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The development of accessibility feedback mechanisms: Related research

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Summary

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List of Contents

1 Introduction

This document gives an overview of related work and research for the TiTi project[1], which is a project about accessible feedback mechanisms. The project has been supported by the Norwegian Labour and Welfare Administration (NAV).

In this document we give an overall introduction to the research theme and present findings from related work in the research literature.

Background

In January 2019, the Norwegian Government presented the national strategy for digitalisation of the public sector[2]. The ambition is for Norway to be at the forefront of development in the digital public sector. Communication with citizens should normally take place through digital, web-based services. The overall goal is that citizens shall receive services that are perceived as coherent, simple, efficient, and reliable to us.

The Norwegian Government wants public entities to put the user's needs at the centre[3]. Users can be residents, self-employed, own employees, voluntary organizations, and other public and private enterprises, etc. Users should also receive help and guidance in using the digital services. This guide can, for example, take place online via digital dialogue or direct contact. Furthermore, user-oriented information and communication should be provided in clear and good language.

Further, the Norwegian Government underscores that public enterprises must follow requirements for universal design of ICT solutions, and that this must also be followed in public procurement. Because the EU Web Accessibility Directive (EU-WAD, 26 October 2016) will be incorporated into Norwegian law, public entities should follow requirements that follow from this directive. The EU Web Accessibility Directive (WAD) requires, among other things, a feedback mechanism, so users can report accessibility problems or request information published in a non-accessible way to be made accessible to them, in an alternative and accessible format. The service provider should respond to the request in an adequate and appropriate manner within a reasonable period of time.

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1 Titi is short for "Tilgjengelige tilbakemeldinger", i.e. "Accessible feedback" in English.

2 Én digital offentlig sektor. Digitaliseringsstrategi for offentlig sektor 2019–2025.
https://www.regjeringen.no/no/dokumenter/en-digital-offentlig-sektor/id2653874/

3 Digitaliseringsrundskrivet. 5 jan. 2021.
https://www.regjeringen.no/no/dokumenter/digitaliseringsrundskrivet/id2826781/

Related work

1.1 The importance of user feedback to achieve usable and accessible solutions

The Web Content Accessibility Guidelines (WCAG) were developed to make web content more accessible to people with disabilities. These guidelines are widely accepted and referred to in international and national legislation, such as the Directive (EU) 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies (Web Accessibility Directive) (EU-WAD, 26 October 2016) and the Norwegian Equality and Anti-Discrimination Act (EAD, 2018).

While conformance to guidelines is an important first step towards creating solutions that are more usable and accessible for people with and without impairments (Schmutz, Sonderegger and Sauer, 2018), this strategy does not guarantee universal design (Fuglerud, 2014; Horton and Sloan, 2014). For example, researchers did not find any significant relationship between severity ratings of usability and accessibility problems given by users with disabilities or accessibility experts, and the priority levels provided by guidelines (Harrison and Petrie, 2007; Petrie and Kheir, 2007).

Other studies have shown that common accessibility testing methods, such as using checklists and automatic testing tools, do not necessarily uncover all barriers that people experience when using ICT solutions (Power et al., 2012). In particular, such tools may not uncover barriers related to cognitive accessibility, such as higher-level logic and understanding (Halbach and Lyszkiewicz, 2015; Bai et al., 2018). Moreover, to be universally designed, the ICT solution must also, according to the WCAG guidelines[4], be compatible with assistive technology (AT) that the user is dependent upon. This requirement does not only mean technical or theoretical accessibility, but that the ICT solution is usable (i.e. perceivable, operable and understandable) with the different ATs that people are actually using. Many types of barriers are related to contextual and situational factors. Complementary approaches to gather users feedback, and to gain contextual and experiential information is therefore necessary in the work towards universal design (Coughlan, Ullmann and Lister, 2017). These are some of the reasons why accessibility should be an ongoing process.

1.2 The need for user-centred design and focus on universal design throughout the product life cycle

The described challenges show that the use of accessibility guidelines, checklists and automatic accessibility testing tools, are by no means enough to achieve universal design. Therefore researchers and practitioners agree that universal design should 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 (Dietrich et al., 2017; Stephanidis et al., 2019). To achieve universal design cross-disciplinarity and participation from user organizations and users in the planning, implementation and evaluation of products and services are recommended (Aslaksen et al., 1997). The process should be iterative, and include empirical evaluations with diverse users throughout the design process (Røssvoll and Fuglerud, 2013; Horton and Sloan, 2014; Harder and Begnum, 2016).

A survey found that 67% of user experience professionals prefer face-to-face meetings with users, and that 73% did not perform remote usability testing (Yavuz et al., 2020). However, user involvement is often not prioritized in practice because of various constraints, such as lack

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4 Guideline no. 4.1 in WCAG 2.0)

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of awareness, priority, time and costs (Hussein *et al.*, 2019). Involving users with disabilities may be even more challenging, for example due to limited access to users, lack of training and costs (Fuglerud, 2014; Power and Petrie, 2019; Inal *et al.*, 2020). The COVID-19 pandemic has made it challenging to conduct face-to-face meetings with users. For example, one study examining the effects of COVID-19 on people with visual impairment reported that nearly 37% out of 937 respondents had underlying health problems which made them vulnerable to COVID-19 (Rickly *et al.*, 2020). Involving people with disabilities in face-to-face design activities can therefore be difficult and sometimes impossible.

Providing an interactive, accessible, and easy-to-use feedback mechanism could motivate users to give feedback and enable solution providers to manage such feedback in a useful way. This can be a valuable supplement to face-to-face user involvement, or a feasible way to get user feedback when face-to-face involvement is not possible. It can also support frequent and continuous user feedback.

1.3   Current feedback channels

Digital feedback systems are channels where users can notify product and service providers and other users about bugs, satisfaction, and desired features. There are various possibilities for giving feedback through digital channels. For example, users can give feedback by sending an email to the product or service provider. They can also post reviews or comments in social media, in blogs, or the user may use contact or feedback forms or chat appearing at the provider's web pages or within the applications.

Feedback can come in various forms, such as ratings or comments, on standardised forms or as free text. One may use text, images, videos, sound clips, and links (Lysbakken, 2017). When users accept that the service provider collects usage data, this can also be considered to be a form of feedback (Groen and Ochs, 2019). However, this type of data lacks the rich detail of use context and explanations about the reasons for use or non-usage (Coughlan, Ullmann and Lister, 2017).

A review looked at feedback mechanisms from the perspective as a management control system (Steur and Seiter, 2020). They studied the design of feedback mechanisms of 102 popular digital platforms and noted that different design approaches affect the users willingness to provide feedback in different ways. The trade-off between detailed information and simplicity was found to be an essential factor in the design of the feedback mechanism. On the one hand service providers want details about the user and the context for the feedback. On the other hand users may not be interested in the additional work involved in providing extra details. Users are unlikely to want to repeat detailed information that they have already reported elsewhere (Coughlan, Ullmann and Lister, 2017). However, keeping user profiles and personal data is subject to privacy legislation, which is discussed below. See a more detailed overview of current feedback mechanisms in (Velazquez and Snaprud, 2021).

1.4   Accessibility feedback

The research literature on the design of accessibility feedback mechanisms is scarce. Alarcon et al. (2018) outline an implementation of a feedback mechanism to support WAD. Their suggested solution, called Public Barrier Tracker (PBT), provides a mechanism for gathering user feedback about web accessibility directly on a website. They also give an overview of some existing approaches for gathering user feedback on accessibility barriers and discuss how the PBT, in addition to functioning as an effective mechanism for users to give feedback on a

particular issue, also can be used as a tool for gathering data to support effective implementation of the WAD at large.

Two digital feedback channels, namely e-mails in applications and App Store reviews for reporting accessibility problems were studied in a master thesis (Lysbakken, 2017). The accessibility of a sample of popular Norwegian Apps was evaluated. Various user feedback about accessibility problems for visually impaired users was sent to 50 different apps, 25 via email and 25 via app store reviews. Only one of the problems was fixed when retesting after 30 days, although 44% of the applications had been updated during this period. Only 16 percent of the emails got an answer, and it was difficult to determine whether the responses were computer-generated or written by a human. It seemed that the developers neither prioritized responding to the accessibility feedback nor correcting the reported issues. The author concluded that sending accessibility feedback through emails or App Store reviews may have minimal effect on improving accessibility of mobile applications.

Another part of the study was to investigate what habits, preferences and experiences people with visual impairment have when it comes to sending digital feedback to application providers (Lysbakken, 2017). The participants' experiences with reporting accessibility issues varied. Usually, they got some form of response to their feedback, but most often this was only to tell them that their feedback was received. They had, however, also experienced that problems were fixed after sending their feedback. The participants had experienced challenges with employing various feedback channels, and they only used text-based feedback. Visually impaired users may feel uncomfortable sending screenshots or videos because they cannot control the content. They felt that advantages of sharing feedback publicly, e.g., on Facebook, were that others also became aware of the issue and that they could then form a pressure group.

1.5   Analysis of feedback

There is a growing recognition that user feedback contains information that reflects the needs and requirements of the end users. App Store, Google Play, and other review platforms offer mechanisms for gathering opinions from large crowds, which can be used as an aid to prioritize issues during development. These platforms often contain a form of rating of the application in question (e.g. number of stars) and a short comment. A majority of feedback in such platforms are provided shortly after a new release (Pagano and Maalej, 2013). Research suggests that user reviews of apps, such as user ratings and comments, have a major impact on a mobile app's success (McIlroy et al., 2017). User reviews affect other users' choice of apps, and there is a strong correlation between app ratings and the total number of app downloads.

Feedback from users can help capture crucial issues, and it can complement other methods of gathering user needs (Alarcon et al., 2018). However, when the amount of feedback is large, the unstructured nature and varying form and quality of the feedback can make it very challenging to identify patterns and useful feedback. For many websites and applications, the amount of feedback may be too large to be processed manually. Therefore, automatic user feedback analysis has recently gained a lot of research focus (Bano, 2014; McIlroy et al., 2017; Bukhsh, Arachchige and Malik, 2018). This includes data mining, parsing, rule-based classification, natural language processing (NLP), machine learning and sentiment analysis. AlOmar et al (2021) trained a binary classifier to identify whether a review is accessibility-related or not.

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One study investigated how developers respond to reviews and the value of responding (McIlroy et al., 2017). In this study a crawler to extract information such as app names, user ratings, and review comments was developed. The data was analysed manually and automatically. The results show that few developers respond to reviews, but when they do respond the responses often lead to improved user ratings.38.7 percent of the users increased their rating after a response, and the median increase was one star (20 percent).

Coughlan et al. (2017) analysed over 6,000 feedback comments from disabled students using an online distance learning tool. They combined automated and manual analysis. By comparing feedback from respondents with a disability with comments from all respondents they identified keywords that had a much higher frequency in the feedback of people with disabilities. Further, they used thematic analysis to explore the semantic usage of the keywords and the themes within five different categories. They found that open comment feedback can complement other practices in providing rich data from a user perspective. Procedural themes were examples of areas where feedback can lead to insight for the improvement of accessibility. Another finding was that explanatory descriptions of personal circumstances could be helpful to understand the issue at hand, and that the use of profile data also could help contextualise the issue.

1.6 User feedback and privacy

User feedback may contain personal data. Groen and Ochs (2019) found that the likelihood of finding usernames, email addresses as well as Twitter handles in textural user feedback is very high. Personal data are typically found in both structured and unstructured form. The structured part can for example include a username in a format allowed by the platform. User data in unstructured form can often be found in the title or the body of the user feedback. According to GDPR, an organisation processing personal data must inform the data subject about the use of personal data and about their rights. Some users have low privacy awareness and may not know what is meant with "personal information". Therefore, in the information one should include examples of what is meant. It is essential that the information is easy to read and understand. If measures are taken to analyse the data, one may be exempt from the GDPR (2019). However, this is only permissible if the data is anonymized immediately and sustainably so that it cannot be traced back to a natural person (Groen and Ochs, 2019).

Some users may want to be anonymous when reporting accessibility issues, for example because they do not want to reveal that they have a disability (Lysbakken, 2017; Alarcon et al., 2018). Another issue is that the user may not have access to a digital ID or necessary information (e.g., codes or passwords) at the time of wanting to give the feedback.

If the user wants to be informed when the reported issue is resolved, the service provider probably needs to store their contact information and the GDPR applies. However there are some alternatives, such as giving the user a token (e.g. a case number) in which the user can use to check the status of the reported issue (Velazquez and Snaprud, 2021). See also discussion in Alarcon et al. (2018). In this way the users can keep their privacy, but to a larger cost; the person in question must keep the token and remember to check the status instead of being notified when something has happened.

Privacy may be an argument for dividing the feedback mechanism into several choices. For example, the Norwegian Labour and Welfare Administration has divided their feedback mechanism into four choices (per March 2021); a) Complaint or appeal a decision, b) Complaints about a service, c) Errors and wrong or missing information, d) Praise.

1.7   Methods for user involvement and inclusive co-creation

User involvement is essential in universal design, and depending on context and project phase, a variety of methods and techniques can be used. We consider a method to be a class of specific operating procedures, while a technique refers more to a single procedure or heuristic, that is, a specific implementation of a method. Many methods from user-centred design, human-computer interaction, user experience and design thinking are relevant. However, in many cases, it is necessary to develop new and more accessible techniques, because current techniques are not accessible to diverse users. For example, many techniques often depend upon participants being able to use visual materials, such as yellow stickers or white boards. It is also advisable to combine different methods and techniques to involve and get input from individuals with diverse abilities, age, gender, culture, etc. Including people with disabilities in research projects requires researchers to be extra aware of and cater for various needs such as digital accessibility, transportation, mobility, health, communication, conflicts of values, professionals' attitudes, and interpreting data from diverse populations (Wattenberg, 2005).

Several standards include guidance on how users can be involved in design processes 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). NS 11040:2013 is a Norwegian standard with recommendations for how to involve users when planning services and products (NS 11040, 2013).

1.7.1   Online focus groups

Online focus groups have been used to study consumer attitudes since the early 1990s (Reisner *et al.*, 2018). In early days, these were mainly through text-based chat functionality. Benefits of online focus groups include independence with regard to finding, paying and traveling to a suitable physical setting, as well as saving time and money for both research participants and researchers. Also, conducting focus groups online allows for participants from a greater geographic area, making it easier to reach smaller subgroups of the population, and thus providing potential for greater diversity among participants (ibid.).

A reported disadvantage of online focus groups is that the online setting can limit the possibility to pick up nonverbal signals (Reisner *et al.*, 2018). 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 (ibid.). However, although online and in-person focus groups may differ, research has found that the content generated by the two forms of focus groups is notably similar (Woodyatt, Finneran and Stephenson, 2016).

Previously mentioned work also provides recommendations to counteract potentially negative aspects of online focus groups (Reisner *et al.*, 2018). While the recommendations are mainly related to text-based focus groups, they may be worth considering for video-based focus groups as well. To facilitate group cohesion, they recommend encouraging participants to interact and share information about themselves in the beginning. They also found that encouraging storytelling among the participants could further promote rich data sharing (ibid.)

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1.7.2 Co-creation of personas and scenarios

Personas can be used as a supplement to other user-centred methods. Some of the claimed benefits of personas are that they can prevent designers from referring to themselves as users, and they can support empathy with users and help designers understand users and their needs and thus be used as an aid 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 varies from project to project. Some common critiques of personas are the danger of creating stereotypical pictures of users, which again can create an illusion of understanding them. The method is also criticized for lack of representativity. Fuglerud et al. (2020) have asserted that striving for representativity may lead to personas that are not coherent and believable, and thus may lose some of its potentially strongest properties, such as its ability to create a deeper understanding, empathy and focus. Fuglerud et al. (2020) suggest instead to co-create personas together with people with disabilities to reduce the risk of stereotyping, and as a way to generate rich data. Along with the persona description, they also co-created a persona scenario. The persona scenario was a narrative description of events in the life of the persona together with contextual information that would help explain the needs of the personas in relation to a new digital (health) tool. They found that this method provided insight about the lived experiences of people with particular disabilities and health conditions, in the given context and over time. Participants found the method to be engaging, and that the persona approach made it possible to talk about events and experiences without disclosing one's or others' personal information. This made it easier to discuss potentially difficult and vulnerable issues (Ibid.). The use of storytelling to encourage rich data sharing was also recommended by Reisner et al. (2018).

1.7.3 User evaluation of prototypes using video-conferencing systems

Simon-Liedtke et al. (2021) investigated the use of video conferencing systems in remote evaluation of usability and accessibility of web applications. Because of the Covid-19 pandemic, many people, including people with impairments, that had previously not used video conferences have gained experience with these collaboration tools. This and the fact that manufacturers of video conferencing systems claim to have accessibility features could open up new opportunities for remote accessibility evaluations. The researchers developed a protocol for online user evaluation with diverse users and piloted this protocol with a few potential users, including one person 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, i.e. the user evaluation was performed through a video-conferencing system. In the asynchronous version, the user was provided with instructions about how to conduct the evaluation and how to report the results. The user could then perform the evaluation on their own. The use of video-conferencing systems made it possible to follow facial expressions and non-verbal cues and also opened up for screen sharing. Participants preferred different evaluation types in terms of synchronous or asynchronous evaluation, and different video conferencing systems. This highlights the need for being flexible in order to accommodate diverse users. Although noting that the participants in the pilot study were quite skilled ICT users, the researchers conclude that conducting remote evaluation of usability and accessibility of web applications can be feasible for participants with different impairments including people with assistive devices such as screen readers (Simon-Liedtke et al., 2021).

1.7.4 Co-creation workshops

User involvement and co-creation is recommended in user-centred, participatory, and inclusive design approaches (Eikhaug et al., 2010; Fuglerud, 2014; Begnum, 2019). Workshops

are widely used for co-creation. 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. According to a study from 2019, one prominent theme in the co-creation literature concentrates around the composition of methods used in co-creation workshops, while another theme is more concerned with the context and perspectives of participants (Akoglu and Dankl, 2019). Common aspects of methods in co-creation workshops are roleplay, prototyping and sharing of ideas to foster joint solutions based on empathy and mutual learning (Ibid.).

Service design is increasingly popular, and public bodies in Norway are advised to use service design and other methods of user involvement and user testing to ensure that services meet the needs of the users (KMD, 2021). Different types of tools and techniques are used, from whiteboards, sticky notes, to various digital tools. However, many of the tools offered within service design are not accessible to all user groups as, often, they are very visual. Co-creation in groups can also be challenging for people with hearing loss, social or cognitive challenges. While there are guidelines and standards for accessible meetings and conferences, there is little guidance on tools and techniques for co-creation that are universally designed, enabling equal participation for all, and even less so in digital environments. There is also little awareness about universal design among service design practitioners (Lintho Bue and Begnum, 2018). There is therefore the need to consider how to adapt tools and techniques to make them more inclusive and accessible for diverse users, including users with disabilities. This is necessary to enable people with disabilities to be included and their voices to be heard in the design processes.

Conclusion

Mechanisms allowing users to provide feedback about accessibility issues is required by accessibility legislation (WAD) and can be a valuable way to capture user needs and requirements. While gathering and analysing user feedback has gotten increased attention, particularly the automatic analysis of large amounts of user feedback, the research literature on how to design an accessibility feedback mechanism is scarce. Such a mechanism must, of course, be accessible in itself. In the further work we will investigate design alternatives for an accessible feedback mechanism. We will examine the balance between ease, simplicity and convenience for the user and benefit for the service owner.

Following recommendations of universal and inclusive design, the development of such a mechanism should be based on an iterative and user-centred design process, involving diverse people, including people with disabilities throughout the whole process. In Titi we plan to use a combination of accessible digital questionnaires, interviews, focus groups and co-creation workshops. Because of the COVID-19 pandemic, most of these activities must be performed remotely through digital tools, such as video conferencing tools. Through the literature review we found that common user-centred methods, such as interviews, focus groups and user-evaluation of prototypes can be performed remotely with the aid of common video conferencing tools, with similar results as when conducting these activities face-to-face. There is little guidance on how to make digital co-creation workshops inclusive and effective. This will be explored further in the Titi project.

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2 Acknowledgment

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