HCI Methods for Including Adults with Disabilities in the Design of CHAMPION

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Abstract
The demand for software, suitable for users with complex communication needs and other disabilities, is increasing. However, traditional HCI design methods are not always suitable for these users. To address this, the CHAMPION project is piloting adapted methods in the development of a patient hospital profile for this user group. Initial results show that users with cognitive and communication disabilities can be involved in participatory design. The challenge is now to develop meaningful evaluation methods for this group.

Keywords
Disability, usability, inclusive design, methodology

General Terms
Design, Experimentation

ACM Classification Keywords
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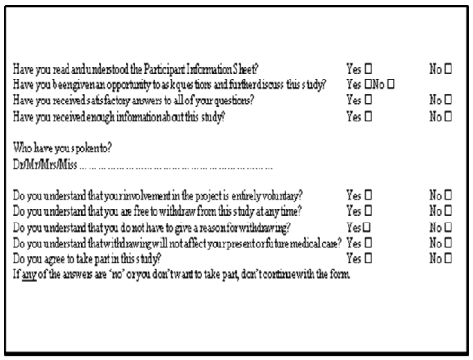
Introduction
Adults with Complex Communication Needs (CCN) have been overlooked as research participants in the past. The CHAMPION project is investigating the potential to include participants with Complex Communication Needs and cognitive impairment in the design of a new health software program.

Working with these adults in participatory design is challenging; traditional HCI methods are not always suitable due to communication problems and the cognitive load involved for the participants using them. Using an AAC device to communicate is time consuming and requires a great deal of concentration by a communication partner. In addition to this, participants who are unused to taking part in any form of research need to be encouraged in providing feedback on systems.

Within the area of Augmentative and Alternative Communication (AAC) and Complex Communication Needs (CCN), there is has been some use of User Centred Design (UCD). Alm et al., [1] included adults with CCN in focus groups which provided ideas which were fed into the software design process. Other projects have used adults with CCN to evaluate early stage paper prototypes [2]. But, to the best of our



Have you read and understood the Participant Information Sheet? Yes ☐ No ☐
Have you been given an opportunity to ask questions and further discuss this study? Yes ☐ No ☐
Have you received satisfactory answers to all of your questions? Yes ☐ No ☐
Have you received enough information about this study? Yes ☐ No ☐

Who have you spoken to?
Dr/Mr/Mrs/Miss .....

Do you understand that you involvement in the project is entirely voluntary? Yes ☐ No ☐
Do you understand that you are free to withdraw from this study at any time? Yes ☐ No ☐
Do you understand that you do not have to give a reason for withdrawing? Yes ☐ No ☐
Do you understand that withdrawing will not affect you present or future medical care? Yes ☐ No ☐
Do you agree to take part in this study? Yes ☐ No ☐
If any of the answers are 'no' or you don't want to take part, don't continue with the form.

Figure 1 Adapted Informed Consent Form. Participants were asked a series of multiple choice questions to which they could answer yes or no, such as "Can you withdraw at any point?", to ensure they had understood their rights in the study

knowledge, little UCD work has been done with adults with CCN who may also have cognitive impairments.

Importance of Work

The number of computer users with cognitive and developmental disabilities is increasing e.g. day and residential units are now including computer courses as part of the program for service users [3]. As adults with developmental disabilities become more integrated into the workplace, the demand for computer software which is accessible by a wider spectrum of users is likely to increase.

However, the main use of technology by this user group remains in assistive technology and AAC devices. As with other user groups, a lack of UCD may contribute to the poor adoption of technology. The rate of abandonment of AAC devices is reported to be as high as 53.3% [4]. It is suggested that the inclusion of end users in the design process may reduce this abandonment rate [2]**.** While there is literature on developing UCD methods for older and disabled users together, there is little research into developing UCD methodologies for adults with CCN who may also have cognitive impairment [5].

Adapted HCI Methods

Traditional HCI methods such as focus groups, design sessions and rapid prototyping were adapted and piloted with a group of adults with CCN and learning disabilities from a local disability day centre.

Informed Consent: As the adults with moderate to profound communicate impairment were unlikely to be able to consent through traditional channels, a modified consent process was followed (see Figure 1).

Focus Group: 6 adults with CCN (3 males and 3 females) took part in a focus group looking at the issues surrounding hospitalization and the information they would like to share with hospital staff. The focus group was held in the day centre, in a room used for activity sessions (Figure 2). Participants were provided with questions in advance to allow those who rely upon AAC devices to prepare longer answers in advance.

Requirements Gathering: 3 participants from the first focus group formed the design group along with a support worker. This group had never been involved in a design project before or in giving requirements for a system. They had limited computer experience beyond the assistive technology they used on a day to day basis. The first meeting of the design group involved a discussion using a storyboard showing how the CHAMPION patient profile system might be used in hospital. Once the participants were clear on its use, the author stepped through how the use of the system would be used to store information. At each stage of the discussion the participants were asked for their requirements at this point.

Design Group and Rapid Prototyping: A week later a second design meeting was held with paper mock ups of the user interface. Using magnets on the back of foam shapes representing buttons, text boxes and labels, the screen layouts were displayed on a large magnetic board. Using the magnetic board meant that participants in wheelchairs could have the 'screen' placed directly in front of them.

The design process then moved onto a medium level prototype. Clicker5 [6], usually used as a way of creating writing tools for children with disabilities, was

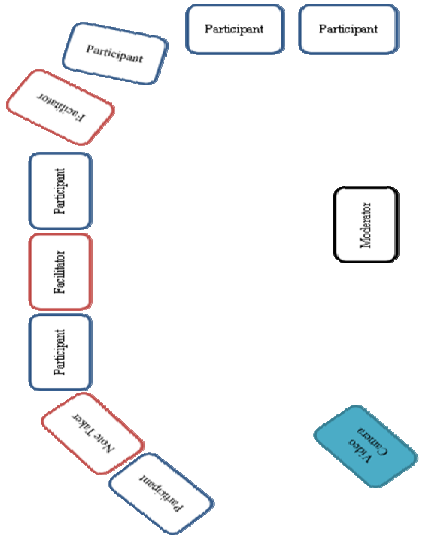


Figure 2 – Layout of Focus Group. As all of the participants used motorized wheelchairs a semi circle was formed with facilitators placed next to the participants who required the most help with their communication. The moderator sat at the head of the circle with the video recorder placed to the left of the moderator to ensure all the participants were captured. One participant had a hearing difficulty in addition to his speech impairment so a facilitator sat next to him at an angle to allow for the signing of questions. The video camera was able to rotate and was operated by a research assistant. The session was video recorded to capture both spoken and non verbal behavior, an important aspect of communication for people with CCN

used for the prototype. Its interactivity options were harnessed to create prototypes in a similar manner to PowerPoint. The main advantages of Clicker5 over PowerPoint for this group are its ability to be controlled by assistive technology peripherals that use scanning; and its voice output of the items on the screen. During the evaluation of the Clicker5, prototype participants chose 3 different peripheral options: scanning; mouse and keyboard; and touch screen. Participants were seen individually during this session to allow better observation of how each used the peripheral device.

Participants' responses to adapted methods

During the focus group participants engaged in discussion with each other around issues prompted by 3 present questions: 1.) The good experiences of hospital, 2.) The bad experiences of hospital and 3.) What would have made the bad experiences better? The moderator took care to ensure that the participants did not interrupt each other. The participants were patient in waiting for each other to either prepare an answer on an AAC device or to have their reply spoken by a facilitator.

In the requirements session, the 3 participants were able to envisage themselves using the system and were able to discuss the different needs they had for the system. When participants disagreed about the amount of support they would require when using an aspect of the system they were able to hold a discussion with each other and attempted to reach compromise on how best to meet one another's need. This is despite the fact that these participants are rarely involved in group discussions in their typical routine.

When working with the paper prototypes, participants were able to adapt quickly to imagining the results that could occur from selecting a button or pressing a text box (Figure 3). As they progressed through the paper prototypes participants provided useful suggestions on better ways of providing instructions or how things should be laid out. Participants agreed that working with paper designs initially reduced their stress about making mistakes and helped them to feel more confident in making suggestions on alterations.

When using Clicker5 for evaluations participants responded well to seeing their ideas progress. Although the designs were based on discussion from earlier sessions there were differences which caused participants to be unsure at stages. Despite the more technical appearance, participants still appeared comfortable in pointing out features they did not like and providing useful suggestions for improvement.

Next Stages

The remainder of this thesis will focus on moving the designs into computer software. The challenge is to ensure continued participation from adults with complex disabilities as the project moves onto more technical stages. Unlike other software projects where one main peripheral is used for development, with others added as the project nears completion, the CHAMPION project will have to adapt the software for many different forms of assistive technology throughout its development if it is to be evaluated by participants with varieties of disability.

Another challenge for CHAMPION will be how to conduct meaningful evaluations with participants over a period of time. It is likely that participants will initially be keen

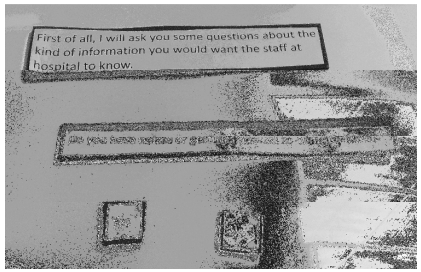


Figure 3 Paper prototype of questionnaire screen

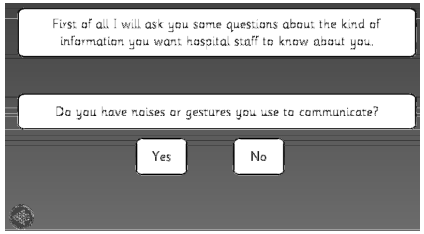


Figure 4 Clicker5 development of screen in Figure 3

to create a profile and store their stories and information on the system; however it is not yet clear how willing they and their support staff will be to maintain their personal records. It may be that additional motivational tools will have to be built into the system to maintain users' interest.

Expected Contributions

To summarize, the expected contributions of these adapted methods are:

(1). Understanding how users with complex communication needs and additional cognitive impairments can contribute meaningfully to the development of new and innovative software.

(2). Adaptation of HCI methodologies, better suited to the cognitive and physical needs of a group of users previously overlooked in design

(3). Increased awareness of the role adults with complex disabilities can play in the design of not only assistive technology but in technology designed for the general population.

The number of computer users with physical, cognitive and communication disabilities is increasing. As more adults with disabilities gain employment in roles using computers the demand for software to be accessible to a broader range of people will increase. It is likely software designers will have to begin take on board the impact of users with disabilities when designing software. Many traditional HCI methodologies are not suitable for adults with limited experience of taking part in research or design groups and who have a range of physical and cognitive disabilities. By addressing these issues adaptations can be made to traditional usability methods to ensure they are suitable for this group.

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