8-2010

Assessing Attitudes Toward Technology Among Older Adults and Usability of Software for Elders - Report Series # 20

Alexa Roggeveen
Sheridan College, alexa.roggeveen@sheridancollege.ca

Pat Spadafora
Sheridan College, pat.spadafora@sheridancollege.ca

Raul Rupsingh

Sheridan Elder Research Centre

Report Series - # 20

Assessing Attitudes Toward Technology Among Older Adults and Usability of Software for Elders

Project Team

Alexa Roggeveen	*Sheridan Elder Research Centre (SERC)*
Pat Spadafora (Director)	*Sheridan Elder Research Centre (SERC)*
Raul Rupsingh (CEO)	*PointerWare Innovations, Ltd.*

About SERC (Sheridan Elder Research Centre)

Through applied research the Sheridan Elder Research Centre (SERC) will identify, develop, test and support implementation of innovative strategies that improve the quality of life for older adults and their families.

1. Wherever possible, older adults participate in the identification of research questions and contribute to the development of research projects at SERC.
2. We conduct applied research from a psychosocial perspective which builds on the strengths of older adults.
3. Our research is intended to directly benefit older adults and their families in their everyday lives. The process of knowledge translation takes our research findings from lab to life.
4. SERC affiliated researchers disseminate research findings to a range of stakeholders through the SERC Research Report Series, research forums, educational events and other means.
5. A multigenerational approach is implicit, and frequently explicit, in our research.
6. To the extent possible our research is linked to and complements academic programs at the Sheridan College Institute of Technology and Advanced Learning.

EXAMPLES OF SERC RESEARCH

Creative and Performing Arts	Lifelong Learning	Civic Engagement	Human Communication	The Built Environment	Accessible Technology
Promotion of healthy aging Strategies to increase participation	Addressing barriers to learning Learning in retirement homes and long-term care	Volunteer work as non-traditional source of personal development	Solutions for older adults with hearing, vision, and cognitive impairments	What is the role of design in health, quality of life, and ability to age at home?	Supporting adult learners of new technology Development of technology to benefit elders

For more information, please contact:

Pat Spadafora, Director, or Alexa Roggeveen, Lead Researcher
Sheridan Elder Research Centre
Sheridan Institute of Technology and Advanced Learning
1430 Trafalgar Road, Oakville, ON L6H 2L1
Tel: (905) 845-9430 ext. 8615 (Pat) or ext. 4117 (Alexa), Fax: (905) 815-4230
Email: pat.spadafora@sheridaninstitute.ca or alexa.roggeveen@sheridaninstitute.ca

Table of Contents

Computer software is frequently not created with the common limitations of the older user in mind. Poor design and usability of computers is a significant barrier for many older adults who wish to use computers. PointerWare Innovations' software breaks down barriers that Windows software frequently presents to older users. This research study explores issues relevant to PointerWare Innovations, as well as any software developer seeking to accommodate the needs older adults.

1. Introduction

PointerWare Innovations is a Toronto-based company that has created software specifically for older adults who are computer novices to use. This software works on top of the Windows operating system to create an interface that is easy to navigate and use with either a mouse or a touchscreen, and has software that allows users to check and send email, look at photos, surf the Internet, and play games. Older adults, however, are not a homogeneous population, and the software was originally designed for computer novices. As the Baby Boomers age, fewer and fewer of them are entirely new to computers, and they have had increasing interactions with computers through work and home use. Therefore, PointerWare is hoping to expand the software available to their users as the expectations of functionality increase among users. However, more functions, by necessity, will mean that PointerWare's software will become more complex. Therefore, in order for PointerWare to further develop their software in a measured way that truly meets the needs of an older user, SERC conducted a study designed to answer the following questions:

(1) How do older users currently use computers, broken down by age group?
(2) What are the attitudes toward computers and technology among adults 55 and over?
(3) How usable is the current PointerWare technology for older users who are not novices?

To complete this work, in Fall 2009, SERC applied for a Colleges Ontario Network for Industry Innovation (CONII) Proof of Principle grant to work with PointerWare. Below are the results of this work.

2. Methodology

2.1 Questionnaire Design

With consultation from PointerWare, we created a questionnaire that asked with what frequency the respondent performed a variety of tasks using a computer. These ranged from email to using dating websites. In creating this measure, we wanted to capture all commonly performed personal computing tasks, regardless of assumptions about how older users may use computers. Respondents were asked how frequently they performed these tasks, on a scale from 1 ("Never") to 5 ("Daily"). This questionnaire also asked the respondent's age, year of retirement, number of hours using the

computer per week (both at home and at work), and a self-rating of ability using the computer. Please see Appendix A for a copy of this questionnaire.

In order to evaluate the respondents' attitudes toward technology, the Attitudes Toward Computer Use Scale 2.0 (ATCUS 2.0; Morris, et al., 2009) was used. This scale was revised and validated in 2009 with an undergraduate student sample to reflect changes in technology since the original version of the questionnaire had been published in 1987. Despite high internal consistency (alpha = 0.83) and test-retest reliability (r = 0.93) among undergraduate students, this measure had not yet been validated with older respondents. Using this measure allowed us to evaluate the internal consistency of this measure with older adults.

Before distributing the questionnaire, based on consultation with other researchers, we determined that one of the items needed to be modified in order to be appropriate for use with a population that is highly likely to no longer be part of the workforce. This item ("I feel that having a computer helps me with my job.") was modified to read "I feel that having a computer at work helps *or would have helped* me with my job". (Italics added for emphasis.)

In addition, we asked the respondents to rate themselves on their Confidence, Comfort, Capability, Difficulty, Anxiety, and Ability when using computers. These additional six items were identical to those used by Morris, et al. (2009), and were rated on a scale from 1 (Not at all) to 5 (Extremely).

2.2 Questionnaire Distribution
Each participant was asked to fill both the ATCUS scale and the computer usage patterns questionnaire. Questionnaires were distributed in four different ways:

(1) Questionnaires were mailed to all 465 members of the SHARE research participant pool at McMaster University in Hamilton, Ontario; and
(2) A link to an online version of the questionnaire was emailed out to all contacts of the Sheridan Elder Research Centre, and was posted to an online newsletter distributed by the Sheridan Institute of Technology and Advanced Learning.

2.3 Usability Testing
In addition to the questionnaires, visitors to the SERC computer laboratory were invited to participate in usability testing of the PointerWare software. Eight (three female; five mail) participants signed up to complete the usability testing.

Participants were asked to do a sample of each of the tasks possible to be performed using the software, including checking email, adding a person to their address book, looking at a picture, doing a search on the Internet, and playing a game of Solitaire (for the full usability protocol, please see Appendix C.)

Each action was timed, and notes were taken based on the comments made by the participant during the testing.

3. Results

3.1 Questionnaire results: Response Rate and Demographics
Of the 465 paper questionnaires mailed to the McMaster SHARE group, 303 were completed and returned (65%). Twenty-one copies were completed online through the distribution to the SERC email contact list and the Sheridan Insider. In total, 324 questionnaires were completed and returned.

The mean age of the respondents was 76.2 (minimum = 55; maximum = 100). The 91.3% of respondents who reported being retired said that they had been retired for an average of 17 years (minimum = 1 year; maximum = 77 years). 62.1% of respondents were male, and 79.6% or all respondents reported that they own a computer.

3.2 Questionnaire Results: Computer Use
We first determined what the most and least popular activities were to perform using a computer. The results are shown in Tables 1 and 2, respectively

Table 1. Most popular activities to perform using a computer

Activity	**Rating (out of 5)**
Email	3.66
Internet	3.20
Word processing	2.53
Play games	2.50
Keep up with the news	2.42

Table 2. Least popular activities to perform using a computer

Activity	**Rating (out of 5)**
Dating websites	1.03
Download music	1.24
Talk to people using a video phone or telephone program	1.31
Watch TV or movies	1.36
Shop online	1.40

Respondents were also given an opportunity to report what activities they would like to do that they did not currently. Of those who listed an activity, the majority of responses were for the following skills:

- 17 respondents indicated that they wanted to know more about working with photos on the computer (downloading, printing, organizing);
- Nine of the respondents indicated that they would like to learn to use Skype; and
- 11 respondents indicated that they would like to learn to use computer better in general.

In addition, the younger the respondents were, the more likely they were to perform certain tasks. These tasks, in the order of the strength of correlation between the task and age of the respondent, are shown in Table 4. The significance of these correlations, however, should be interpreted with caution, as the very large sample size results in a great deal of statistical power.

Table 4. Correlation between age of respondent and frequency of activity

Activity	**Correlation (R^2)**
Internet searches	-0.35*
Use spreadsheets or accounting programs	-0.28*
Listen to music	-0.27*
Email friends and/or family	-0.26*
Word processing	-0.25*
Book travel arrangements	-0.23*
Shop online	-0.22*
Use social networking sites	-0.21*
Keep track of a daily schedule or tasks	-0.21*
General reading	-0.19*

** Correlation is significant at p < 0.01 level (2-tailed)*

To examine these correlations further, we broke down the group by decade (ages 55 – 59; 60 – 69; 70 – 79; 80 – 89; 90 – 100) and calculated the average frequency rating of performing each activity for each group. The top five activities for each age group are listed below, with their mean ranking out of 5 in parentheses.

50s (ages 55 – 59):

(1) Internet searches (4.22/5)
(2) Email (4.11/5)
(3) Word processing (3.44/5)
(4) Keeping up with news (3.11/5)
(5) Keep track of daily schedule and tasks (2.67/5)

60s (ages 60 – 69):

(1) Email (4.08/5)
(2) Internet searches (3.82/5)
(3) Word processing (3.05/5)
(4) View photos (2.63/5)
(5) General reading (2.45/5)

70s (ages 70 – 79):

(1) Email (3.69/5)
(2) Internet searches (3.18/5)
(3) Keep up with news/events in my area and the world (2.61/5)
(4) Play games (2.45/5)
(5) Word processing (2.44/5)

80s (ages 80 – 89):

(1) Email (3.39/5)
(2) Internet searches (2.77/5)
(3) Play games (2.68/5)
(4) Word processing (2.25/5)
(5) View photos (2.17/5)

90s (ages 90 – 100):

(1) Email (2.67/5)
(2) Internet searches (2.33/5)
(3) View photos (2.21/5)
(4) Keep up with news/events in my area and the world (2.21/5)
(5) Play games (2.2/5)

Based on these results, there are a few interesting patterns. First, all but the youngest respondents (those in their 50s) reported that they used email most frequently, followed by Internet searches. Second, those in their 50s were the only group to report that they kept track of their schedule and tasks using a computer among the top five most frequently performed activities.

Third, as the respondents increased in age, their rankings of frequency for the top five behaviours decreased, despite consistency in where certain activities fell in the order of frequency. Keep in mind that a 5 was assigned to a response of “Daily” for each activity, and a 1 was assigned to “Never”. The youngest respondents gave an average response of using email between “Daily” and “Every Few Days”. The oldest respondents, while still reporting that they used email most frequently, only said that they used email between “Weekly” and “Occasionally”. The ratings for all activities across the age groups are depicted in Figure 1.

3.3 Attitudes Toward Computer Use Scale Results
The reliability (alpha) of 22-item ATCUS was 0.88, indicating a very high internal consistency of the items in the questionnaire. The alpha did not change substantively when each item was deleted from the reliability analysis, indicating that each item is likely to load onto the same latent factor of attitudes toward technology. The high

reliability of the ATCUS indicates that it is a useful measure of attitudes toward technology among older adults.

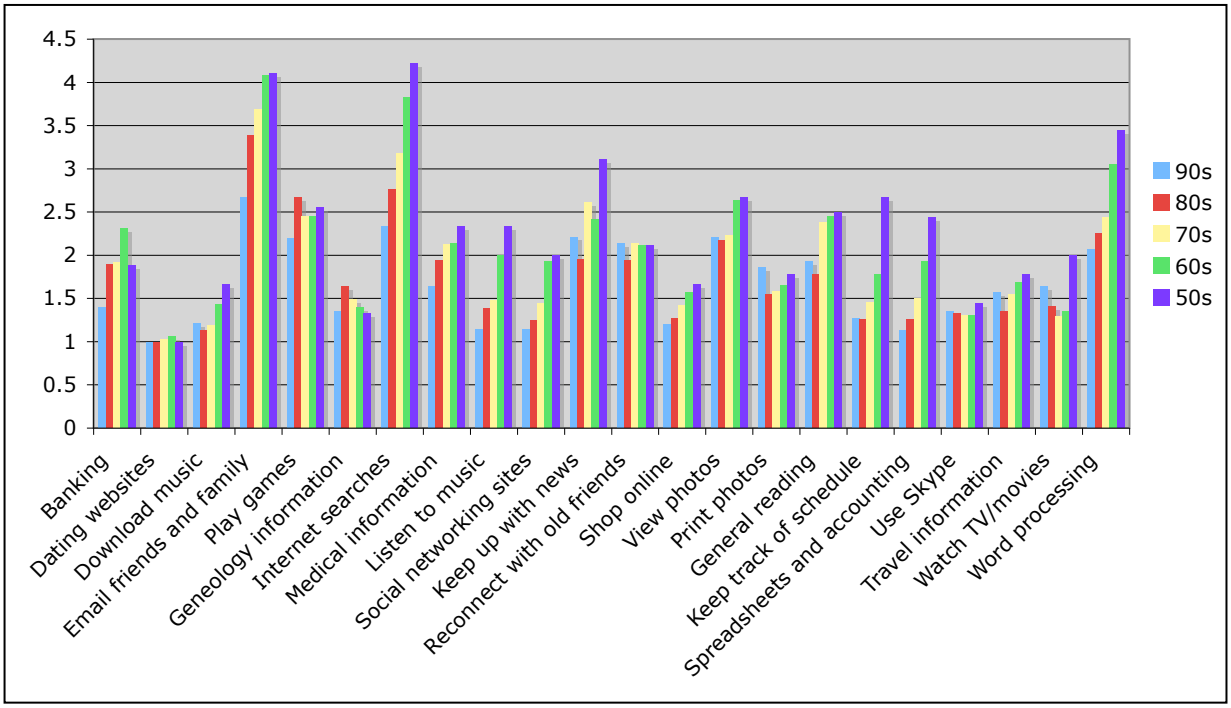
Across all age groups, the two most highly rated items (indicating agreement with the statement) were the following:

(1) "I think that computers and other technological advances have helped to improve our lives" (5.67/7)
(2) "I feel that having a computer at work helps or would have helped me with my job" (5.33/7)

The two lowest rated items were the following (indicating disagreement with the statement):

(1) "I would rather shop online than in a physical store." (2.09/7)
(2) "When learning a new task, I would rather follow an interactive computer program than learn from someone in person." (2.77/7)

Figure 1. Average frequency ratings for all activities by age group.



The average score on the ATCUS was correlated with the age of the respondents. As the age of the respondents increased, their attitudes toward computers became more negative (R^2 = -0.28, $p < 0.01$). The average score on the ATCUS was also significantly correlated with self-ratings of Confidence, Comfort, Capability, Difficulty, Anxiety, and Ability when using a computer (see Table 5). Negative emotions and negative items on

the ATCUS were reverse-scored so that a positive rating now indicated a less negative feeling.

Table 5. Correlation of self-ratings of emotions when using computers with ATCUS

Emotion	Correlation (R^2)
Confidence	0.65*
Comfort	0.64*
Capability	0.64*
Difficulty	0.60*
Anxiety	0.49*
Ability	0.55*

** Correlation is significant at p < 0.01 level (2-tailed)*

The fact that these self-ratings of emotions when using computer correlate so highly with the average score on the PANAS gives support to the validity of the questionnaire among this age group, as attitudes toward technology are affected by the positive and negative feelings one has while using it. For example, if one does not feel comfortable or capable using a computer, it's unlikely one will have many positive experiences when using it.

3.3 Usability Results

3.3.1 Demographics

The median[1] age of the participants in the usability portion of the study was 74, and the median number of years spent using a computer was 5.5. When asked to rate themselves on their ability to use a computer, the median rating of ability was 3 out of 5, with 1 being poor, and 5 being excellent.

3.3.2 Participant performance on tasks

The average time spent completing each task and the correlation of the time spent completing the each task with the number of years of experience using a computer were calculated. These results are presented in Table 3. The significance of the correlations was not calculated due to the small number of participants.

Table 3. Time to complete task and correlation with computer use experience

Task	Time to complete (sec)	Correlation with Use
Open and send email	64.06	-0.72
Create a new contact	133.30	0.13
Look at a photo	12.28	0.49
Email the photo	54.92	-0.11
Open browser and go to Google.com	44.36	0.46

[1] Means were not used to calculate participant demographics, as the average did not represent the central tendency of distribution of responses. This is likely to be due to the small sample size.

Choose to play solitaire	17.65	0.50

These results are interesting for two reasons. First, on only one of the tasks did the correlation imply that increased experience using a computer meant that the task took less time to complete (Open and send email). Second, on three of the tasks, the correlation indicated that more experience using a computer actually slowed the response time (Look at a photo, open browser, and choose to play solitaire). The comments from participants below begin to show why this may be the case.

3.3.3 Positive feedback on software

The following comments were compiled from the notes taken during the usability testing sessions.

About the icons:

- "I really liked the size of this. I can read it even without my glasses." (Participant A)
- "Icons are very large and easy…the large icons will provide a sense of safety." (Participant B)

About the appearance of the software:

- "It would be useful because the fonts are bigger." (Participant E)
- "There's not too much on the screen." (Participant E)
- "The exit [button] is nice and big." (Participant E)
- "It's not cluttered…[it's] easy to read." (Participant G)

About sending a photo:

- "I've never sent a photo before! That was easy." (Participant F)

About the software in general:

- "This is good for a beginner – for grandma sending emails to her grandchildren." (Participant B)
- "It's very simple. The photo was beautiful – very easy to use. Everything is good." (Participant C)
- "It's very simple. When I was first learning no one had patience for me. I wouldn't have needed help if I had this. It would be good for people in nursing homes – it's very simple…it's a very good thing for seniors, for seniors' homes or nursing homes." (Participant D)
- "It would be perfect for beginners – kids, my wife – it's getting you used to it as opposed to a big screen with a mass of information on it." (Participant E)
- "It's nice…open concept." (Participant E)
- "This is pretty neat!" (Participant F)
- "This was easy. I liked using it." (Participant F)
- "I could see myself using this. I'd like to send photos and this was easy." (Participant F)
- "There are small, simple steps." (Participant G)
- Participant G noted that the easier it is to use, the more someone would use it

- "This is very simple – it has to be for me." (Participant H)
- "It's straightforward – no monkeying around with it." (Participant H)

3.3.5 Constructive criticism and/or tasks that presented difficulty

In task *"Open your email and send a blank email…"*

- Participant A chose Internet rather than Mail and was confused about where to go from there.

In task *"Create a new contact…"*

- Participant A chose to go to Internet rather than Mail to do this at first, and required redirection to complete the task.
- "I'd like to see where the name went." (Participant B wanted confirmation that the new contact was on the contact list. Participant B also expressed difficulty understanding "contact" and the relationship to "write mail".)

In task *"Look at the photo of the family at the computer."*

- "What happens if you have hundreds of photos, and at more than one location?" (Participant B)

In task *"Send one of the photos to Alexa."*

- "[Thumbnail photo] should be larger." (Participant A)
- Participants A and H wanted to mail the photo from "Mail" rather than through "Photos"
- "How would large photos work? Would it spread across two screens/pages in email?" (Participant E)

In task *"Open the web browser and go to Google.com"*

- Participant A asked what the magnifier (+ and -) buttons were for
- Participant B was confused that there was no home page

General comments

- "I'm used to a blue background so white strikes me as odd. It's difficult to look at – hard on my eyes." (Participant B)
- "I'm used to doing more." (Participant B)
- "…for me now, it's too simple." (Participant D)
- Participant E wants photo editing capability, and clear instructions on how to edit photos, with possibly more options than "send" and "delete".
- Participant E noted that the indicator of where to type in the web browser was hard to see, and thought that using the arrow from the directions box could be used to point to the start of the box below it.
- Participant G noted that she might get bored with it, but that it opens the door for new users

3.4 Limitations

A limitation of this study is the distribution of ages represented by the respondents to the questionnaire. The majority of respondents were in their 70s. This is a result of the distribution method chosen, as the majority of members of the McMaster SHARE group are in their 70s. With a more even distribution of respondents per age group, we would achieve a better representation of how the computing interests of older adults change across age groups.

Similarly, the ability level of the participants in the usability study was homogeneous, as they were selected from people who were taking part in one-on-one computer tutoring at SERC. Therefore, these were older adults with some, but not a great deal, of computing experience. Additional groups who would be of interest would be older adults with substantially more experience using computers, and older adults with sensory and/or cognitive limitations with a variety of previous computer experience.

4. Conclusions

This study resulted in several key findings that may help guide the further development of PointerWare software.

(1) How do older users currently use computers, broken down by age group?

The frequency of performing all tasks with a computer is higher among younger adults in our sample. The most frequently-performed tasks, however, differs in small ways between the age groups, with the youngest group showing evidence of using computers in the workplace (#5: Keep track of daily schedule and tasks) where the older respondents did not. Email and Internet searches were the most frequently performed tasks across all age groups.

(2) What are the attitudes toward computers and technology among adults 55 and over?

Attitudes toward computers are more positive among younger users, as shown by the significant negative correlation between the average PANAS score and age of the respondent.

We can be confident that this is an accurate evaluation of the age effects on scores on the PANAS because the ATCUS the reliability analysis and correlations with self-ratings of emotions when using computers indicate that the ATCUS is a reliable way to evaluate attitudes toward computers in older adults. In addition, the high overall scale reliability, the incidence of corrected item-total positive correlations for each item, and the high reliability in each case where a single item is deleted all indicate that this scale is measuring a single factor: general attitudes toward technology.

(3) How usable is the current PointerWare technology for older users who are not novices?

The response to the appearance of the software was very positive, particularly for the simplicity of the display, and the size of the icons and the fonts. Participants expressed that this would be excellent software for a beginner to using computers.

However, the negative feedback reveals that there may be some weaknesses when people with even limited experience using computers use this software. The difficulties of some the participants likely reflected their previous use of computers: for instance, they may have tried going to the Internet to check email, because they may have used an online email client for their personal use. Participants also reported that they would want to do more with the software than what was immediately available to them in its current format.

Experience with computers, however, also put the user at a greater advantage when first using the software. There was a significant correlation between the self-rating of ability and the time it took to complete the first task: the more competent the user rated themselves, the shorter the task took. The time to complete the remaining tasks was uncorrelated with self-rated ability.

One glitch that two users experienced was in sending a photo someone via email. Both wanted to send this through “Mail” rather than through the “Photos” area of the software. This may be a place where the functionality to send a photo could be added to the “Mail” section of the software, as well.

5. Implications for PointerWare software and Future Research

PointerWare Innovations would be well served to consider the following additions to its existing software:

- Photo software with basic editing tools
- Word processing software
- A simple RSS feed to aid in keeping up with news and events
- A video chat program, similar to Skype

Based on the usability findings, the more familiar a user is with completing the tasks that PointerWare software allows, the more confusing they will find completing tasks using PointerWare. In many ways this is intuitive – while a very simple interface, if a user knows how to complete a task one way, changing the method will create confusion, however brief. The learning curve among this group, however, is not steep; all were able to figure out how to complete the tasks presented to them.

In addition, PointerWare Innovations is on the right track with the visual appearance of the software. Participants gave high marks to the ease of seeing most of the items on the screen.

For future research, we make the following recommendations:

- After feedback from participants, an additional item ("I enjoy using PowerPoint or other computerized visual aids to accompany my presentations") on the ATCUS may also benefit from being modified, as many older adults do not have the opportunity to give presentations.
- Future work should gather additional information from a greater number of older adults not captured in this sample (those younger than 70 and older than 85).
- An additional group of interest would be older adults who have a physical and cognitive disability that may be forcing them to switch from software that they are experienced with (such as Windows) to one that accommodates for their disability.

10. References

Morris, S.A., Gullekson, N.L., Morsen, B.J., & Popovich, P.M. (2009). Updating the attitudes toward computer usage scale using American undergraduate students. *Computers in Human Behavior, 25*, 535 – 543.