfy this rule of thumb is twenty, because the construct with the greatest number of incoming paths is that of social trust, with two incoming paths. Both the cognitively young (n = 79) and cognitively old (n = 51) subgroups, as well as the total sample size (n = 130) are all above the minimum required sample. Additionally, the result of power analysis is satisfactory [Cohen, 1988]. Using G\*Power 3.1.5 with set parameters of  $\alpha = 0.05$ , power = 0.8 at large effect size, the required sample size is thirty-one for the test of our structural model. Thus, both our full and subgroup sample sizes are adequate to test our hypotheses.

### Measurement Model

The measurement model of entire data set (N = 130) was analyzed to assure reliability and validity of the measurement items before hypothesis testing. All factor loadings are greater than 0.70, and t-values are also statistically significant, thereby demonstrating the convergent validity of our survey constructs as illustrated in Table 3 [Arnold and Reynolds, 2003]. In Table 4, the composite reliability scores of our constructs exceed the threshold of 0.70, and the AVE scores for constructs are much higher than the generally recognized cutoff value of 0.5 [Fornell and Lacker, 1981]. Table 4 presents the discriminant validity statistics. The square roots of the AVE scores are all higher than the correlations among the constructs, demonstrating discriminant validity [Fornell and Lacker, 1981]. Additionally, as illustrated in Table 3, all constructs in the survey demonstrate discriminant validity as well, with cross loading values below the recommended threshold for establishing discriminant validity [Fornell and Lacker, 1981]. Discriminant validity was also assessed according to the criterion proposed by Garrity, Glassberg, Kim, Sanders, and Shin [2005]. For all constructs, the difference between the square root of the AVE and the corresponding correlation coefficient is greater than 0.1.

Table 3: Measurement Model and Cross Loading						
	t-value	PRVD	SEEK	TRU	QoL	CA
PRVD1	80.80	<b>0.96</b>	0.66	0.57	0.36	-0.16
PRVD2	119.91	<b>0.97</b>	0.57	0.54	0.39	-0.17
PRVD3	80.59	<b>0.96</b>	0.61	0.57	0.36	-0.15
SEEK1	51.87	0.54	<b>0.93</b>	0.50	0.44	-0.18
SEEK2	42.99	0.58	<b>0.94</b>	0.46	0.38	-0.16
SEEK3	78.82	0.66	<b>0.94</b>	0.57	0.28	-0.11
TRU1	43.35	0.54	0.52	<b>0.93</b>	0.39	-0.17
TRU2	101.79	0.52	0.50	<b>0.96</b>	0.41	-0.13
TRU3	39.35	0.55	0.51	<b>0.90</b>	0.46	-0.11
QOL1	15.16	0.30	0.22	0.36	<b>0.82</b>	0.00
QOL2	95.72	0.41	0.38	0.46	<b>0.95</b>	-0.05
QOL3	95.84	0.33	0.41	0.40	<b>0.95</b>	-0.11
CA1	8.04	-0.19	-0.17	-0.20	-0.06	<b>0.95</b>
CA2	8.33	-0.17	-0.17	-0.18	-0.12	<b>0.90</b>
CA3	8.62	-0.13	-0.13	-0.07	-0.04	<b>0.93</b>
CA4	5.66	-0.06	0.00	-0.02	0.03	<b>0.88</b>

PRVD: Perceived information-provision activity level      QOL: Perceived Quality of Life  
 SEEK: Perceived information-seeking activity level      CA: Cognitive age  
 TRU: Perceived online social Trust



Table 4: Composite Reliability, AVE, and Correlations Between Latent Constructs							
Con.	CR	AVE	PRVD	SEEK	TRU	QOL	CA
PRVD	0.97	0.93	<b>0.96</b>				
SEEK	0.95	0.87	0.64	<b>0.93</b>			
TRU	0.95	0.86	0.58	0.55	<b>0.93</b>		
QOL	0.94	0.83	0.38	0.39	0.45	<b>0.91</b>	
CA	0.95	0.84	-0.17	-0.15	-0.15	-0.07	<b>0.92</b>

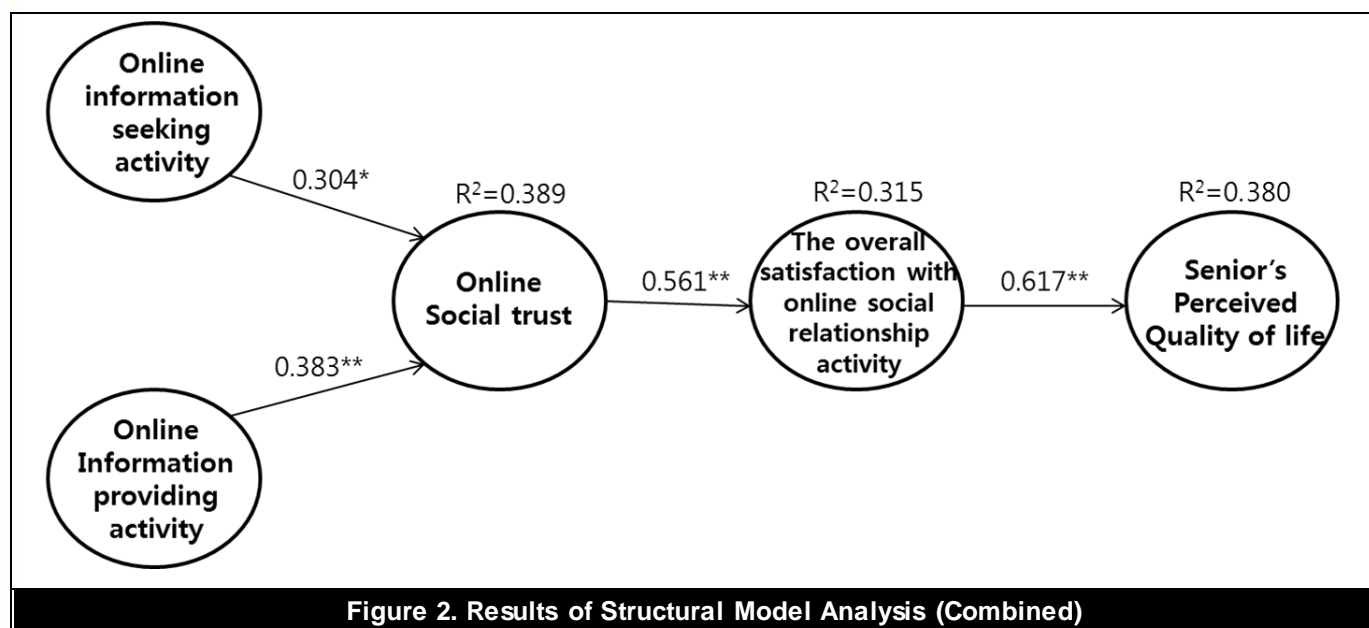
PRVD: Perceived information-provision activity level      QOL: Perceived Quality of Life  
 SEEK: Perceived information-seeking activity level      CA: Cognitive age  
 TRU: Perceived online social Trust

### Common Method Bias

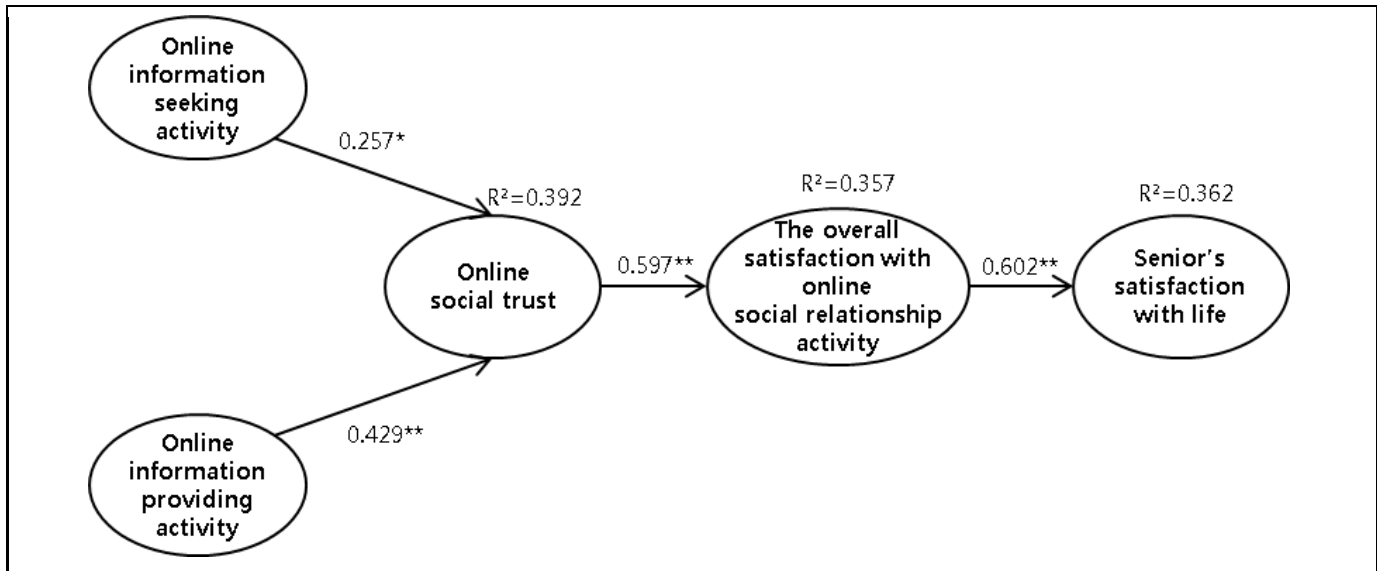
Two tests were performed to assess common method bias. First, we conducted Harmon's single factor test [Podsakoff, MacKenzie and Podsakoff, 2003]. No single factor emerged that accounted for the majority of the covariance in factor analysis. A second test to examine the correlations between each pair of constructs was conducted. As shown in Table 4, all values are under the generally recognized cutoff value of 0.7 [Podsakoff et al., 2003]. These results suggest that our data are not greatly influenced by a common method bias.

### Structural Model

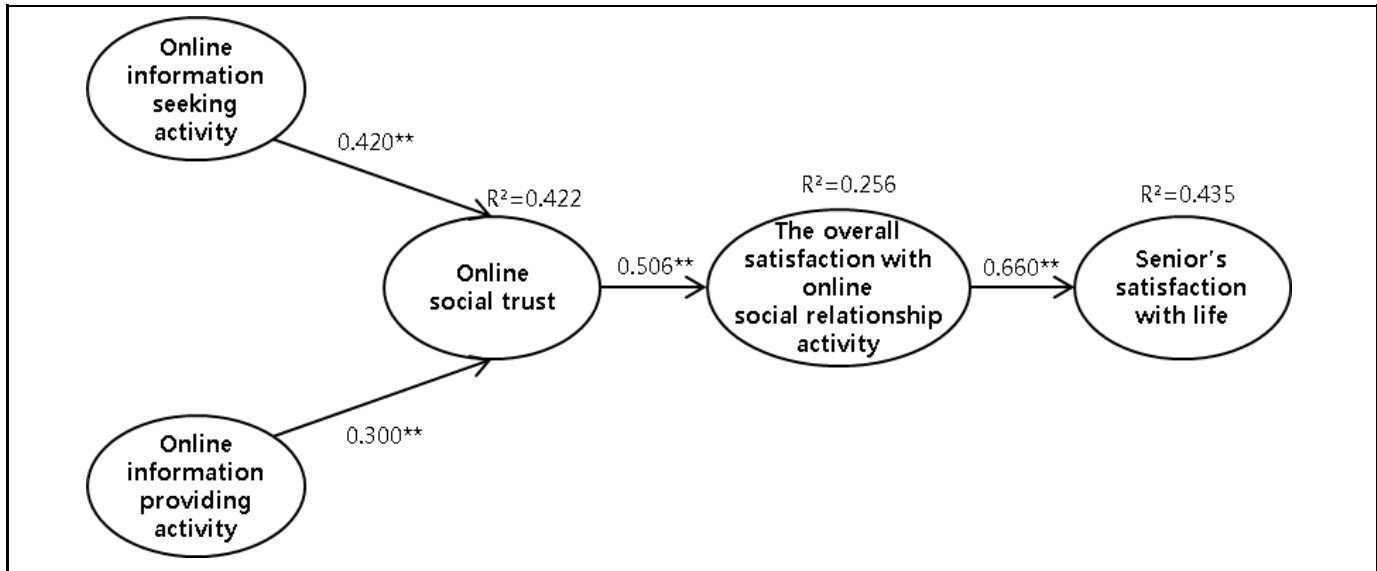
Figure 2 presents the results of hypothesis testing for Hypotheses 1–4.



All paths in the model are statistically significant and in the hypothesized direction. Online information seeking has a significantly positive effect on online social trust ( $\beta = .304, p < .05$ ), thus supporting Hypothesis 1. Online information provision has a significant positive effect on online social trust ( $\beta = .383, p < .01$ ), supporting Hypothesis 2. Online social trust also significantly affects the overall satisfaction with online social relationship activities ( $\beta = .561, p < .01$ ). The overall satisfaction with online social relationship activities have positive effects on seniors' QoL ( $\beta = .617, p < .01$ ). Hypotheses 5-1 and 5-2 were tested by comparing the effects of information seeking and information provision on online social trust for the cognitively young and cognitively old groups. All hypothesized relationships were supported ( $p < .05$ ). For the cognitively young group, online information seeking has a significant positive impact on online social trust ( $\beta = .257, p < .05$ ). Online information provision had a positive impact on social trust ( $\beta = .429, p < .01$ ), and online social trust had effects on the overall satisfaction with social relationship activities ( $\beta = .597, p < .01$ ). Lastly, seniors' perceived QoL is positively affected by the overall satisfaction with social relationship activities ( $\beta = .602, p < .01$ ). Similar results hold for the cognitively old. Both online information seeking and information provision had significant positive effects on online social trust ( $\beta = .420$  and  $.300$  respectively,  $p < .01$ ). Online social trust positively affected the overall satisfaction with social relationship activities of the cognitively old ( $\beta = .506, p < .01$ ), and the satisfaction level in turn positively influenced perceived QoL ( $\beta = .660, p < .01$ ). The results for the cognitively young and cognitively old subgroups are shown in Figure 3 and Figure 4 respectively.



**Figure 3. Results for the Cognitively Young Group**



**Figure 4. Results for the Cognitively Old Group**

Table 5 presents the results of group comparison tests for Hypotheses 5-1 and 5-2. For the cognitively young, there is a stronger positive impact of online information provision relative to online information seeking on online social trust, supporting Hypothesis 5-1 ( $t = 9.53, p < .05$ ). For the cognitively old, there is a stronger positive impact of online information seeking on online social trust, supporting Hypothesis 5-2 ( $t = 7.22, p < .05$ ).

	Impact of online information seeking (IS) on online social trust	Impact of online information provision (IP) on online social trust	Difference	t-student
Young	0.257	0.429	-0.172	9.53***
Old	0.420	0.300	0.12	7.22***

\*\*\*  $p < .01$

**VI. DISCUSSION**

In this study we examined how seniors' utilitarian information-seeking and information-provision activities may lead to increased QoL by increasing online social trust and satisfaction with online social relationships. We also found that seniors' subjective cognitive age affects the relative importance of the two aspects of online information sharing: the cognitively young are more likely to develop social trust through information-provision activities, whereas the

cognitively old are more likely to do so through information-seeking activities. We tested our hypotheses with a survey of seniors who are active users of the Internet and explained the differentiating effect of subjective age on social trust via online information-sharing activities. All hypotheses were statistically supported showing that the senior's online information-sharing activity has a positive effect on his QoL.

Our study has several limitations. Potential bias may exist in our survey sample because of our sampling from a single site, which also limits the generalizability of our research findings. Our study also relies on self-reported responses of seniors and fails to actually measure seniors' online social activities. Although our test for common method bias did not indicate that common method variance was a significant factor, future studies are needed to further test the hypothesized relationships by conducting surveys of seniors within online communities and to relate their survey responses to actual behavioral measures of online social relationship activities and online information sharing activities.

Our study has several implications, theoretically as well as practically. In terms of contribution to theory, we found that one's subjective age, i.e., cognitive age, is an important factor to consider in studies that examine seniors' attitudes toward online information environments and pursuing online information-sharing activities. We also extended prior research that stresses the important role that social trust plays in seniors' active pursuit of social relationships online by examining what may lead seniors to initially develop this social trust. Prior research has focused on the importance of online social trust for online social relationship formation, which, in turn, is an important predictor of seniors' quality of life. However, these prior studies did not sufficiently explore how this critical online social trust is developed. In particular, seniors experience high technology anxiety and may be generally reluctant to participate actively online; therefore, they are at a disadvantage in experiencing social support online. Our study examines the antecedents of online social trust and thus provides a theoretically derived set of antecedents that may be critical for improving seniors' perceived QoL.

From a practical perspective, this study provides theory-driven recommendations regarding the implementation of social networking that have the goal of providing both a venue of communications regarding a wide range of topics, including hobbies and health issues, as well as social support to seniors for improved physical and emotional well-being. There is growing interest in patient-centered approaches for e-health communications [Dawson, Tulu and Horan, 2009; Johnsen and Gammon, 2009; Klein and Dinger, 2009; Ryan, 2010]. To date, prior research suggests that effective online communities to support e-health communications should focus on providing social support in order to improve the participants' well-being. Our study findings suggest, however, that seniors are unlikely to directly engage in social activities online. Rather, such communities should be designed to support more effective information sharing that facilitates repeated interactions and, hence, enables the formation of social trust. Based on our research findings, seniors should not be viewed as a homogeneous group based on chronological age; rather, subjective age perception shapes seniors' attitudes and behaviors in important ways. Additionally, the antecedents of social trust development are different for seniors of different subjective ages. Our study indicates that for developing online social network services that are truly senior-centered, seniors' cognitive age needs to be taken into consideration—in particular for health-related communications and online relationship building for social support. For example, seniors who perceive themselves to be cognitively young may benefit from features in online communities that highlight increased opportunities for information provision and highlight seniors' online contribution activities. Seniors who perceive themselves as cognitively old may benefit from intuitive navigation tools and features that facilitate the information-seeking process.

Once online community members are able to fulfill their needs by participating in the community, they will actively join and sustain participation, resulting in a vibrant, successful community [Cheng and Vassileva, 2006]. Since seniors are generally concerned about being misunderstood, it will be hard for them to overcome the intergenerational divide and to take part in existing online social communities or services. Moreover, according to the findings from this study, even within the same senior generation, there are different preferences over two information-sharing activities. Information-provision activities have greater effects on social trust for the cognitively younger group and on information-seeking activities for the cognitively older group.

In conclusion, this study found that online social relationship activity based on information sharing has a positive effect on seniors' quality of life. In particular, we found that the relationship between social trust and either information-seeking or information-provision activity is different depending on seniors' perceived subjective age. Once social trust is established, it leads to improved quality of life through improving online social relationships. In short, our study indicates that, rather than attempting to improve seniors' quality of life through interventions and online community platform services that are designed directly to increase social interactions and focus on social relationship formation, it is more effective for such online communities to be designed to facilitate information sharing.

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*Editor's Note:* The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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## APPENDIX A: ITEM MEASURES

Table A-1: Item Measures		
Items		Source
Perceived quality of life		
QOL1	Overall, my life is close to my ideal.	Pavot and Diener, 1993
QOL2	My current life state is excellent.	
QOL3	I am satisfied with my life.	
Perceived online social trust		
TRU1	The people whom I met in the Internet were truthful to me in general.	Chow, 2008
TRU2	Generally, I tend to trust the people whom I meet via the Internet.	
TRU3	I tend to trust the information earned via the Internet in general.	
Perceived information-seeking activity level		
SEEK1	I am good at seeking information via the Internet.	Self-developed
SEEK2	I try to find new information on the Internet.	
SEEK3	I actively learn about something new via the Internet.	
Perceived information-provision activity level		
PRVD1	I tend to provide other people with information that they want via the Internet.	Self-developed
PRVD2	I tend to provide other people with information that they did not know via the Internet.	
PRVD3	I tend to provide other people with useful information that I learned from the Internet.	
Cognitive age		
CA1	I feel as though I am in _____ years old.	Barak and Schiffman, 1981
CA2	I look as though I am in _____ years old.	
CA3	I do activities as though I am in _____ years old.	
CA4	My interests are mostly of those who are in _____ years old.	

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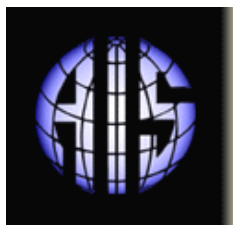
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