

ACCESSIBILITY OF GROUP SUPPORT FOR BLIND USERS

Yuanqiong Wang and John Schoeberline

Department of Computer and Information Sciences, Towson University, 8000 York Road, Towson, U.S.A.

Keywords: Group support, Accessibility, Usability, Blind.

Abstract: Group support applications are widely used in workplace. Unfortunately, persons who are blind often find difficult to access such applications, due to the highly graphical nature of the applications, which hinders their ability to contribute to the group. As the result, persons who are blind are often face problems gaining and retaining employment. This paper presents preliminary results of a series of focus group study conducted in the mid-Atlantic region on accessibility and usability issues of group support applications. How persons who are blind utilize group support applications to support their group tasks; the tasks/steps utilized to complete a group project; and, the accessibility and usability issues experienced by blind users are discussed. Additionally, the focus group study identified the reasons persons who are blind discontinued utilizing group support applications; the other tools utilized to support group work; the accessibility design considerations; and, the accessibility documentation and support needed.

1 INTRODUCTION

According to World Health Organization (2010), about 314 million people are visually impaired worldwide, among them 45 million are blind. In the United States, it is estimated that over one million people are legally blind. In today's global economy, collaboration has become an essential activity in business. Many organizations utilize software applications that support communication, coordination and collaboration (such as email, document sharing, scheduling software, conferencing systems) for their collaborative work. Considering the unemployment rate for working age persons who are blind in the united states of 70% to 75% (ICBV), the accessibility problems associated with group support applications become crucial. In order to improve the design of group support applications, the following questions need to be answered first:

- RQ1: how do persons who are blind work in groups (collocated or distributed groups)? More importantly, is there any difference comparing to the way of a group containing all sighted members?
- RQ2: What are the accessibility and usability challenges persons who are blind experience with software applications (specifically groupware or group support application)?

- RQ3: What kind of support do persons who are blind require so that they can perform well in groups?

After a pilot study, a series of focus group studies were conducted in the mid-Atlantic region. This paper reports the focus group studies we conducted and some preliminary findings. It is organized as follows: in the next section, a brief discussion on the research background is presented. The research methodology utilized is discussed in section three. The preliminary findings and future research directions are discussed at the end.

2 RESEARCH BACKGROUND

2.1 Accessibility and Usability Issues for Persons Who Are Blind

Accessibility describes the degree to which a product, device, service, or environment is accessible by as many people as possible. It is often used to focus on people with disabilities and their right of access to entities, often through the use of assistive technology. In order to understand the output from computer systems, persons who are blind are forced to use either tactile displays or sound. A screen reader (e.g. JAWS, Windows-Eyes) is a piece of software that runs in the background to

read the screen memory and send any text it finds there to a speech synthesizer (Pitt & Edwards, 1996). However, the screen reader cannot interpret graphical information on the screen, if the program is not properly programmed. For example, Java based technologies such as chat rooms are often inaccessible to persons who cannot use a mouse; poorly labeled forms and the use of frames can also make the program inaccessible to persons who are blind. Moreover, with technology advancement, more and more applications are incorporating dynamically generated content, which presents accessibility challenge to persons who are blind.

On the other hand, usability refers to the extent a product (e.g., device or service) can be utilized by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use. When people with disabilities are aware of accessibility and usability issues based on their previous experience, they are more likely to try to avoid using that type of applications. Instead, they will try to find a work-around to complete that specific task. When no such work-around is found, the frustration can affect their mood.

2.2 Groupware and Group Support Applications

Groupware applications refer to software applications that assist persons to communicate, coordinate, collaborate and compete (Shneiderman & Plaisant, 2005). Groupware can be considered a comprehensive tool that includes Email, group calendars, as well as tools such as wikis, blogs, social networking, etc. Time/place matrix (Johansen et. al. 1991) is the most cited framework to categorize groupware -- by time (synchronous or asynchronous) and place (collocated or different distributed). As the technology evolves, more and more software applications start to incorporate features that used to be key features of groupware applications. For instance, a document editor now provide features such as shared track changes that allow collaborators to co-write papers, an email application that also allow the sharing of calendars from multiple users. Even though the above examples are not typical groupware applications, they do incorporate key features of groupware applications that support group work. We would refer these software applications as group support applications. Most of these applications utilize a Graphical User Interface (GUI) that involves multiple forms or frames and may contain graphical

controls and images that screen readers cannot interpret successfully.

3 RESEARCH METHODOLOGY AND PROCEDURE

Focus groups are group interviews. Generally, focus group is used for marketing research purpose while it has been used in social and design research since 1930s (Courage and Baxter, 2005). It is very useful for generation of ideas and for discover problems, challenges, frustrations, likes, and dislikes among users especially when the researchers do not have enough information to design a survey. The result of focus group study can provide information to prepare for other usability studies. Moreover, focus groups allow the access of multiple points of view in a short time period (e.g. a single meeting) (Courage and Baxter, 2005). The size of the group can vary from 4 to 6 as mini-group to more than 10 as a full group (Greenbaum, 1998). Considering the explorative nature of this particular study, we believe focus group study is an appropriate approach to gather data regarding group support applications from blind users that are from a working group. This will not only allow us to collect data from multiple sources at a single meeting, it will so enable us to observe the dynamic of the group as they interact; gain agreement among several group members; and validate the group process and other data with the entire group.

Considering the limited time that each participant can contribute, each focus group session included a mini-group of five participants for this study in order to get more in-depth information (Greenbaum, 1998). The focus group sessions were conducted in a small conference room in a hotel at the mid-Atlantic region during a state convention. All participants are blind with no residual vision. The purposes of this study are to understand how persons who are blind work in groups, what tools they use for group collaborations and communications, what the accessibility and usability issues they encounter, and what additional support they need for group interactions.

The focus group session, contained the following steps:

- Prepare demographic, prior-experience questionnaire and meeting guideline;
- Recruit the participants;
- Conduct the focus group session, based on the meeting guideline;

- Perform content analysis of the audio transcript and the researcher notes, to identify content categories;
- Validate agreement of the coded content, using Cohen's Kappa (Simon, 2008); and,
- Report findings.

As Goebert and Rosenthal (Goebert & Rosenthal, 2002) noted, "the primary consideration is who will provide the most insightful information," related to the topic when conducting focus groups. Considering the objective of this research project, participants of this project must meet all the requirements specified below:

- Persons who are blind, with no residue vision;
- Persons who have experience working in groups (collocated or distributed);
- Persons who are familiar with screen readers;
- Persons who utilize computers for their work; and,
- Persons who have tried to use group support applications and other tools to support his/her collaboration with others.

The Researchers solicited help from the NFB (National Federation of the Blind) in order to recruit persons who are blind to participate in the focus group study. Fourteen people participated in three focus group sessions with four to five members in each group. The participants of the focus group study met all of the selection criteria for this study.

Prior to the focus group study, each participant were asked to fill out a short background questionnaire, regarding demographic information and prior-experiences with group support applications and screen readers. A meeting guideline was designed, before the start of the meeting, containing a list of possible questions for discussion.

In order to be easily accessible for the participants, the focus group session was conducted in a private conference room in a hotel while they attended a state convention. The session lasted about 90 minutes. One researcher served as the moderator while the other served as a note-taker during the session. The session was also audio-recorded. The focus group started with a brief introduction from the moderator on the purpose of the meeting, a round of brief self-introductions, and followed by a discussion based on meeting guideline. Follow-up, probing questions were asked to ensure the understanding of the discussion.

After all the focus group sessions were finished, the audio recordings of the group discussions were transcribed with the permission from the participants

and then compared with the researchers notes. Both transcripts and detailed notes on the group discussion were coded based on the themes that emerged from the participants' comments.

4 PRELIMINARY RESULTS

4.1 Demographics and Experience

Of the fourteen participants, nine participants completed the background questionnaire. Computer using experience was discussed during the focus group. Therefore, the data regarding computer experience were collected from all 14 participants.

Among all the participants that responded to the survey, five (5) are between 40 to 49 years old; two (2) are between 50 to 59 years old; and, two (2) participants are 60 and over. In regard to experience utilizing a desktop or laptop computer, five (5) participants had 11 to 20 years of experience; while nine (9) participants had 21 to 30 years of experience. All of the participants utilized the computer daily and were middle to elder aged adults with computer experience of at least 11 years. It is anticipated that the participants' high-level of experience may play a role in providing several examples of accessibility and usability issues and increasing the diversity of applications discussed.

The participants responded that they utilized screen reader software to access their computer applications. Among 9 participants who responded, the level of experience on using screen reader ranges from 1 year to 30 years with majority (five participants) having 21 to 30 years of experience. Based on these responses, it appears that the participants have considerable experience utilizing screen readers. The specific screen reader software reported most frequently was the JAWS (five responses) screen reader, followed by the Windows Eyes (three responses) screen reader.

Novell GroupWise, Microsoft Outlook, Microsoft Office (including Access, Word, Excel, and PowerPoint), Microsoft SharePoint; Microsoft Internet Explorer; and, various versions of BlackBoards were identified as tools that the participants use while working in groups. Microsoft Outlook and Microsoft Word were the top two mentioned applications, with five (5) and six (6) responses respectively. These applications were utilized by the participants to communicate with each other, access data; prepare for classes, participate in class discussions, share documents, and make group schedules. It is clear that most

participants utilized some groupware or utilities in various software packages. However, none of the participants utilized traditional full-fledged groupware application for group work they participated.

4.2 Data Analysis of the Focus Group Study Recording

Content analysis was performed on the audio transcriptions and notes collected during the field studies. Two research assistants performed as coders for this analysis. Key points were grouped into categories. After a training session and exercise on how to code the transcript using a random selected transcript segment, the two coders worked individually to code all the data. Cohen's Kappa (Simon, 2008) was calculated to verify the inter-coder reliability (Kurasaki, 2000). The coders agreed on 97% of the 94 cases. Cohen's Kappa with value of 0.7 or above is normally regarded as having consistent coding between coders. Therefore, the codes from two coders are accepted as reliable.

Six categories were identified as the result of this analysis:

- the tasks/steps necessary to complete a group project;
- groupware or group support software utilized;
- accessibility and usability issues encountered;
- group interaction techniques utilized;
- accessibility documentation and support; and,
- accessibility design considerations.

The following sections will present each of the six categories identified with discussions.

4.2.1 Tasks/Steps Necessary to Complete a Group Project

In order to investigate the support needed for blind users in group setting, it is essential to study how blind members work in groups (collocated or distributed), check out whether there is any difference in terms of the needs from sighted members. Therefore, the focus group started discussion by identifying the tasks or steps utilized when completing a group project involving blind members.

All focus group participants worked with groups involving both blind and sighted members. Not surprisingly, general work flow with groups containing all blind members as well as partially blind groups are very similar to the process that is normally followed by sighted groups. The project normally start by identifying the purpose of the

project, assigning a project leader, exchanging documents via email, followed by a combination of face-to-face meetings, conference calls and additional emails.

When groups were collocated, more face-to-face meetings were scheduled during the process. While for distributed groups, conferences calls were conducted when an immediate attention/feedback was required. One participant commented, "A lot of group stuff, there are a lot of face-to-face. It is a combination of face-to-face, email and conference calls. It is dependent on the makeup of the group."

4.2.2 Groupware or Group Support Software Utilized

Outlook, Outlook Express, GroupWise, Google Calendar, chat tools such as Instant Messenger, Office (Excel, Word, and PowerPoint), SharePoint, and Word Perfect were identified as the tools utilized during group work. Tools such as Outlook, Outlook Express, GroupWise, Instant Messenger and Google Calendar were used for emailing, chatting, task tracking, and group scheduling. Office, SharePoint and Word Perfect were mostly used for document sharing and exchanging.

In order to be able to access the above mentioned applications, the focus group participants utilize screen readers. The predominant screen readers utilized were the JAWS and the Window Eyes. Scripting languages are available to customize the screen reader to improve accessibility of applications the screen reader interfaces. Utilizing the screen reader's scripting language to assist with making the interface to group support applications accessible can enhance the screen reader's functionality. Once it is determined that a specific application is not accessible, the screen reader's scripting language can be modified to incorporate features for accessibility. Utilizing the scripting language to improve an application's accessibility may be a possible area for further research.

Note takers, a hardware-typing device, are normally used to document discussion content during face-to-face group meetings. The notes are transferred to their computers after the each group meeting. PAC Mate and Braille Sense note takers were identified as the ones that used most frequently.

It is interesting to notice that none of the focus group participants actually used traditional full-fledged groupware applications (such as Think Tank from Group Systems). Instead, features from different software applications were utilized for

different purposes during group collaboration. With the development of the web technology, more and more group features (such as email, co-editing, and group calendar) are integrated as components in software applications that are normally not regarded as groupware. Groups especially the ones involving sighted members tend to use web-based applications.

4.2.3 Accessibility and Usability Issues Experienced

With the intense utilization of the software applications, participations discussed various accessibility and usability issues they encountered. A lot of the issues were common among various software applications even though it was mentioned in regards to a specific application when the discussion started.

One recurring theme, in the area of accessibility, is the inability to access and use the track changes feature supported by Microsoft Word. The track changes are garbled with so many inserts and deletes that it is difficult to comprehend the changes to a document. A participant commented, *“My track changes goes from the next comment to the next comment. It is hard to keep up with all of the information presented, and to determine the original and the change. I can turn on Window Eyes, to hear the changes, but I hardly ever turn that feature on, because it is too much to keep track of. Deleted two words and added a couple of words – it becomes impossible! Frequently, I just accept all of the changes. There is too much clutter with track changes.”*

Can there be a new approach to present all the changes that has been made by members? We may need to look into alternative ways to allow co-editing within the group. Possibly have the original paragraph, followed by the changed paragraph in their entirety, with the ability to switch back-and-forth between views. Somehow, a complete representation of the changes may be easier to understand. Considering that the focus group participants simply accept the changes and then review, presenting the changes in their entirety before they accept the changes may be an improved alternative approach.

While working in distributed groups synchronously, it is critical that members are aware their current stage and have the control of what they need to do. Unfortunately, this may not be easy for blind members. Echoed with previous research on supporting synchronous communication for the blind (Hample, 1999), the inability to follow a

conversation in a chat session was raised as another issue that prevent blind members to contribute to the group as much as they would like to. A participant commented, *“In a Chat Session – figuring out who said what, is an issue. You are no longer synchronous, when you have to look around the screen to figure out who said what. You are going to get behind the chat pretty fast. Even if you have access, chat is too difficult to keep up with the conversation.”*

Identifying the participants of a conversation is an important feature of a chat application. Future research can be utilized to focus on the issues associated with synchronous communications and solving the issues of identifying participants and keeping pace with the conversation.

Periodic software updates that fix bugs or improve performance are expected by most software users. Unfortunately, this poses a new problem for blind users. The focus group participants noted that when new software upgrades were made to existing applications, functionality and interface changes they made to prior versions were always lost which normally lead to extra time and effort to reset all the accessibility features that work with the screen readers they normally use. A participant commented, *“I try to customize my interface but you loose your changes to the interface when upgrades occur. When you get a new version of Office, for example. The new software comes out for sighted people, then the access technology people scramble to make the software function for persons who are blind.”* Another participant concurred with the work around he utilize, *“My office is using Google Calendar, which is not accessible. I now have a new assistant, who enters my schedule into Google Calendar. That type of stuff happens all the time. Some big global change takes place, and then someone thinks how will this impact a blind person, then you are playing catch-up.”*

In the same vein as upgrades to group support applications are cosmetic changes of new versions of group support applications which leads to inaccessibility of the application. For instance, the ribbon menus added to new versions of Microsoft applications made the previously accessible application inaccessible. A participant commented, *“I use to be able to go to the menu bar. The ribbons are not accessible – you have the up-and-down ribbons, and you are supposed to memorize the ribbons. It is not very usable. I cannot get to the other ribbons, like the spell checker for example. The prior design with the menus and the alt keys was a better approach for accessibility and usability.”*

It is important that prior to upgrades or changes to existing group support applications are applied, changes are tested with persons with disabilities to prevent loss of service of these applications due to accessibility and usability issues. The application developers should be aware of this issue so they can take it into consideration when they provide upgrades to software applications.

Another area of accessibility that was mentioned by the focus group participants was the inability of the screen reader to keep pace with the cursor position while reading messages in Microsoft Outlook. A participant commented, *"Microsoft Outlook, when I am arrow down through the messages, the arrow is moving down the messages, but the JAWS Screen Reader has stopped talking."* When the locus of control is important to the user, how to provide the right information regarding the cursor position and current focus to the screen reader or other adaptive technology is essential. Therefore, it is imperative that the developers of the application as well as adaptive technologies (e.g. screen reader) work together to solve the issue.

4.2.4 Group Interaction Techniques

The focus group studies' participants reported that they communicate as a group by utilizing face-to-face meetings, conference calls, email, and instant messages depending on whether they are collocated or distributed, and whether the issue needs immediate attention. This is consistent with the time/place matrix discussed in the literature. It also parallels the approaches to group communications of sighted persons. The real difference is that persons who are blind have to use additional adaptive tools such as screen readers and note takers. The screen reader provides access to applications via synthesized speech, and the note taker provides a method for documenting notes during face-to-face meetings and conference call. The area of future research in regard to the group process is to determine an approach to creating a comprehensive solution for email, chat, and note taking for persons who are blind.

4.2.5 Accessibility Design Considerations

Being able to customize the interface is an approach to enhancing the accessibility and usability of an interface. The ability to modify and possibly simplify the group support application's interface was seen as a requirement of the focus group participants. Often times, a group support application interface component was removed from

the interface to allow the screen reader interpret the interface better. For example, participants often *"remove the preview pane from the interface in outlook"*. When the group support application's interface is less cluttered, persons who are blind can focus their screen reader on more precisely presented content.

4.2.6 Suggestions on Accessibility Documentation and Support

Due to the difficulties interacting with software applications, the support provided with the application becomes critical on whether a blind member can perform in the group to the extent they intended to. The participants noticed the importance of having access to a support staff *"I have IT Support. They use remote access, to login to my computer."* Another participant commented, *"I contact Plum Choice to remote access my computer who can look at my interface and we try to find a way a blind person can adjust the interface."* However, not all support staff in their own organizations are aware of the accessibility features provided with the application. Therefore, in order to allow people who are blind (as well as with other disabilities) best utilize the application, it is crucial to provide documentation that discusses any accessibility aspect of the application.

5 DISCUSSIONS AND FUTURE DIRECTIONS

The participants of the focus group studies are adults with extensive experience utilizing adaptive technologies while working in groups. Even though the participants have extensive experience, they do encounter accessibility and usability issues while interacting with group support applications.

Although the size of our study is relatively small, considering the potential user population and cases identified from the study, the preliminary results do illustrate the need of further investigation in the design of accessible group support software applications. Studying the group process enabled the researcher to determine the significant group support applications and adaptive technologies necessary for persons who are blind to be able to collaborate and communicate in groups. Screen readers and note taking devices are utilized to interact with group support applications.

Further research is needed in several areas in

regard to accessibility and usability of group support applications. Some of the areas discussed include: integrating email, chat and document sharing into a comprehensive group support application; utilizing screen reader scripting languages to correct accessibility and usability issues; creating new approaches for track changes of shared documents; providing awareness of who is talking and on which subject matter during chat session to determine the conversation stream; identifying the cursor position or controlling the cursor position while reading messages; and, providing approaches to support of upgrades and enhancements to make sure the requirements of persons who are blind are considered.

The future directions suggested by this series of studies support several paths:

- Developing and evaluating accessible group support prototypes capable of integrating email, instant messaging and document sharing;
- Developing and evaluating new approaches to presenting email messages that prevent loss of place;
- Developing and evaluating new approaches to help control pace and the orientation of participants utilizing chat sessions;
- Developing and evaluating new approaches to track document changes that are accessible and usable;
- Developing and evaluating screen reader scripts to improve accessibility to group support applications;
- Developing and evaluating new approaches to improve the accessibility and usability of the ribbon menu structure of Microsoft Applications; and,
- Developing and evaluating interface designs that are less cluttered or have the ability to be modified for accessibility and usability.

6 CONCLUSIONS

The results from focus group studies present the need to focus attention on the accessibility and usability needs of persons who are blind. Several accessibility and usability issues were identified by the field studies' participants that need to be addressed in order for the participants to interact with group support applications.

The next step in this research is to select one or several of the accessibility and usability projects identified and conduct research on the accessibility and usability of the proposed solutions.

REFERENCES

- Courage, C. Baxter, K., 2005. *Understanding Your Users. A Practical guide to user requirements. Methods, Tools, and Techniques*. Morgan Kaufmann Publishers, San Francisco.
- Goebert, B., Rosenthal, G., 2002. *Beyond Listening: Learning the Secret Language of Focus Groups*. New York. John Wiley.
- Greenbaum, T. L., 1998. *The handbook for focus group research*. Sage Publication, Thousand Oaks, 2nd Edition.
- Hampel, T., Keil-Slawik, R., Claassen B. G., Plohmann, F., Reimann, C., 1999. Pragmatic Solutions for Better Integration of the Visually Impaired in Virtual Communities. In *Proc. GROUP '99, Phoenix, AR, USA 1999*, pages 258-266.
- ICBV., n.d. Assuring opportunities: A 21st century strategy to increase employment of blind Americans. Retrieved from <http://www.icbv.net/National%20Issues/Opportunities.htm>.
- Johansen, R. Martin, A. Mittman, R. Saffo, P. Sibbet, D. and Benson, 1991. *S. Leading Business Teams: How Teams Can Use Technology and Group Processes Tools to Enhance Performance*, Reading MA: Addison Wesley.
- Kurasaki, K. S., 2000. Intercoder Reliability for Validating Conclusions Drawn from Open-Ended Interview Data. *Field Methods*, volume 12, No. 3, August 2000, pp 179-184.
- Pitt, I. J., Edwards, A. D. N., 1996. Improving the usability of speech-based interfaces for blind users. In *Proceedings of ASSETS 1996, 124-130*. Vancouver, British Columbia, Canada.
- Shneiderman, B., Plaisant, C., 2005. *Designing the User Interface: Strategies for an Effective Human-Computer Interaction*. Addison Wesley, Boston, 4th edition, 411-450.
- Simon, S., 2008. What is a Kappa coefficient? Retrieved from <http://www.childrens-mercy.org/stats/definitions/kappa.htm>.
- World Health Organization, 2010. Visual impairment and blindness. Retrieved from <http://www.who.int/mediacentre/factsheets/fs282/en/>