Accessible Participatory Design: Engaging and Including Visually Impaired Participants

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Abstract This paper provides an overview of various participatory design techniques made accessible for visually impaired participants. Within a project to design a tactile, pedestrian, navigation aid various participatory techniques were utilised. A suggestion for application is made alongside points of interest for each technique which may be of value to researchers new to both participatory design and design for visually impaired users. The conclusive paragraph draws out generalizable findings alongside the notion that, as the designers empathy for the user group increases, so to will their ability too create accessible participatory approaches.

1 Introduction

Whilst laying out participatory design (PD) as a separate technique from user-centered design (UCD), Sanders (2002) defines UCD as 'designing *for* the users' whilst PD is defined as 'designing *with* the users'. This adds another level of difficulty to the design process as the challenge of how to make it accessible and enjoyable for the non-design-based participants must also be considered.

Brandt (2006) notes that 'designing the design process itself is just as important as designing the artefact', and in the context of accessible products and inclusive design this is even more prevalent. As the design process is often visually driven: from early stage mind maps and mood boards to sketching, prototypes and information layouts, 'engaging and involving' (Sanders et al. 2010) visually impaired (VI) participants will involve considerable methodology planning and deliberation.

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Sanders et al. (2010) overviews various documented PD techniques and categorises them as:

- 2-D collages
- 2-D mappings
- 3-D mock-ups
- stories and story boarding
- diaries
- cards to organise, categorise and prioritise ideas
- game boards
- props
- participatory envisioning and enactment
- improvisation.

These techniques are playful in approach which encourages engagement in the process. They also have a non-direct element about them; the techniques focus on understanding tacit knowledge rather than the explicit knowledge gained from traditional methodologies (Sanders 2002). They differ from traditional UCD research methods such as focus groups, interviews and observation as the participant is much more integrated into the task. Rather than a question–response relationship, the participatory methods ask the participants to become creative in their own right.

There are some excellent open resources giving new researchers tips on how to effectively conduct focus groups and interviews with VI participants (Gerbe 2000; Henry 2003; Kroll et al. 2007). These sources give valuable information on a variety of issues a researcher may encounter when working with VI participants including: suggestions on room layout, communication, consent, location and preparation. However, there is little collated information available on how to approach more interactive participatory methods with VI participants.

This paper intends to overview some participatory techniques accessible to VI participants that have been utilised by the author in the hope that future researchers may find the information of value when planning their own studies.

2 The Study

The majority of the techniques described were employed throughout the author's PhD studies. The brief set was the research and development of a pedestrian handheld navigation device with tactile output. The device was not intended to be specifically a mobility aid for VI users but to be a mainstream navigation aid. VI people were asked to participate in the design process for their expert knowledge of the tactile sense and to ensure the final product would be accessible to VI users.

2.1 Recruitment

Participants were originally sourced through three organisations dedicated to aiding VI people: Cardiff Institute for the Blind (part of RNIB), Royal National College for the Blind and Action for Blind People: Technology Department (part of the RNIB). The participants who engaged most with the project were those sourced through Action for Blind People which highlighted the value of finding participants who have an interest in the product being produced. Their prior involvement with the Technology Department marked them out as actively interested in technology and genuine potential users; consequently, they invested more into the design of the product and so engaged more in the participatory process. It also meant that their knowledge of existing products and available technologies was far superior to other involved participants. The Action for Blind People focus group consisted of five members, three male and two female, aged from 27 to 35; the groups were video and audio recorded, the audio was transcribed and coded to uncover recurring themes and opinions and the video utilised to analyse physical movement (such as product exploration techniques).

3 Collages

As stated by Sanders (2010), 2-D collages can be utilised throughout a PD process to probe for existing knowledge, prime the participants in the area of interest, understand viewpoints and emotion or generate ideas. For the project in hand, 2-D collages were created in the form of moodboards to understand the aesthetic and ergonomic factors of existing products. These allowed the designer to have visual prompts when sketching to aid development of the design. It was essential that these moodboards be created by the participants rather than knowledge assumed by the researcher; however, without the ability to create physical moodboards the process was edited to be verbally accessible.

3.1 Collage Method

A group of four participants was gathered, the concept of moodboards was explained alongside the aim of the moodboard in hand, in this case ‘to document physical attributes of small electronic devices that either aid or hinder access for VI users’. Participants were then asked to ‘call out’ product features and how they help or hinder; an example response is ‘Virgin Media TV remote buttons, bad because they’re too shallow’. Responses are recorded and a physical representation is produced post-event to allow for easy presentation of information to designers.

3.2 Points of Interest

3.2.1 Engagement

The value of 2-D collages largely stems from the creativity element which engages the participants; conducted verbally, these methods could easily take place as a straight forward focus group discussion. However, asking the participants to call out their answers adds an element of chaos not regularly found in formal focus groups, which was deemed to be fun and engaging for the participants.

3.2.2 Dominating Participants

As with any group work scenario, full participation may be hindered by dominant individuals. It is the researcher's role to ensure this does not affect the output of the task. This is of particular relevance with VI participants as they cannot utilise the visual cues of somebody who may be waiting to say something. The challenge lies in controlling this whilst still allowing the chaotic element (as mentioned in Sect. 3.2.1) which helps engage participants. A suggestion to rectify this is that the researcher calls participants names at random and they must give an answer on the spot: this allows for the fast thinking, game-like approach to be continued but in a more controlled manner.

3.2.3 Reliance on Prior Knowledge

Whilst creating moodboards with sighted participants, no prior knowledge of the products need be available; the participant can simply be handed a magazine and asked to cut out inspiring pictures. As VI people must rely on their prior knowledge, to gather a broad range of answers the researcher must encourage broad thinking and out of context examples that may still be applicable.

3.2.4 Focus on Detail

As VI people explore detail before overall shape it might be small detailing that draws them to the object, rather than the overall shape or look. It may be simply 'the layout of the buttons' or the clarity of orientation and this must be represented properly in the final visual boards. The reverse is also true: that they enjoy the form of the product but are not able to access the function.

3.2.5 Visual Terminology

VI participants, regardless of their visual ability, regularly use visual terms, such as 'it looks beautiful' to describe objects. Care must be taken to fully understand what is meant when a VI participant describes something in a visual manner as fully sighted individuals may understand the statement differently.

4 Foam Models

Models and prototypes enable participants to discuss form and feature placement in a manner that may be difficult to do verbally. The challenge within PD is to make this accessible and fun to the participants. Keeping models low fidelity and 'sketch like' removes pressure to perfect the models and allows the participant to enjoy the task regardless of skill.

4.1 Foam Modelling Method

Many blank shapes were created in Styrofoam to express a selection of potential overall forms for the product (based upon previous discussion and tasks). The participants were then asked to explore the models and dictate to the researcher where they would envisage key features of the product; these features could then be drawn on creating a very low-fidelity model of the product. The participants were also able to feedback on the overall shape and grip and choose preferred forms which would aid the designer in concept selection and development.

4.2 Points of Interest

4.2.1 Opposite to Usual Product Exploration

As stated by Miao et al. (2009), VI people will first explore detail then build up a mental model of the product. In this task, the researcher is asking them to do the opposite and feel the overall shape before they develop detail. The participants seemingly enjoyed and engaged with this task as it allowed them to add something tangible to the design.

4.2.2 Fully Explain the Prototype Stage

If the prototype is at the initial stages of design this must be made clear to the participants to stop any frustration at lack of detail. Though this would also be true with sighted participants, it is heightened with VI participants as they may not be able to perceive the many visual cues that might give away the stage of development. At later stages in the process this becomes even more prevalent: as modelling materials may be both visually and tactilely very realistic, the participants must be verbally assured that they are allowed to be honest and changes are still possible based upon their feedback.

4.2.3 Model Strength

The models will be explored through touch and so should withstand vigorous tactile exploration. If the model is delicate, a VI participant will often have no warning of this until it is too late as the force of the tactile exploration itself may be enough to break it.

4.2.4 Material Selection

Material selection should be appropriate for the level of development the product has seen. Foam worked well as a material for feedback as whilst it kept the overall shape, which allowed participants to experiment with different grips and orientation easily, it is also editable by the participants on a surface through applying pressure with their fingers or with a pen.

4.2.5 Do Not Be Precious

Though many hours may have been spent shaping and moulding the models, participants with limited experience of model making (which VI people are likely to be) may not recognise this; the goal of the exercise is to allow the participants to both feedback on and edit the design and so they should be encouraged to do so as much as necessary to communicate their views.

4.2.6 Avoid Tactile Noise

Any tactile elements that are not in direct focus or consideration for the participant should be highlighted at the beginning of the task. As VI participants utilise minor details to build up their mental models, incorrect minor details even on low-fidelity models can be of high significance. This concept is also documented by Miao et al. (2009) when creating paper prototypes of computer interfaces for VI user trials.

5 Cards

Separating features, ideas, themes out onto cards allows participants to 'organise, categorise and prioritise' concepts (Sanders 2010). Cards are very easily presented in a verbal manner to a VI audience with a variety of applications.

5.1 Card Method

A simple successful method to utilise cards is to aid resolution for decisions that cause debate within focus groups. Features, functions and qualities are separated out to create 'cards'. The researcher presents two or more cards verbally to the participants and asks them to immediately and instinctively respond to which is more important. Examples include: 'Features or Price?' or 'Tactile output, visual output or audio output?'

5.2 Points of Interest

5.2.1 Visual Aids for the Researcher

Whilst the cards will be presented verbally for the VI participants, visual prompts aid the researcher in quickly presenting results and knowing what question will come next. For the project in question, the author simply used a word processor and read from the screen as a prompt for the verbal presentation and copied/cut and pasted the cards to display results; in hindsight, physical cards (of which photographs can be taken for examination post-task) might have been quicker and less obtrusive as the clattering of a keyboard and mouse can be distracting.

5.2.2 Present Limited Cards at Any One Time

With no visual cues, organisation of multiple cards is more difficult as it relies on memory or regular prompting by the researcher, which can be tedious for both parties. Present only limited cards for more clear and accurate responses from the participants. Plan the order in which the cards will be presented beforehand to ensure conclusions are reached in the most effective manner.

5.2.3 Do Not Rely on Memory

As previously stated, having the researcher verbally list the cards for each question becomes tedious for both the researcher and the participant. There is no way to tell without extended discussion whether the participant has remembered all the cards and so results will be less valid.

6 Existing Product Feedback

Existing products with similar features to the product being designed were utilised to gain feedback on aesthetic and ergonomic design. These products are not necessarily direct competitors, merely products with similar features to the product being designed.

6.1 Product Feedback Method

Relevant existing products were placed on the table in front of the participants who were asked to pick each one up and explore it. Participants were asked what features of the product they liked or disliked.

6.2 Points of Interest

6.2.1 Avoid the Props' Existing Use

It may take some time for VI participants to recognise the existing product or in some cases they may not recognise the product at all. Whilst it is interesting to see how someone who has no prior contextual knowledge interacts with an object, avoid the notion of 'testing' the participant as it can be frustrating and patronising. In the author's experience, the participants would first explore the product before asking the function, which allowed time for the initial exploratory acts to take place without any context.

6.2.2 True Feedback on Form

VI participants are in a good situation to give true feedback on ergonomics and form as they are not in a position to be influenced by graphical cues indicating orientation or use. To make the most of this, the researcher must take care not to influence the participant unintentionally; examples of this include: the researcher passing

the object to the participants indicating orientation and the researcher referring to buttons or grips by the finger for which they are intended ('the thumb button').

6.2.3 Focus on the Interaction

If recording the task, ensure that the camera is focussed on the product and the tactile interaction taking place rather than the participants face to ensure the exploration is fully documented.

7 Story Telling

Scenarios and storytelling can easily be conducted verbally; however, there are some significant differences between eliciting a verbal story and asking a participant to create a storyboard.

7.1 Points of Interest

7.1.1 Summary Versus Cumulative Viewpoints

When drawing a storyboard, the summary view allows for more information to be added at any stage. As a verbal story is cumulative it is difficult to add more information without breaking the flow of the story. For this reason, the researcher must be clear from the start if they aim to gather any specific information.

7.1.2 Visual Representation

From the researcher's experience, there was little benefit gained from visually representing the verbal stories (post-interview): any attempts made merely replicated the data in a form that was less comprehensible than the original.

8 Conclusion

Engagement and involvement are the two major challenges in a PD process (Sanders 2002). For researchers with little experience of working with people with physical impairments, these challenges are considerably more demanding. It is unlikely that VI participants will have experience of the design process and what it

entails; this in itself is engaging for the participants as many of the tasks will be new experiences.

In the experience of the author most participatory tasks can be fairly easily edited to allow for access. However, a prior understanding of the difficulties that may be encountered alongside an early identification of how the output will differ from the initial method is vital for successful research. Generalizable findings include a need for clarity and honesty, a focus on the tactile sense to help engage participants, and a necessary heavier reliance on prior knowledge. Also important to note is the value of finding participants who are invested and interested in the product development. Not only does this mean they are more likely to become engaged with the process but it also means their prior knowledge will be more applicable and relevant. The information presented is intended to be used alongside the existing sources (Gerbe 2000; Henry 2003; Kroll et al. 2007) which give advice on how to best plan and run more traditional UCD research methods.

The participatory process itself has been developed to help researchers gain empathy with users. As with the design of products it is expected that, as the researchers' empathy with the user group grows, they will be better able to successfully design techniques to enhance the product design process through better accessibility, engagement and involvement of VI participants.

References

Brandt E (2006) Designing exploratory design games: a framework for participation in participatory design? In: Proceedings of the 9th conference on participatory design: expanding boundaries in design, Trento, Italy

Gerbe E (2000) Conducting usability research with computer users who are blind or visually impaired. American foundation for the blind. www.afb.org/sectionaspx?SectionID=57&TopicID=167&DocumentID=1718. Accessed 1 July 2013

Henry S (2003) Just ask: integrating accessibility throughout design. http://uiaccess.com/accessucd/resources.html. Accessed 1 July 2013

Kroll T, Barbour R, Harris J (2007) Using focus groups in disability research. Qual Health Res 17(5):690–698

Miao M, Köhlmann W, Schiewe M, Weber G (2009) Tactile paper prototyping with blind subjects. In: Altinsoy ME, Jekosch U, Brewster S (eds) Haptic and audio interaction design. Springer, Berlin Heidelberg

Sanders EBN (2002) From user-centered to participatory design approaches. In: Frascara J (ed) Design and the social sciences: making connections, Taylor and Francis, London

Sanders EBN, Brandt E, Binder T (2010) A framework for organizing the tools and techniques of participatory design. In: Proceedings of the 11th biennial participatory design conference, Sydney, Australia