

Active Aging in Community Centers and ICT Design Implications

Young S. Lee, Shirley Chaysinh, Santosh Basapur, Crysta J. Metcalf, and Hiren Mandalia

Applied Research Center

Motorola Mobility Inc.

600 US Hwy 45 Libertyville, IL 60067 U.S.A

{youngLee, shirley.chaysinh, sbasapur, crysta.metcalf, hirenm}@motorola.com

ABSTRACT

In recent years, the wellness of seniors has become more important than ever before in our rapidly aging society. In the U.S., approximately 11,000 community senior centers provide a broad spectrum of programs for seniors to improve their overall health and wellness in their community. Although numerous studies have reported on the various benefits of participation in such programs, little is known about how information and communications technology (ICT) can support seniors' participation in this practice. We describe findings from a two-phase qualitative study using semi-structured interviews, site visits, and focus groups with seniors and staff of senior centers located in urban and suburban areas of Chicago, IL and Tampa, FL. Based on the results, we discuss design implications for technologies that could facilitate seniors' engagement with their local community including senior centers.

Author Keywords

Community senior centers, community engagement, older adults, health and wellness

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors

INTRODUCTION

In recent years, the wellness of seniors has become more important than ever before in our rapidly aging society. According to census estimates in 2009, the world's 65-and-older population has already increased by 23 percent since 2000 to 516 million; however, the biggest shift is expected soon as post-war baby boomers will come of this age, making the world's senior population triple by 2050 [1,2].

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As similar to other developed nations, the United States faces enormous challenges in supporting health care for their aging population, and a growing number of researchers are turning their attention to local community wellness programs as a means of lifting the overall health and well-being of seniors while reducing overall health care costs [3].

Since the Older American Act of 1965, senior centers in the United States have been a community focal point on aging, where older persons can come together for services and activities that support their independence and encourage their involvement with the community [4]. According to the Administration on Aging, approximately 11,000 community senior centers provide a broad spectrum of programs and services for seniors that include, (1) meal and nutrition programs; (2) information and referral assistance; (3) health and wellness programs; (4) recreational opportunities; (5) transportation services; (6) arts programs; (7) volunteer opportunities; (8) educational opportunities; (9) employee assistance; (10) intergenerational programs; (11) social and community action opportunities; (12) financial benefits assistance; and (13) special services addressing local needs [4]. With various services for the aging population, senior centers serve as a gateway to the aging network that enables seniors to maintain their independence and to improve their health and wellness.

A number of studies reported on the various benefits of participation in senior center programs such as possession of a positive outlook on life, practice of healthy behavior, and increased social connectedness, all of which are integral parts of a seniors' well-being [5,6,7,8,9]. Therefore, it is our belief that facilitating seniors' participation in the senior center programs is one of the most effective ways to improve seniors' wellness. Furthermore, with the positive evidence of increasing seniors' technology adoption [17], we believe that technology can play an important role in this goal. However, little is known about information and communication technology (ICT) strategies to support the practices of senior centers. Hence, we conducted an ethnographic field study to understand the current practices of senior centers and explore the potential benefits that ICTs can provide in their practices. We wanted to design interactive systems which allow communication and

collaboration between senior individuals and groups, participating in senior center programs, such that their wellness goals could be met more easily.

To achieve this goal, we investigated perspectives of two parties playing different roles in the senior center community: 1) senior center directors who provide the programs and services and 2) individual seniors who consume the services. In this paper we report our findings on the current practices and present design implications for interactive systems for seniors seeking wellness by participating in senior center activities.

RELATED WORK

Wellness as Multi-dimensional Condition

Although there are variant definitions of wellness that exist in the literature, Hettler defined wellness to be a multi-dimensional condition with six dimensions: social, occupational, spiritual, physical, intellectual, and emotional [10,11]. Social wellness is concerned with one's ability to interact with people around them, including having meaningful relationships with families and friends and contributing to the common welfare of one's own community. Occupational wellness is involved in preparing for work in which one gains personal satisfaction and finds enrichment in one's life through work. Spiritual wellness is a personal matter involving values and beliefs that provide a purpose in one's life. Physical wellness refers to those attributes related to one's physical body, such as physical fitness and healthy eating habits. Intellectual wellness involves engagement with creative, stimulating mental activities to expand one's knowledge and skills, including participation in cultural or community endeavors to learn or spend time pursuing personal interests. Emotional wellness is concerned with having an optimistic attitude towards one's own life and expressing emotion appropriately [10]. From a holistic perspective of wellness, retirement can deprive many seniors of multiple sources of wellness ranging from occupational, social, emotional, and physical wellness. Therefore, senior centers in the U.S. aim to provide alternative sources of wellness for retirees by providing various services to support seniors' multi-dimensional condition of wellness in their community.

Senior Centers and Impacts on Seniors' Wellness

Numerous research studies have reported on types of senior center services and their positive impact on elders' health and wellness. Comprehensive literature reviews were done by [5,6,7,8,9], which highlight the following:

A variety of senior center typologies have emerged since the enactment of the Older Americans Act. Some centers are single purpose (e.g., meals only) while 75% of senior centers are considered multipurpose and provide multiple services. Located in various geographical locations, senior centers vary in size, geographic coverage, numbers of people served, funding sources, and target populations.

Some senior centers provide services for healthy individuals only, whereas others support frail and older individuals with several disabilities and special needs with adaptive and therapeutic programming [7]. According to [9], there are two conceptual models of the senior center: the voluntary organization model and the social agency model, and his typology still serves well in this modern era. The former depicts the center as a voluntary organization emphasizing the center as an formal and informal social club; whereas, the latter regards the senior center as a social service agency designed to meet a range of needs of the frail elderly, the low income and disengaged.

The benefits of participation in senior centers are well documented. Participation in senior center programs provides a social environment conducive to the development of a social support system, and this resulting system reduces seniors' loneliness and depression, and enhances their life satisfaction [5,6]. A survey with 1,100 seniors who participated in senior center programs revealed that the majority of respondents found their center important in making them feel like a part of a group, having fun, improving their quality of life, maintaining new friendships, feeling more relaxed, providing a place to go each day, and improving their physical health [8]. Also, senior center programs are informative in producing a variety of learning opportunities ranging from intellectual topics (e.g., art, writing, and politics) to daily living information (e.g., power of attorney, living will, and Medicare) [7].

Applications for Facilitating Senior Center Participation

A few researchers in the field have started exploring the usefulness of technologies to increase participation and engagement in senior center activities. To facilitate seniors' social connection in the senior center, Keyani et al. [12] designed an augmented dancing environment that allows elders to select dance sequences from well-known movies and dance along with them. The system, called DanceAlong, was developed to provide entertainment and exercise for each individual user and to promote social engagement within the group. After the evaluation of the system at a senior community center, they found that elders tend to interact with people that they have already known and suggested that design of technologies that encourage them to explore and venture out beyond their closed social circles would be helpful for them to increase social engagement.

Some researchers in the field of community computing have investigated ways to increase seniors' engagement in community using technology. For example, Casalegno [13] on the Blacksburg Electronic Village (BEV) project found that the Internet reinforces and expands seniors' social networks and increases the ties, or flows of information among members. The exchanges on the listserv, in combination with the face-to-face meetings of BEV seniors, makes it possible for members to know each other better.

The use of the listserv also helped seniors discover other members who share the same interest. Interestingly, however, the website of social groups did not increase the sense of social ties within the group because the website was perceived to be public [13].

From the literature review, we found that there has been a myriad of studies investigating the impact of senior center participation on elders' wellness, but there were few studies that address designs of technology to facilitate elders' participation in the senior center community. Furthermore, none of the previous studies had inquired about the needs for technological support from both the seniors' perspective as well as the perspective of the centers' management and instructional staff. Building upon the previous findings from the community computing literature, this research seeks potential design implications for interactive systems that improve seniors' participation and engagement with their local community.

METHOD

We conducted a two-phase qualitative study with multiple ethnographic methods. In phase 1, we conducted site visits and semi-structured interviews with nine senior centers. We used a mixture of convenience and snowball sampling methods where we contacted community centers in urban and suburban areas of Chicago (IL) and Tampa (FL) and received a referral from them to continue participant recruitment. As a result, five centers in the Chicago area and four centers in the Tampa area were recruited. All senior centers were multipurpose drop-in centers targeted for well older adults, following the voluntary organization model. They have various funding sources such as independent not-for-profit organizations, municipal funding support, or funding governed by local townships. We conducted semi-structured interviews with the directors of the senior centers. We asked them to select some of the most popular programs offered at their center and describe the process of how those programs came into existence. We sought information about their processes including ideation, implementation, promotion, and evaluation of programs as well as seniors' participation in the programs from directors' perspective. Each interview lasted for an hour and was voice recorded. After the interview, we requested a tour of the center. During the 30-40 minute tour, we collected or photographed artifacts relating to the programs, such as brochures and bulletin boards, and conducted direct observations of seniors' activities by attending the classes when possible.

In phase 2, we conducted four focus group interviews with 24 seniors. Using the purposeful sampling technique, we chose four programs from the popular programs mentioned in Phase 1. The four programs were selected for maximum variation in terms of the activity type and program dynamics. A detailed description for each program is shown in Table 1. We contacted the senior center director first and asked for his/her recommendation to recruit six participants

from each program. All participants were the members of the center, having experience with the Internet and email. There were 11 females and 13 males. The age distribution was: two people in 55-64, nine in 65-74, and 14 in 75 above. The focus group interviews began with a general discussion on the seniors' experiences of participating in the senior center programs. We prompted their responses by asking them to describe 1) how they found out about the senior center and programs, 2) how they communicate with the senior center, including the instructors, 3) activities that occur during the program/class, and 4) their relationship and communication with other classmates. The focus group lasted for an hour, and the participants were compensated for their participation.

The two-phase study produced a large amount of data. All of the data including notes from the site-visits, interviews, and focus group interviews were transcribed and analyzed using a grounded theory-based affinity analysis [14]. We extracted items-of-interest from the transcribed data and identified themes to answer our research questions using the affinity [19]. We report the themes that emerged from our data analysis along with design implications for technology development.

| Center (Location) | Program | Description |
|-------------------|--------------------------------------|--|
| A (IL) | Current events and American politics | A discussion group where 30 members contribute to the moderator-led discussion on a wide variety of topics |
| B (IL) | Conversational Spanish | About 10 students learning conversational Spanish taught by an instructor. A part of continuing education program of a local community college |
| C (FL) | Acrylics and oil open studio | An unstructured class allowing experienced artists to paint at their leisure in a friendly and social setting |
| D (FL) | Stretch and tone | About 40 seniors stretch and tone various muscles, led by an instructor |

Table 1. Descriptions of programs selected for Phase 2

RESULTS

Co-creation and seniors' active participation

Because all communities are distinctive in terms of geographical location, demographic profile, and facility availability, each senior center is run in its own unique way and has a self-built individual style. We observed, however, that there is a common culture of "co-creation" across the centers. Co-creation was found to be a pervasive form of the current practice in which various stakeholders are actively involved in creation, promotion, and evaluation of the programs. In our presumption, we had viewed the center

staff and individual seniors as the only major contributors in the senior center practices. However, a number of additional stakeholders, such as professional instructors, community partners, and local government, were playing a vital role in defining “how the center works for the community” through the program creation and promotion. We also noted that senior centers are connected to one another in various types of formal and informal networks, exchanging information or tacit knowledge about various programs (Fig. 1).

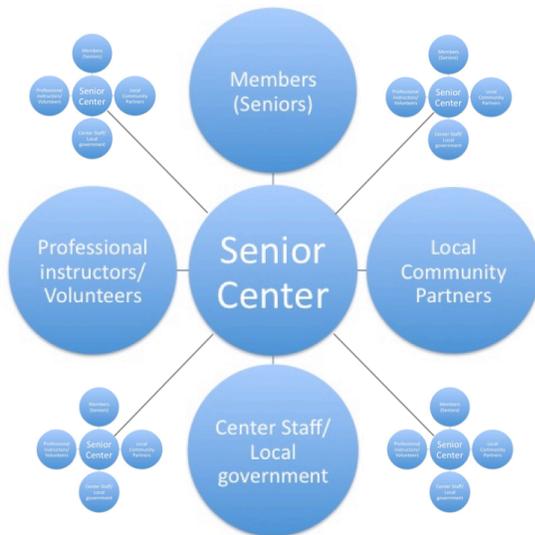


Figure 1. Stakeholders of senior centers

Within the “co-creation” culture, one of the most prominent findings was that individual seniors, as one of the stakeholders, play a very active role in this practice. Seniors are very vocal with input as to what kind of programs should be offered and how the center should go about its various other functions. Not only do they provide input, but also they frequently volunteer to initiate programs for the center. Some seniors take a leading role by organizing more narrowly focused communities based on common interests. These seniors, as voluntary leaders, manage their own clubs independently by dealing with the activity planning, member recruitment, and the advertisement of the club. We found a wide variety of self-managed clubs across the participating centers, ranging from investment clubs to American politics discussion groups. Many seniors in such groups share support, empathy, a sense of belonging, and social identity throughout these focused communities. Further details of such communities, which we called “activity circles”, will be provided in a later subsection of this paper.

As seniors are very expressive about what they want, the directors emphasized that it is important to hear their voice to generate “topics of interest.” Currently, senior centers employ various means of communication to listen to

seniors’ needs, utilizing both structured and unstructured approaches. Four centers were found to conduct comprehensive interest surveys or focus groups on a regular basis, while others utilized casual conversations or suggestion boxes in which seniors drop off a message with their comments. However, directors said that it is not always easy to gather their opinions due to the limited resources and manpower.

Meanwhile, programs are also offered by professional instructors and other agencies. They have a considerable influence at most senior centers by bringing expertise and vitality to the senior centers. For example, in Center A (Table 1), professional instructors were offering various classes on American politics, current events, and art and history. Their popular classes usually gathered a big crowd of up to 200 people in every session. They built a strong fan base with students following the lecturers to different places. Some other programs come from other partnership entities like community hospitals. For instance, Center D in partnership with a community hospital offered evidence-based programs where seniors receive specific health-related instructions and exercise programs based on research outcomes, and their health conditions are tracked for the course of the program.

Information Flows and Word-of-mouth

On the basis of the co-creation culture, the stakeholders are connected to one another in various types of communication channels. Using these formal and informal communication channels, stakeholders shared information about various programs at the senior centers and their community. However we noted that the current networks and communication channels heavily relied on word-of-mouth, which does not guarantee successful dissemination of such information. Hence, information about senior center programs is often scattered in the particular local area and is not distributed uniformly. Seniors, especially those who recently moved to a new town, often complained about difficulty in finding information about senior centers and programs available in the community. D-P2 (Participant #2 of Center D) remarked: “*I found out [senior center and programs] by almost accident. I was at the library and the library started talking about having a senior center. As I moved from New York, I didn’t know about what programs were available for me here. This is how I knew about it.*” A-P6 mentioned: “*It is very hard to find information about different programs. It is all scattered everywhere.*”

In fact, senior centers make use of various communication channels to advertise programs and promote participation (Fig. 2). Program books, which are usually a printed booklet, are delivered to a large audience to inform them of detailed information about their programs (e.g., course description, schedule, place, instructor, fee, etc.). Because the program book is only sent out a limited number of times (3-6 times a year), senior centers also use newsletters or fliers for time sensitive announcements and reminders.

Emphasizing the significant cost in the production and delivery of the paper-based program books and newsletters, seven directors reported their increased use of email reminders because they found a growing number of seniors adopt email as one of their main communication channels. In addition to the email, six senior centers in Phase 1 utilized their own website as their promotion channel, while four senior centers planned to include Social Networking Sites (SNS) due to increasing seniors' adoption of SNS.

Despite the various means of communication, directors agreed that centers' outreach to attract seniors is always a big challenge, and word-of-mouth, in the end, is the most influential means for promotion. Especially, when word-of-mouth is from friends and family, it becomes a very powerful persuasion tool that leads to seniors' trial and signing up for the senior center programs. Director of Center D, for example, remarked: *"Honestly, word-of-mouth is the most effective. A senior brings in a friend. If a senior knows someone in the center they will come in together. People meet at church and other places and they talk about us...saying if you have elderly parents, this might be good for your mom."*



Figure 2. Various communication channels to advertise programs (fliers, program books, bulletin boards)

The word-of-mouth travels through many different stakeholders including instructors, directors, and individual seniors. We found that program instructors and directors are often involved in casual conversations with seniors at the center, and they promote seniors' participation in various programs. A-P6 spoke: *"James (pseudonym of the facilitator of current event and American politics) encourages people to come in and sit in to see how they like it. Then a lot of people stay and sign in."* D-P2 also mentioned the director's influence on her participation. *"Mary (pseudonym of the instructor) talked about different classes in this center. Then I tried and liked it...that is how I found about the center."* However, exchange of word-of-mouth within friendship circles was the most common and influential mode of proliferating seniors' participation. C-

P2 said: *"A neighbor across the street came here a week before I came, and he got me interested and we are carpooling together now."* B-P2 also found the center from her friend: *"I found out about it through a friend of mine. One of my book discussion groups and he and his wife had taken Spanish and he said it was very pleasant, very good. I got more information and joined the next semester."* A-P3 also mentioned *"A couple of my friends talked about this center. I did not even notice this existed, but I stopped in and picked up a catalogue and went through it."*

Similarly, seniors also make suggestions for other friends to extend the recommendation chain. C-P1 spoke: *"I told my friends that I have a good time in the painting class here, and where it is and when it is, so that they make a decision."* C-P6 also proudly spoke about his influence on several friends who eventually became a member of the center. *"I have at least 4-5 people coming here because I recommended."* Interestingly, seniors exerted their control over recruitment for new members when they feel the class is too crowded. A-P3 said: *"I recommended to other friends and they stayed with it and they became regulars. At this point, it is sort of crowded, so I am not recommending."* C-P4 also added: *"I used to recommend to my friends but I don't do that anymore because I don't want any more people to come."*

Sharing the "Personality" of the center

Because all communities are distinctive, each center provides unique services for the needs of that particular community. Therefore, each senior center has its own distinct "personality", and sharing of that "personality" of the center is critical in motivating individual seniors to join its programs. The directors said that the center's personality is embodied in their practices, facilities, and members, representing their collective image of the community. Hence, directors make efforts to communicate their "collective image" clearly so that potential members can better evaluate the value of joining the center. In their efforts, bulletin boards and photo collages were the most common tool for sharing the collective image of the center (Fig. 3). In particular, senior centers use various forms of bulletin boards and photo collages to celebrate their past events and current activities. These help seniors or other visitors to get a good sense of the personality of the senior center, according to the directors. Senior centers also designate some areas in their facilities to display members' own artwork such as photography and paintings. All of these visible representations are crucial means of promotion and motivation because they demonstrate the vitality of the center while providing a sense of community.

Seniors seem to follow the adage: "Seeing is believing". When seniors become interested in a particular program, they tend to visit the senior center to check the center's personality by observing its facilities, atmosphere, and people attending the program before making a decision on their participation. After that, the seniors join the center if

the image of the center and value of the program is aligned with their self-image and expectation. A-P2 commented: *“I recommended to a friend of mine, and he was hesitant. I said... come here one time. Once he was here, he got the chutney in his arm. That is it. He was addicted.”* A-P1 also added: *“A friend of mine told me that there is a class that I might be interested in. He was going to the class and I attended with him. I fell in love with it.”* C-P4 remembered the first day when she was brought into the art class: *“About two years ago, Katherine (pseudonym of her friend) brought me in and I enjoyed it a lot. I became re-interested in art that I had put down for a long time.”* Directors also described their working principle of promotion: *“We think that if someone would just come, they would probably see the value as opposed to what may be in their mind in terms of what senior center is like.”* They commented that technology would be critical to share the personality and the vitality of the center with a larger number of people in the local area.



Figure 3. Bulletin Board with Photo Collages to Share Community Personality

Self-actualization and Active Program Search

We found that self-actualization and socialization are the main drivers for seniors to be engaged with the senior center programs. From the perspective of life development cycle, seniors are in a new stage of their life where they are free from the family-supporting obligations and are looking to explore, experience and learn new things for self-fulfillment after retirement. Indeed, all participants in our study were active learners who look for new learning opportunities vigorously. Especially, they were looking for new programs and activities that are intellectually and mentally stimulating. For example, A-P4, a retired lawyer, mentioned: *“My law practice was declining on purpose. I was looking for something that will be mentally stimulating. I am in beginning process but look forward to participating in more programs in this center. What I really like is intellectual variety.”* Another participant A-P2 remarked, *“My wife worried about my retirement, but I used this center a lot because I found the courses are intellectually*

stimulating. We don't stop learning. We restart our life at 70 or 75.”

Other seniors were looking for new challenges in language learning. B-P2 described her active search for a Spanish program; *“I was interested in learning Spanish. I spent quite a time finding a Spanish course in my area. When my friend told me about this class here, I thought I got to give that a try and see what it is like. It was like more of an intellectual experiment.”* Others tried learning languages as prevention from the aging-related illness such as dementia or Alzheimer's. B-P5 told us, *“The best thing you can do to prevent mental degradation, such as dementia or Alzheimer's, is doing crosswords, learn musical instrument, or learning a new language. That is why I am here to prevent mental degradation.”*

Some seniors were more enthusiastic about their new learning than others. 12 participants were crossing over to other centers or institutes to extend their learning. For example, in pursuit of his late career, C-P6 joined a local artist group –Tampa Realistic Artists- in addition to his regular participation in the acrylics and oil open studio at Center C. Three participants in Center A joined another discussion group held in a different community center. Some seniors undertook long commutes for the sake of a “quality” class. Three seniors commuted more than 30 miles each way to attend a class held in another town. B-P4 who drove 30 miles twice a week for the Spanish class said *“I couldn't find anything that appeared desirable in my neighborhood. There is McHenry county college but it offers classes in the school year, but I want more.”* C-P1 also commuted more than 30 miles on a weekly basis for the open studio. All seniors agreed that finding social and intellectual opportunities in their community is not easy, and they relied on word-of-mouth. A-P3 remarked: *“Finding learning opportunities, especially the good ones with minimum cost is difficult. I know there are resources out there but you need to know where to look.”*

Activity Circles and Information Sharing

Besides providing new learning opportunities, the senior centers also provide a social environment where seniors can meet others who share the same interest. Because seniors interact with each other for the same interest, a good rapport develops by participating in the program, often resulting in friendship. The friendship sometimes grows even further to a “mini sense of community” that fosters intimate relationships between group members. Consequently, the mini sense of community generates a feeling of belonging, shared emotional connection, and reciprocal influence on continuous participation in the group. This is what we called an “activity circle” – a group of people interconnected based on common interests and activities.

Seniors often described their peers in the activity circle as “extended family” and “friends”. D-P5 described: *“It is like*

family. It is the second family. When I moved here, I did not know anybody. My life changed a lot since I joined this center.” C-P3 also commented on the members of the art studio: “You are not locked into it. People miss you if you don’t come. We call each other and ask how each other is doing.” D-P2 explained: “We all do different things but we all are connected. There is lots of kissing and hugging between us. We are all concerned for each other. It is like an extended family.”

Seniors in the activity circle frequently communicate with one another to share information about various events which they might attend together. For example, C-P2 in the art studio commented: “We do things together all the time. We went to look at the glasswork, modern art, art in outdoor last week. We also went to TECO public art gallery together too.” D-P2 also commented: “We went to the Strawberry Festival together last month. We had a wonderful time. Next month, we are planning a trip to a race game. And next month, we are planning to do a lunch cruise. We do things as a group.” Once any member of the activity circle finds information about interesting events, they share it with the whole group to measure the groups’ interest to go together. D-P2 continued to explain how they set up a trip in her activity circle: “We, seniors, like to go and do things together. I am still new to here. I don’t know a lot about museum things although I plan to go. One of ladies in the club does lots of things and talks about a new event in the museum. She checked it out on fees, time to visit, and came back to us and we opened it up to everyone here. Since then, a lot of information is going on there, and we put up the sign-in sheet.” Members in the Spanish class of Center B also formed an activity circle and shared extra-curricular activities. B-P3 said: “There are lots of events related to Spanish. There is the Spanish fair in the fall. The folklore dancing crew is coming to Chicago. We got this information from TV or radio. Also there is a Spanish cultural center in Chicago. Sometimes special events are going on. ‘El Dia de los Muertos’ on Nov. 1st. We share all of these.”

Directors and instructors also become a part of the activity circle and play a critical role by becoming a main source of local events information at the center. Because directors and instructors are connected with other community entities, they often hear of local events. In addition, they regularly search various media, including the newspaper, websites, and TV, for local events information. For example, the instructor of the open studio at Center C commented: “There are people who would go to plays and opera. I know people who are into art and who are looking for art-related information. I am always searching event information. Not necessarily something I want to go to but if it interests someone else, I find it and share it with the members.” He also confirmed that such local events information is scattered among multiple sources, and it is time consuming to find the event information. The Spanish instructor at Center B also expressed the time-consuming

issue when finding various local events information. She mentioned: “I am getting information from everywhere. We got information from Internet, free newspapers, Spanish stores in the area, tribune, advertisement, and Google and Yahoo.... It takes a quite time though.”

Seniors also confirmed that directors’ and instructors’ local event information is very helpful. C-P6 said: “The way we know about local events on art is through Jane (pseudonym of director C) sending us email. If something happens, she sends us email.” C-P3 also remarked: “The instructor and director help us enter other art contests like Florida State Fair and planning all these trips we do like museums and exhibits. It keeps you back all the time. They really help us to find out about places to go.”

DISCUSSION AND DESIGN IMPLICATION

The objective of this research was to build an in-depth understanding of current practices of community senior centers in order to identify technology design implications to facilitate seniors’ participation. Using multiple ethnographic methods, such as semi-structured interviews, site-visits, and focus group interviews, we obtained rich data and artifacts from their environment and extracted the reflections of their practices in our analysis. Understanding the heterogeneity of the senior centers, we attempted to recruit senior centers of the voluntary organization model based on Taietz’ two conceptual models of the senior center [9]. Nevertheless, we realized that each center maintains mixed characteristics from both models to varying degrees. In fact, we found the significant inclusion of the social agency model (i.e., congregate meal program) from one of the centers participating in Phase 1, and we noticed that a different set of design implications can be developed in this case. Despite the distinctive nature of the senior centers, our analysis in this paper focused on identifying commonalities across the nine centers. Based on the commonality, we developed design implications for future interactive technologies. Hence, it should be noted that the practices and design implications reported in the present paper mainly apply to the senior centers following the voluntary organization model. The different practices and design implications for the social agency model will be presented in another publication.

As indicated by the concept of the voluntary organization model, we observed a considerable voluntary involvement from seniors. The senior center, rather than being a place created by staff members, was a community that is co-created by a number of stakeholders (e.g., local community partners, instructors, aging agency, and family/ friends) who share ideas, information, and resources through various forms of interaction and communication. In particular, seniors’ active participation as well as their active aging practice was highly visible beyond our expectation. Therefore, we confirmed in this research that seniors are not only consumers of the center service but also active producers of the programs and services. The next

section draws out some important considerations that we feel are imperative for designing interactive systems meant for supporting active seniors seeking wellness by participating in senior center activities. There are three considerations to support: activity/event discovery, “personality” sharing, and lastly, activity circles.

Need for Activity/Event Discovery Support

Our findings show that seniors had a clear motivation for learning to satisfy their intellectual and social needs. Their enthusiasm for learning leads them to actively search for the best offerings, but such information is often scattered in the particular local area. Currently, individual seniors have limited means of being informed about programs available in their community and other neighboring communities. As a consequence, they rely on word-of-mouth to discover activities and events of interest. Therefore, it is our belief that new design of ICT should be focused on supporting individuals’ program/activity discovery. For instance, an integrated database can be developed to allow individuals (seniors and their family members) to discover various programs available in the local area. Considering that an increasing number of senior centers are adopting web technologies, an event aggregation service can be developed that extracts community event information from multiple web resources (e.g., local newspapers, magazines, local media, and senior center websites) and make such information available to seniors and other local residents. Using this kind of event aggregation service, an interactive system, such as a community event calendar, can be designed to recommend events and activities for seniors based on individuals’ preferences and criteria such as topics of interest, the history of activity participation, or friends’ participation.

Currently, there are a few local event services that provide a searchable repository of local events, such as upcoming.org and Facebook event. However, none of the services have been designed for seniors’ use nor do they provide comprehensive local event data including senior center programs. Therefore, future research should focus on development of open APIs (Application Programming Interface) to allow senior center programs to be integrated into the local event aggregation service. Also, a notification and reminder service can be included to increase seniors’ awareness and participation in local events relevant to their interest.

Need for Personality Sharing Support

We reported that the senior center itself acts as a symbolic representation of the community personality and that clear communication of the community personality is critical in motivating seniors’ participation. As described in the results, seniors are concerned with measuring the value of the program and the group dynamics before deciding on their participation. To facilitate their judgmental process, senior centers use various form of bulletin boards and photo

collages, but the presentation of the collective image displayed on bulletin boards is confined to the physical location of the senior center.

We believe that such personality sharing can be enhanced by multimedia technology. For example, a multimedia content service like YouTube™ can provide a level of flexibility and new ways for senior centers to represent their collective image to the outside world. Using the empowering nature of videos and images for delivering rich contextual information, multimedia technology would provide seniors with a realistic sample of the atmosphere of the program. This will help seniors measure the expectation of the program and the class dynamics, such as instructors’ teaching style and participating students’ characteristics, by viewing real live action rather than a few descriptive sentences about the class. Now that mobile devices provide various options for multimedia content creation and consumption, they unlock the potential to reach out to the mass of senior population in the community at any time. Using such mobile media technologies, individual seniors or club organizers will be able to create their own media to share their experiences with particular programs with other seniors. As for the educational programs, many seniors and staff emphasized that showing the learning process via multimedia is an important aspect to encourage seniors’ participation since many of seniors express their anxiety and stress when it comes time to join the class for the first time. By seeing other seniors in the learning progress, seniors can be motivated with ‘I can do it’ spirit, and this vicarious experience will increase their self-efficacy to participate in new programs as described in Bandura’s self-efficacy theory [15].

Need for Activity Circle Support

Our results showed that various forms of activity circles were pervasive across senior centers, ranging from independent clubs to class groups themselves. Seniors in an activity circle share a common interest and exchange a wide range of information about various events and activities of interest. After that, they participate together in the events to have more fun while sharing their experiences at the event. These findings suggest that supporting such activity circles’ dynamics would be critical in increasing seniors’ participation and engagement with the local community center programs. As a popular technology trend, we believe that social networking services (i.e. Facebook or Google+) have great potential for supporting those seniors in activity circles by allowing them to share local event information and measure group’s interest using social plug-ins (e.g., like button).

A recent study showed the positive evidence of increasing seniors’ usage of social media technology. As nearly half of U.S. internet users aged from 50 to 60 engaged in social networks such as Facebook and MySpace, marking an 88 percent increase from the previous year of 2009 [17]. Meanwhile, online seniors 65 and older using social

networks doubled to 26 percent. Thanks to the popularity of social networking services (SNS), we witness a growing number of social networking sites for seniors have also come into existence. Based on our findings, we suggest that future SNS should include features explicitly for seniors to 1) discover local events based on their interest, 2) share such information with their peers in a simple manner, 3) discuss the event, 4) measure the group interest, 5) organize a group action (e.g., group visit to a museum), and 6) share their experiences at the event using multimedia. This will allow seniors to be aware of what other members are doing or caring about. By observing and commenting, individuals can gain a greater sense of participation in each others' social networks while facilitating two types of social influence: social pressure (i.e., users feel pressure to take other programs because other friends do so) and social support (i.e., users receive recognition and encouragement from their friends) [16].

CONCLUSION AND FUTURE RESEARCH

This paper aimed to increase our understanding of the current practices around the community senior centers and suggest technology needs to facilitate seniors' participation as a way to promote their wellness. Our study findings show that the senior center (of voluntary organization model) is a local community created by seniors themselves who practice active aging in their community. Seniors are active learners seeking intellectual and social opportunities, and they pursue the new stage of life by joining various activity circles and share information and opinions. Based on these findings, we suggested possible ways in which new interactive systems can support seniors' active aging practice, including local event aggregation service, multimedia content service, and social networking services. Although each service suggested in this paper has come into existence in various technical forms, none of them have been integrated into one service nor designed for seniors. We believe that when such services become integrated into one place, it will provide exponentially better support to empower active seniors to discover various social and learning opportunities in their community and be engaged with their peer groups (activity circles) by exchanging their knowledge. In the end, this will help seniors improve their health and wellness while maintaining their independence.

Although we suggested the design implications based on our understanding of the current practice, further studies are required to validate them with seniors. Despite increasing seniors' technology adoption in general, we still witness that the majority of older adults are being excluded from the information society. Recently, studies revealed that a large proportion of the older adults perceive the Internet generally as an unwelcoming place for sociality, and SNSs as places for people who seek publicity and superficial relationships [20,21]. Nevertheless, we found that SNSs are often cited as a remedy to prevent seniors' isolation and loneliness, assuming that seniors will interact with other

seniors on the Internet to overcome their seclusion. However, we argue that it will be more important to support seniors' existing social network in a local community to prevent seniors' isolation as evidenced in studies of community computing [13]. The contribution of our research lies in the development and facilitation of community networks using the current technologies including social media and mobile technologies.

Prioritizing the implications above, therefore, we developed three concepts for validation and created storyboards demonstrating user experiences of seniors using our new technology concepts as below (Fig. 4):

- Story 1: a hypothetical user (Jane) receives a notification from the senior center on her tablet-like mobile device. She clicks on the notification and reviews the details of programs. She decides to register for a program and lets other friends know about her registration using the mobile device.
- Story2: Jane enters the senior center and her presence is detected automatically. She receives a welcome message and information about today's social events. In the classroom, she also takes a picture of her artwork and shares the picture with other friends. When she comes home, she receives recommendations of local events related to art along with some educational information about the subject.
- Story3: Jane receives an evaluation form of the program at the end of the day. Using the mobile device, she also receives a recommendation of clubs and programs that are related to the subject she just finished. She joins the club and later receives a message from the club leader welcoming her to the club.



Figure 4. Examples of Storyboards (Story 1, 2, and 3 from the top)

We have already conducted another round of focus group interviews with 24 seniors to validate our new concepts, but the results of this study will be presented in another paper. Currently, we are in the first iteration of the prototype development and plan to evaluate the concepts in a field study with seniors.

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