

INVOLVING DIVERSE USERS FOR INCLUSIVE TECHNOLOGY DEVELOPMENT

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ABSTRACT

This work discusses recommendations for including diverse users in universal and inclusive design of ICT and discusses some challenges and possibilities of remote user involvement. Related research recommends a user-centered design process, the involvement of individuals with a wide range of abilities and disabilities, and to have user participation in all development stages, such as needs assessment, co-creation sessions and trials. However, there is little guidance in the literature regarding tools and techniques for inclusive co-creation on equal means for all, especially when it comes to remote participation. The paper discusses various methods and techniques for inclusive design that can be performed remotely, including focus groups, workshops, personas, and scenarios. Our analysis suggests that, with the proper tools and techniques, performing such activities remotely can have other advantages than traditional approaches, such as reduced time and costs for both participants and researchers, as well as the potential for greater diversity since one can recruit from a greater geographic area. Finally, we present ongoing work to make use of remote feedback as a valuable tool for user involvement in inclusive design.

KEYWORDS

eAccessibility, universal design, inclusive design, diversity, disabilities, impairments

1. INTRODUCTION

The Norwegian government wants to put the user's needs in the center during the digitalization and development of public services (KMD, 2021). Their strategy underscores that, as the EU Web Accessibility Directive (EU-WAD, 26 October 2016) is going to be incorporated into Norwegian law, public entities are to follow the requirements for universal design of ICT solutions, and that this also applies to public procurement.

Besides the political regulations, research has found good reasons why users should be involved during the development of new technology. Simple conformance to accessibility guidelines is a common strategy on the road towards more accessible products and services. However, following accessibility guidelines do not necessarily uncover all barriers that people experience when using ICT solutions (Power *et al.*, 2012). Moreover, there is no clear relationship between the priority levels provided in the guidelines and how severe usability and accessibility problems were rated by accessibility experts and users with disabilities (Harrison and Petrie, 2007).

It is, however, not clear what user involvement implies in order to assure the inclusiveness of the final product or service. This work tries to answer some aspects related to this question, in particular in light of the need for remote participation, as we have seen since the beginning of the Covid-19 pandemic.

In the following, we review and discuss related research with the objective to compile some recommendations for the inclusive development of an accessible and usable user feedback channel for websites, as required by EU's WAD. The conclusion summarizes our discussions and gives a brief outlook of future work.

2. RELATED WORK

For a better overview, we have categorized related work according to six broader topics and dedicate each topic to a section of its own.

2.1. Human-centered design and continuous focus on diversity

Researchers and practitioners recommend any effort for the universal design of ICT to be based on a human-centred and participatory design process, involving a broad range of stakeholders throughout the design process, including people from vulnerable populations (Stephanidis *et al.*, 2019). The development should be iterative and include empirical evaluations with diverse users throughout the design process (Horton and Sloan, 2014).

Several standards include guidance on how users can be involved in design processes in order to implement accessible ICT systems. The international standard ISO/IEC 30071-1:2019 takes a holistic approach by combining guidance both at an organizational and a system development level (ISO/IEC, 2019). The standard also details how to conduct user testing with diverse users. The international standard ISO 9241-210:2019 provides general and broad guidance regarding human-centred design principles and activities throughout the life cycle of computer-based interactive systems (ISO 9241-210, 2010). Also, NS 11040:2013 is a Norwegian standard with recommendations for how to involve diverse users when developing ICT products and services (NS 11040, 2013).

In many current development projects, user involvement is not prioritized because of various constraints, such as lack of awareness, priority, time, and costs (Hussein *et al.*, 2019). Involving users with disabilities is often viewed to be extra challenging, for example due to a limited availability of users, and lack of training and costs (Power and Petrie, 2019). While the success of user involvement depends on how it is conducted and managed, researchers have found that user involvement can make an important and positive difference, particularly when it comes to ease of use for various user groups involved (Borch and Strandbakken, 2019; Fischer, Peine and Östlund, 2020).

2.2. Inclusive co-creation

Some authors make a distinction between traditional user-centered design (UCD) on the one side, and participatory design (PD) and co-creation on the other side, where UCD is about designing *for* the users while PD and co-creation is about designing *with* the users (Andrews, 2014). Universal design emphasises the latter, and depending on context and project phase, a variety of methods and techniques can be used. In this paper, a method is considered to be a class of specific operating procedures, while a technique refers to a single procedure or heuristic, that is, a specific implementation of a method.

There are a plethora of methods and techniques from UCD, PD, user experience and design thinking that could be relevant for inclusive co-creation. Examples include Paper Prototyping, Personas, Card sorting, Storytelling, Dot voting, Empathy map, Inspiration cards, etc. See e.g. (*How To & Tools*, 2020). However, it is often necessary to adapt or to develop new and more accessible techniques because current techniques are not accessible to a wide diversity of users. For example, many techniques depend upon participants being able to use and draw on visual materials (Andrews, 2014). Such techniques should therefore be adapted or changed to engage and include visually or motor impaired participants.

Including people with disabilities in research and development projects requires extra awareness of various needs such as digital accessibility, transportation, mobility, health, communication, conflicts of values, professionals' attitudes, and interpreting data from diverse populations (Wattenberg, 2005). In the following we discuss the inclusivity of a few common methods for remote user involvement.

2.3. Online focus groups

Online focus groups have been used to study consumer attitudes since the early 1990s (Reisner *et al.*, 2018). In the early days, they were conducted mainly through text-based chat. An important advantage of online focus groups is that traveling and getting to a suitable and accessible physical setting are not necessary. This can reduce complexity, costs and time for both research participants and researchers. Also, conducting focus groups online allows for participants from a greater geographic area, making it easier to reach participants from small subgroups of the population, and provide potential for greater diversity among participants.

A disadvantage of online settings is the limited possibility to pick up nonverbal signals. This may lead participants to misunderstand one another or researchers to miss nuances conveyed through body language. The more impersonal nature of online environments may also negatively affect the group dynamic and engagement among the participants (Reisner *et al.*, 2018).

Although online and in-person focus groups may differ, research has found that the content generated by the two forms is notably similar (Woodyatt, Finneran and Stephenson, 2016). Reisner *et al.* (2018) provides recommendations to counteract potentially negative aspects of online focus groups. While the recommendations are mainly related to text-based focus groups, they may be worth considering for video-based arrangements as well. To facilitate group cohesion, it is recommended to encourage participants to interact and share information about themselves in the beginning. They also found that encouraging storytelling among the participants can further promote rich data sharing.

2.4. Co-creation workshops

Various types of workshops are common in co-creation (Akoglu and Dankl, 2019). Usually co-creators are gathered in one physical room, giving the participants the possibility of getting to know each other and to participate in exercises and discussions to explore a subject or a design. Common aspects of methods are roleplay, prototyping and sharing of ideas to foster joint solutions based on empathy and mutual learning.

Various digital design tools for co-creation are also emerging, see e.g. Miro.com, Mural.com and Hoylu.com. However, such tools may also have challenges when it comes to accessibility for various user groups. While there are guidelines and standards for accessible meetings and conferences, there is little knowledge on accessible digital tools for inclusive co-creation.

2.5. Co-creation of personas and scenarios

Fuglerud *et al.* (2020) review both benefits and critiques of personas, which is a method to develop fictional characters that can be used in design. Some of the claimed benefits of personas are that they can prevent designers from referring to themselves as users, support empathy with users, help designers understand users and aid designers in prioritizing product requirements. It is recommended that personas be generated from aggregated user research, combining input from many users into a narrative form, but the creation process may vary from project to project.

A common critique of personas is the danger of creating stereotypical pictures of users which again can create an illusion of understanding them. Personas has also been criticized for lack of representativity (Fuglerud *et al.*, 2020). However, striving for representativity may lead to personas that are unlikely and not coherent, with the consequence that the method may lose some of its potentially strongest properties, such as its ability to create a deeper understanding, empathy and focus.

Fuglerud *et al.* (2020) assert that co-creation personas together with people with disabilities will reduce the risk of stereotyping while generating rich data about user needs. They used co-creation of personas for the development of a novel digital health tool. Along with the persona description, a persona scenario was created, consisting of a narrative of events in the life of the persona together with contextual information explaining the needs of the persona in relation to the aforementioned health tool. This provided valuable insight about the lived experiences of people with particular disabilities and health conditions. The participants found the method to be engaging, and the persona approach made it possible to talk about events and experiences without disclosing one's or others' personal information. It was hence easier to discuss potentially difficult and vulnerable issues (Fuglerud *et al.*, 2020).

2.6. Remote usability evaluation

Recent work has investigated the use of video conferencing systems in remote evaluations of usability and accessibility of web applications (Simon-Liedtke *et al.*, 2021). Because of the Covid-19 pandemic, many people with and without impairments who had previously not used video conferences, have gained experience with these collaboration tools. In addition, manufacturers of such systems claim to have added accessibility features to open up new opportunities for remote evaluations and participation. The researchers developed a protocol for online user evaluation with diverse users and piloted this protocol with a few users, including an individual with visual impairment, using a screen reader. The protocol included an option for synchronous and asynchronous evaluation. In the synchronous version the user and the researcher were separated by space alone and used an online video conference system. In the asynchronous version, the user was provided with instructions about how to conduct the evaluation and how to report the results. Here, the user could then perform the evaluation on their own, while the use of a video conferencing system made it possible to follow facial expressions and non-verbal cues and also opened up for screen sharing. The researchers found no clear favorite method or system, which highlights the need to be flexible in order to accommodate diverse users. The researchers conclude that conducting remote evaluations of the usability and accessibility of web applications can be feasible for participants with different impairments including people using assistive devices such as screen readers, provided that the tools and materials used are accessible and known to the users in question (Simon-Liedtke *et al.*, 2021).

3. CONCLUSION

In this work, we have reviewed and discussed related work for universal and inclusive design of ICT in remote settings. We found little guidance on tools and techniques for digital inclusive co-creation. The general recommendation, however, is to involve diverse users – individuals with a wide range of abilities and disabilities – throughout the entire user-centered design process. This implies that user involvement should start as early as possible and be a part not only during the assessment of expectations, needs, and other requirements, but also in trials and evaluations, and during development iterations with co-creation. User involvement can for instance be implemented as online focus groups and workshops, persona- and scenario-creating sessions, and combinations thereof. Special attention should be given to accessible tools and techniques, both of which should support the needs of each participant and enable their full participation equally to others.

In our current research project, we plan to employ a combination of digital questionnaires, interviews, focus groups and co-creation workshops for the development of a user feedback channel for websites. We have an ongoing collaboration with a wide variety of interest- and user organisations, which facilitates user involvement. Because of the Covid-19 pandemic, most of these activities must be performed remotely through video conferencing tools. We have found that some of the aforementioned techniques can be performed remotely with the aid of common video conferencing tools with results similar to approaches with face-to-face activities. A user feedback mechanism can in itself be a valuable add-on to any technology development project to make it easy for users to voice their opinion on the design. In our research project, we will explore further how to make digital co-creation both inclusive and effective. In particular, we will explore the use of an accessible feedback channel as a tool for inclusive co-creation in an agile development process.

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