

# Virtuality Improves the Well Being of Seniors through Increasing Social Interaction

Oliver K. Burmeister

► **To cite this version:**

Oliver K. Burmeister. Virtuality Improves the Well Being of Seniors through Increasing Social Interaction. 9th IFIP TC9 International Conference on Human Choice and Computers (HCC) / 1st IFIP TC11 International Conference on Critical Information Infrastructure Protection (CIP) / Held as Part of World Computer Congress (WCC), Sep 2010, Brisbane, Australia. pp.131-141, 10.1007/978-3-642-15479-9\_12. hal-01054800

**HAL Id: hal-01054800**

**<https://hal.inria.fr/hal-01054800>**

Submitted on 8 Aug 2014

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# Virtuality Improves the Well Being of Seniors through Increasing Social Interaction

Oliver K. Burmeister

Centre for Research in Complex Systems, School of Computing and Mathematics, Charles Sturt University, Boorooma Street, Wagga Wagga, NSW 2678, Australia  
[oburmesiter@csu.edu.au](mailto:oburmesiter@csu.edu.au)

**Abstract.** Virtual social interaction amongst seniors is strengthened through face to face contact. While confirming previous studies that have shown the strengthening of virtual friendships result from physical meetings, this study also showed that virtual face to face meetings have a similar benefit. As more seniors around the world are encouraged to stay at home longer, rather than enter institutional care, virtual sociability is being shown to provide the necessary social inclusion benefits for particularly mental well being, that has been identified in psychological and sociological studies of seniors.

**Keywords:** Ethnography, Human Computer Interaction, Online Community, User Centred Design, Value Sensitive Design.

## 1 Introduction

Social inclusion is increasingly being seen as critical to the health and general well being of seniors. Psychosocial research has shown that the mental and overall well being of seniors is significantly enhanced through society resourcing the social engagement of seniors; the more socially active seniors are, the better it is for their long term well being [1, 2, 3]. Governments around the world are concerned that the ageing population is putting financial and other resourcing pressures on the services provided to their senior citizens. They are looking for ways to keep seniors at home and out of institutional care longer and technology is a major potential contributor to such aims. Yet a challenge is that of social isolation at home, which raises particularly mental health concerns [2, 4]. It is in this area that this paper shows the benefits of virtual social interaction for seniors.

Studies of what is effective for social inclusion inform that design process, enabling the design of better social spaces in the virtual world. This paper reports on an ethnographic study of one of the largest virtual communities for seniors in the world at the present time. In particular the focus is on one aspect of sociability, namely the move from virtual social interaction to face to face interaction. The latter may also involve virtual or physical social interaction.

This paper begins by showing why studies of seniors are important. It then goes on to describe the online community called GreyPath, which was the basis of this study. It then briefly reviews human computer interaction (HCI) literature and places the

literature on values in design, which was the focus of this study, within that broader context. Next it describes the interpretivist, constructivist approach that was taken and how the results led to this discussion of social inclusion. Lastly the results of the study are reported and their implications for design explored.

## **2 Studies of Virtual Sociability amongst Seniors are Important**

The combination of decreasing rates of mortality and birth rates, means that the number of seniors in Western nations is projected to increase significantly over the next several decades. McDonald and Kippen [5] showed that in 1870 only 2% of Australians were aged 65 and over, and that by 1998 this had increased to 12%, with forward projections showing a marked increase in the percentage of older people in the Australian population. According to the Australian Bureau of Statistics (ABS) [6] one in four Australians (23 to 25%) will be over 65 by 2056, up from 13% in 2007. By 2056, there will be twice as many pensioners as now with half as many people supporting the social security system, which provides pensions and health care along with other benefits to seniors. This is a function of a general trend in the developed world of lower birth rates and people living longer. According to Britain's Office of National Statistics:

Over the last 25 years the percentage of the population aged 65 and over increased from 15 per cent in 1983 to 16 per cent in 2008, an increase of 1.5 million people in this age group. Over the same period, the percentage of the population aged 16 and under decreased from 21 per cent to 19 per cent. This trend is projected to continue. [7]

As in Australia and Britain, so it is in other Western nations. Belsky [8] said that only 4% of Americans were elderly in 1900, whilst by 1999 that figure had risen to 13%. In 1999 the proportion of elderly Americans was 1 in 8, and this was forecast to rise to 1 in 5 by 2030.

In Australia the majority of seniors live independently at home, either with a partner only (46%), family (17%) or alone (28%) [9]. With the demands these forecasts are expected to place on aged-care provisions, governments around the world are looking for ways to keep seniors in their homes and out of institutions as long as possible.

This study contributed to knowledge regarding the social interaction needs of seniors. It achieved this through a focus on Australia's largest online community for seniors [10], greypath.com (GreyPath).

### **2.1 The GreyPath Virtual Community**

GreyPath Pty. Ltd. manages the portal greypath.com. Membership is restricted to seniors, which it defines as 50 years of age and over. In sociological terms, participation is not spatially determined, as traditional communities have been [11], but ubiquitous [12]. The community has members in every state and territory of Australia, including some who are travelling (have no fixed address) and overseas

members (their chat rooms regularly have seniors participating from Europe, the Middle East, Asia, and North America). GreyPath has 35 volunteers who freely give of their time and skills to maintain the site. All contributors, management, administrators, technical support personnel and ordinary members are seniors.

A significant feature of the GreyPath portal is its hybridity [13], that is, its multi-faceted approach. It allows for all manner of users, from novice technology users, to people very technologically literate. It has members who rarely use the site and then only to find specific information, and others who use the site for many hours every day for social interaction with other members. GreyPathians (as several interviewees in this study called themselves) can enroll in free or nominal cost courses, and they can contribute to or receive information on a wide variety of topics. The online destinations of GreyPath members are dictated by their interests and time constraints. GreyPath is also a safe place, in that it is moderated by volunteer contributors who each have placed their name and face on the site.

As at August 2009 there were approximately 100 million web sites worldwide. GreyPath traffic ranked approximately 1.3 millionth according to the web information organisation Alexa [14], placing it in the top 1.5 percent of world-wide sites by traffic. As at August 2009 it had more traffic, as defined by Alexa [14], than any other seniors site in the world at that time.

GreyPath is accessed by groups of people who participate in a number of the various options available, such as the forums, blogs and chat rooms. GreyPath management continue to innovate, with the development of video editorials, a new multimedia seniors course development engine, and a possibly unique approach to a three-dimensional (3D) seniors game currently under development. The most recent innovation has been the first simple broadcasts of GreyPath Internet TV. It is this Australian portal for seniors that was the basis of this study.

### **3 Value Studies**

This study was focused on the initial stages of HCI design methodologies called Value Sensitive Design (VSD) and Values at Play (VAP). That is, it focused on discovering the things that GreyPath seniors valued most about their online social interaction.

There had been some thought given to the idea that values were reflected in technology prior the advent of VSD, with some of the earliest work by Winner [15] referring to artifacts having “political qualities”, but described in ways that later researchers discussed as values. No explicit attempts had been made to discover values that impinge on design until the first references to VSD appeared [16]. Since that time numerous publications have arisen in related areas [17, 18, 19]. A fundamental premise of VSD is that technology artifacts embody values.

Two main research avenues have been pursued. Having started on the road to researching how values can and should be incorporated in design, Friedman and Nissenbaum, though sharing a common research purpose, have developed their research into incorporating values in the design process along different lines. Friedman has continued along the lines of VSD, expanding the methodology, defining

it and together with other researchers, has attempted to prove its efficacy in the design process [17, 20]. Nissenbaum has built on the foundations laid by VSD, together with other researchers to develop Values at Play (VAP) [21]. Like Friedman, Nissenbaum has attempted to define the methodology involved and prove the concepts in design examples.

In putting forward new design considerations, these researchers were not seeking to usurp existing design methodologies, but rather to extend them. Flanagan, Howe and Nissenbaum [22] stated their goal as supplementing existing, well-established design methodologies. They sought to have values considered as one part of what constitutes technical design excellence. They argued that measures of design excellence included terms such as reliability, usability, functional efficiency, and safety; values were not considered, but should be. In various ways these HCI researchers espoused that the current research into value considerations will one day see value considerations become an integral part of the criteria for design excellence.

The brief sketch of values in design gives the background against which this study took place. This study sought to discover the values that were important to seniors in their online social interaction.

#### **4 Research Design and Method**

The main research question was: What do participants in the GreyPath community value about their online social interaction? An interpretivist, constructivist philosophy was chosen to help answer this question, based on the nature of the data to be collected and the purpose for the study. It was a study to discover the values of seniors in a chosen online community and therefore their perceptions of their values were crucial. The nature of this study meant that a positivist approach was inappropriate as it would necessarily entail an emphasis on quantitative data. Such an approach might have sought to survey members of the online community, to elicit their values. Given no prior studies had been reported of seniors' values when using technology, such a survey could not have been reliably scripted. In order to quantify and then generalise the findings of a survey, the values themselves first need to be established. Therefore in order to discover those values, an inductive approach involving observation and in-depth interviews with seniors was seen as more appropriate.

Interpretivist constructivists emphasise the meanings of participants within the social phenomenon under study [23, 24]. This was appropriate to the present study of an online community, because the aim was to understand the 'meanings' of participants with regard to their values. Furthermore, interpretivist constructivist researchers use an inductive approach, where "researchers develop concepts, insights and understanding from patterns in the data" [25]. Patton [26] distinguished inductive analyses from hypothetical-deductive approaches, based on the latter requiring variable specification before data collection. Since this study was to explore descriptions of values not previously identified in other studies, making such variable specification would have been inappropriate. Instead, the nature of the study required an inductive approach, one in which themes related to values would emerge during

analysis, and would be grounded in, and checked against, observations and interview transcripts.

The 30 interviewees for the study were chosen on the basis of purposive sampling, which is appropriate to interpretive research. Patton [26] describes various types of purposive sampling. Because no prior study in the domain existed and there were no known specific variables to focus on, the one most appropriate to this study was 'criterion sampling'. Criterion sampling uses a particular set of criteria to guide sample selection. In this study, the criteria for selection of participants were determined prior to the commencement of the sample selection, in order to aid as widely as possible the understanding of GreyPath members' social interaction values.

Analysis of data was a continuous process, using an inductive approach for thematic analysis. The analysis process was informed by grounded theory approaches to analysing data. The initial themes and categories, determined both during the observation phase and after the initial interviews, were continually reassessed and expanded as more data was collected. During interviews the interviewer was open to the meanings of interviewees. Values that were thus discovered, were then structured and organised into themes.

One theme that emerged during the course of the research was that of values related to the different types of social interaction experienced by GreyPath members and within that theme the key value was the move from 'forum to face'. That is, the move from various forms of virtual interaction, such as text based forums, or text and audio based chat rooms, to some form of social interaction that involved face to face communication.

## 5 Results

Many participants valued being able to interact with GreyPathians and others in ways that did not necessarily involve a GreyPath facility. They used Voice over IP (VoIP), instant messaging (IM), personal email and the normal postal mail system (snail mail). Predominantly they valued extending their GreyPath contacts in ways that created lasting, personal contact, that extended the online GreyPath experiences to deeper involvement with the people they had met. Closely associated with the value 'Forum to face' were other ways of extending the GreyPath experience, in particular 'Personal email' and 'Snail mail'.

Extending online relationships into other situations has been recognised particularly in sociological research. The online environment does not lure people away from face-to-face contact, making them less sociable, less able to relate to other people [27]. Instead research has shown that online community involvement encourages greater social contact via other means, especially face-to-face and telephone [28, 29].

Forum to face is valued by GreyPath management. Several times each year they organise seminars on different topics of interest to seniors. The seminars are open to all seniors, but are particularly run for the benefit of GreyPath members. All the seminars are held in Melbourne, which is where GreyPath started and where the

GreyPath office is located. This is illustrated below by the GreyPath web master (note that participants are only identified as [gender, location, age]):

[The chief administrator] is preparing a seminar ... I guess some of them [GreyPath members] will attend that or quite a few of them we hope, so that will be a new experience for me. [Male, VIC, 55-59]

Forum to face is valued by GreyPath members too. This is seen in the following two quotations concerning a physical meeting of GreyPathians, organised months in advance. The second quotation is from an unsolicited email an interviewee sent the researcher after the meeting.

Next month we're going to meet at Mt Barker, which is a place about [number] odd mile away from here, for a coffee morning ... There's going to be a couple there, I'm single now, otherwise I'd be taking my wife, I'm not sure how many, three or four will be there, five or six maybe. It's something to do, and besides it's nice to be able to put a face to the name. [Male, SA, 70-74]

[Post interview email about the Mt Barker meeting:] We had the GreyPath morning coffee meeting today. Five of us show up and a good time had by all. We started at 11 am, had coffee then stayed for lunch and on our way home by 1:15 pm or so. [Male, SA, 65-69]

Other studies have similarly shown that for seniors online social interaction frequently leads to offline interaction, as is seen in the above quotation. Xie's ethnographic study of the OldKids online community in China [30, 31, 32] showed that this online to offline interaction greatly affected the overall relationships of those seniors [31] and she went on to say that such movement to offline interaction strengthened later, further online interaction. Similarly, she found that when relationships began offline and then moved to online, it resulted in stronger social bonding. Her summation was that: "In general, those who interact with one another both online and offline are more likely to develop closer, stronger relationships than those who interact only online." [31] However, while Xie's 'offline' results are supported by this study, her conclusion about 'only online' were not supported. Xie only looked at the online-offline relationship. This study of the GreyPath community confirmed Xie's findings in regards to the offline influences on strengthening relationships. However, this study found the same was true when forum to face meant webcam type interaction, which arguably contradicts her conclusion that 'only online' interaction does not strengthen overall relationships in the same way physical offline interaction does. When forum to face interaction means moving from forum to webcam, it is still online interaction, even if it is not taking place through the GreyPath portal. In this study all forms of forum to face movement were valued by members and seen to strengthen relationships and community building.

Other examples of forum to face are illustrated below:

I know ... the names, addresses, phone numbers ... one lady who ... came to the funeral [of his wife], and she had been before once to stay with us for a weekend when my wife was alive, and then when my wife died, she found out when the funeral was, she asked me, and then she came to the funeral, and she went straight home of course, because I don't want any kind of, complications, shall we say, well certainly not yet I mean. Next year who knows, but I doubt it. [Male, SA, 70-74]

A lady called [Name] who comes from Western Australia, and whenever she comes over here, she makes a point of finding out, if she's going to stay at whoop whoop, does anyone live near whoop whoop, could I meet you and have a coffee. [Male, NSW, 70-74]

This girl [a younger GreyPathian] ... I don't know how long she's been a member it was just that we had the big fete here yesterday and she came up to me then ... I didn't realise that she'd gone onto GreyPath but she saw my name there. [Female, WA, 70-74]

An Adelaide girl [a younger GreyPathian] ... she says: "Come and stay with us" ... I stayed with her, and she arranged a dinner ... And, well she introduces me to all these other people that are on GreyPath. [Female, NT, 75-79]

I'll go out to locals here in Brisbane, I meet quite a few regularly, but individually, not as a group, we have never done that. [Male, QLD, 65-69]

A couple of times a year I meet up with two of them and we have lunch together that's the husband and wife. The husband and I are both very much into computing so we often send emails back and forth about that, even a few jokes go back and forth between the three of us, messages come across, emails and I try to change ideas with [Name] and things like that and we get together a couple of times a year and have lunch. [Male, SA, 65-69]

Amongst the people that I personally know, I've had a visit as well from a chatter [GreyPath Chat room contact], it's just like talking over the garden fence, you know, I can't add it any stronger than that. [Male, OVERSEAS, 75-79]

An interesting observation arises from this last quotation. The author of the last quotation lives overseas, is house-bound and most of the time room-bound, due to a disability, and he has met not one, but several GreyPath members. These were people who while vacationing in Europe made a deliberate effort to include this man in their itinerary.

The next two quotations are from the same person. She and her husband use the GreyPath site to source house sitting opportunities. As one might expect, this has led to her getting to know the GreyPathians whose houses she and her husband look after. In several cases they 'sat' the same houses repeatedly over time:



Well most of them have turned out to be very close relationships. This one here that we're at the moment, they're a doctor and his wife and we, as opposed to being house sitters three years ago, we are now really the best of friends sort of thing ... We don't get sort of totally involved with people, because we're never there long enough to do that, and while we're there, they're not sort of thing. [Female, MOVE, 65-69]

When we went down to South Australia again through that [GreyPath] Coffee Shop forum, two or three families, GreyPathers down there, organised a coffee morning ... We all met up at a pub just out of Elizabeth, up the road, and we all sort of had lunch together, and through that ... we were house sitting down there. We used to phone these different ones up and it was a great friendship, because we knew nobody in Adelaide and we were able to phone them up and we went round to their places and had coffee and afternoons out and they took us around. As far as I'm concerned, that part of GreyPath was excellent, you know? They really opened their homes up to us, because we were gypsies, after all, that they didn't know. And they were just quite welcoming, it was great. [Female, MOVE, 65-69]

As previously stated, the value 'forum to face' was supported by related values of extending contact to personal email and snail mail. The following examples illustrate this:

A lot of months ago, I entered my name [in the GreyPath ePals] and a lady sent me an email from Victoria, from around Geelong, and we got talking ...I send her jokes, we often interact and talk about the weather, or, she's quite surprised, as a New South Welshman that I was aware of what happened at AFL ... We don't interact on a weekly or daily basis, it might a couple of times a month and then it might be a couple of times a week sometimes. [Male, NSW, 70-74]

Three that I send emails to and, no phone calls, no snail mail, just emails yeah, interact with them on emails. [Male, NSW, 70-74]

I did get a few non-replies with that ePals one, but of the ones that did reply, we've sort of kept in touch and it's been, to me, it's been absolutely brilliant. I've really enjoyed it. [Female, MOVE, 65-69]

The above quotations illustrate that like forum to face, personal email, including with people they met in the GreyPath ePals section, extends online social interaction beyond that available through GreyPath facilities. The following two quotations illustrate this through the use of snail mail:

At least half a dozen of them write to me privately. [Female, NT, 75-79]

She's a German immigrant, been in Australia some years I believe, very friendly with her, and my wife, we swap DVD's, we swap news. [Male, OVERSEAS, 75-79]

Whilst the dominant views expressed by participants favoured 'forum to face' relationship progression, there were some objections. The following three quotations exemplify the concerns raised by some participants:

The good thing is you don't have to rush and do your hair...You don't have to worry, you don't have to worry about your wrinkles either. [Female, VIC, 60-64]

I don't know whether I want to know anyone on GreyPath within my town, I don't want that sort of relationship. [Male, NSW, 70-74]

I haven't met anyone personally and I'd be very very reluctant to do that, I'm a fairly slow person and face to face meetings are harder. [Female, VIC, 70-74]

The first of these three responses shows that some female participants (no male participants made similar comments) were concerned about their appearance. Comments included needing to fix their hair, change out of their bed clothes and having to put make-up on, if webcam or face to face meetings became more common with GreyPath.

The second response typified the reluctance many seniors expressed about having people visit them in their home. It was too close. They were happy to travel to a larger gathering, but didn't want close contact near where they lived.

The third response is more difficult to interpret. In one sense it is related to the first one. It is not about appearance in the sense of one's looks, but rather about age-related problems and disabilities. One participant said that she had won national dancing awards in previous years, but that she was constantly in and out of hospital and had just come out of hospital (at the time of the interview). She had age-related disabilities that not only meant she could no longer dance, but that she could barely walk and she was reluctant to allow people she regularly communicated with on GreyPath to see her as she is now. She wanted to interact using text only, so that she appeared 'normal' to everyone she corresponded with.

Despite these last three quotations against extending relationships beyond the GreyPath venues, the overwhelming views of most participants were in favour of extending the relationships, of deepening online friendships by extending contact to include the telephone, IM, VoIP, webcam, email, snail mail and personal visits.

## **6 Conclusion**

The feedback loop identified by Xie's earlier studies of Chinese seniors was confirmed in this study of Australian seniors. Relationships that began online and

were extended into offline settings, resulted in stronger online relationships. However this study extended Xie's findings to show that the same was also true for relationships that stayed online, but moved from text-based interaction to some other form of face to face meeting, such as the use of webcam.

Psychological and sociological studies have shown the need to have society promote ways of encouraging social inclusion amongst seniors, for their overall well being [2, 33, 34]. This paper built on prior work that showed that virtual communities can help promote social inclusion amongst seniors [31, 35], by showing that seniors highly value virtual social interaction and the friendship building opportunities it provides them. Of the 30 participants in the study, 27 accessed GreyPath from home, showing further that efforts by governments around the world to keep older people in their homes longer, need not mean social isolation. Virtual sociability amongst seniors increases their ability to maintain their mental and overall well being while at home.

## References

1. Baltes, M.M., Carstensen, L.L.: The process of successful aging. *Aging and Society*, 16, 397-422 (1996).
2. Baltes, P.B., Staudinger, U.M., Lindenberger, U.: Lifespan Psychology: Theory and Application to Intellectual Functioning. *Annu. Rev. Psychol.*, 50, 471-507 (1999).
3. Baltes, P.B., Smith, J.: New frontiers in the future of ageing: From successful ageing of the young old to the dilemmas of the fourth age. In: Valencia Forum, Valencia, Spain (2002).
4. Christophidis, N.: Physical and mental changes during lifetime. In: First National Conference, Life Long Learning. University of the Third Age, University of Melbourne (1991).
5. McDonald, P., Kippen, R.: Ageing: the social and demographic dimensions. In Policy implications of the ageing of Australia's population, pp. 47-70. Melbourne: Productivity Commission. (1999).
6. ABS. One in four Australians aged 65 years and over by 2056. Australian Federal Government (2008).
7. ONS, Ageing, Office of National Statistics (Editor). Crown Copyright: Surrey, UK (2008), <http://www.statistics.gov.uk/cci/nugget.asp?id=949>.
8. Belsky, J.K.: *The Psychology of Ageing: Theory, Research, and Interventions*, 3rd edition. ITP, Melbourne (1999).
9. ABS. ABS report profiles Australia's older people. Australian Bureau of Statistics (1999).
10. Burmeister, O.K.: What 45,000 seniors value about online social interaction. In: IFIP WG9.5 Conference on Massive Virtual Communities. Luneburg, Germany: Leuphana University (2008).
11. Wellman, B., Leighton, B.: Networks, Neighborhoods, and Communities: Approaches to the Study of the Community Question. *Urban Affairs Quarterly*, 14(3), 363-390 (1979).
12. Wellman, B., Hogan, B.: The Immanent Internet. In: McKay, J. (ed.) *Netting Citizens: Exploring Citizenship in the Internet Age*, pp. 54-80. Saint Andrew Press, Edinburgh (2004).
13. Arnold, M.V.: The concept of community and the character of networks. *The Journal of Community Informatics*, 3(2) (2007), <http://ci-journal.net/index.php/ciej/article/view/327/355>.
14. Alexa. Alexa The Web Information Company (2009), <http://www.alexa.com/>.
15. Winner, L.: Do Artefacts Have Politics. *Daedalus*, 109, 121-136 (1980).

16. Friedman, B.: Value-sensitive design. *Interactions*, 3(6), 17-23 (1996).
17. Miller, J.K., Friedman, B., Jancke, G.: Value tensions in design: the value sensitive design, development, and appropriation of a corporation's groupware system. In: *Proceedings of the 2007 International ACM Conference on Supporting Group Work*. ACM, Sanibel Island, Florida, USA (2007).
18. Brey, P.: Disclosive Computer Ethics. *Computers and Society*, 30(4), 10-16. (2000).
19. Leitner, M., Wolkerstorfer, P., Tscheligi, M.: How online communities support human values. In: *5th Nordic Conference on Human-Computer Interaction: Building Bridges*. ACM, Lund, Sweden (2008).
20. Friedman, B., Borning, A., Davis, J. L., Gill, B. T., Kahn, P. H. J., Kriplean, T., Lin, P.: Laying the foundations for public participation and value advocacy: interaction design for a large scale urban simulation. In: Chun, S. A., Janssen, M., Gil-Garcia, J. R. (Eds.) *Proceedings of the 2008 international conference on Digital government research*, pp. 305-314. Digital Government Society of North America, Montreal, Canada (2008).
21. Flanagan, M., Howe, D., Nissenbaum, H.: *Values in Design: Theory and Practice*. In: Van Den Hoven, J. and Weckert, J. (eds.) *Information Technology and Moral Philosophy*. Cambridge University Press, Cambridge (2007).
22. Flanagan, M., Howe, D.C., Nissenbaum, H.: Values at play: design tradeoffs in socially-oriented game design. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, Portland, Oregon, USA (2005).
23. Williamson, K.: Research in Constructivist Frameworks Using Ethnographic Techniques. *Library Trends*, 55(1), 83-101 (2006).
24. Sudweeks, F., Simoff, S.J.: Complementary Explorative Data Analysis: The Reconciliation of Quantitative and Qualitative Principles. In: Jones, S.G. (ed.) *Doing Internet Research: Critical Issues and Methods for Examining the Net*. Sage, Thousand Oaks (1999).
25. Reneker, M.H.: A qualitative study of information seeking among members of an academic community: methodological issues and problems. *Library Quarterly*, 63(4), 487-507 (1993).
26. Patton, M.Q.: *Qualitative Research and Evaluation Methods*, 3rd edition. Sage, Thousand Oaks (2002).
27. Boase, J., Wellman, B.: Personal Relationships: On and Off the Internet. In: Perlman, D. and Vangelisti, A.L. (eds.) *Handbook of Personal Relations*. Cambridge University Press, Cambridge (2004).
28. Wellman, B.: An Electronic Group is Virtually a Social Network. In: Kiesler, S. (ed.) *Culture of the Internet*, pp. 179-205. Lawrence Erlbaum: Hillsdale, NJ. (1997).
29. Hampton, K., Wellman, B.: Neighboring in Netville: How the Internet Supports Community and Social Capital in a Wired Suburb. *City and Community*, 2(4), 277-311 (2003).
30. Xie, B.: Multimodal Computer-Mediated Communication and Social Support among Older Chinese Internet Users. *Journal of Computer-Mediated Communication*, 13(3), 728-750 (2008).
31. Xie, B.: The mutual shaping of online and offline social relationships. *Information Research: An Electronic Journal*, 13(3) (2008). <http://informationr.net/ir/13-3/paper350.html>.
32. Xie, B.: Using the Internet for Offline Relationship Formation. *Social Science Computer Review*, 25(3), 396-404 (2007).
33. Marsiske, M., Lang, F.R., Baltes, P.B. Selective optimization with compensation: Life-span perspectives on successful human development. In: Dixon, R.A. and Baeckman, L. (eds.) *Compensation for Psychological Defects and Declines: Managing Losses and Promoting Gains*, pp. 35-79. Erlbaum: Hillsdale, NJ. (1995).

34. Park, D.C., Reuter-Lorenz, P.: The adaptive brain: aging and neurocognitive scaffolding. *Annual Review of Psychology*, 60, 173-196 (2009).
35. Pfeil, U., Zaphiris, P.: Investigating social network patterns within an empathic online community for older people. *Computers in Human Behavior*, 25(5), 1139-1155 (2010).