

Achieving Accessible Websites - A study of Design and Development Processes in NRK

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Abstract

Web accessibility plays an important part in improving the quality of web and the quality of life for people in their everyday life. However, despite significant effort recent years, inaccessible web sites is still a major problem. Developing an accessible website has proven challenging and several studies have indicated that having access to developer guidelines is not sufficient. This paper presents results from a study of the front-end website development process of the Norwegian Broadcasting Company (NRK), including the developers and designers involved. The results indicate that there are several factors that may influence whether a development team achieves accessibility. In addition, this study provides recommendations and strategies for developing accessible websites.

1 Introduction

Web accessibility involves the process of designing and developing websites that can be used by everyone, regardless of their disabilities, in different situations with mainstream or assistive technologies [1]. In addition, accessible web is considered a human right, and currently many countries have introduced legislative requirements for organisations and businesses to assure accessibility of their websites [2]. Despite the importance, legislative requirements, and various advantages of accessible web, several studies indicate that a large portion of websites around the world are inaccessible to certain user groups [3].

Similarly, the online public media is booming due to features like instant sharing and access of information by a large number of people in a short period of time. For every end-user to participate, which is a requirement for both freedom of expression and to ensure a democracy, the public media are required to be accessible to everyone. The current study is a follow-up study of previous work on universal design issues in NRK [2, 3], where a multi-method approach was used, evaluating a few selected webpages owned by Norwegian Broadcasting Corporation (NRK). Previous studies concluded that the selected pages had not fulfilled a majority of the success criteria of WCAG 2.0 [4], which caused the website to be inaccessible to many users. Examples of accessibility

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issues were missing keyboard navigation support for menu items and videos, in addition to several problems related to use of screen readers.

NRK is the second largest media house in Norway, and publishes daily 250 online articles at www.nrk.no written by around 400 journalists [5]. It is a state-owned media house which shall be free of politics and accessible to everyone. As the study of Sanderson et al. [3] indicated, several issues related to accessibility have been present in NRK's web site. To improve this situation, it is essential to understand what has caused this inaccessibility, and to mitigate these factors to increase the accessibility.

To identify the factors causing the accessibility issues, the research presented in this paper aims to study the process and people involved in the design and development process in the front-end construction of www.nrk.no. Furthermore, with a thorough study of previous research, practical and reasonable solutions for creating accessible websites will be recommended. Thus, the following two research questions were the starting point of this study:

1. What are the main factors causing the inaccessibility of NRK's website?
2. What strategies should be applied by NRK in order to ensure accessibility of their website in the future?

2 Related Work

Tim Berners-Lee has stated that the web only meets its goal and power when it is accessible to everyone despite their limitations or disabilities [6]. Web accessibility is one of the major aspects of universal design, and one of the core principles in *United Nation Convention on the Right of Persons with Disabilities* [7]. The six major aspects in accessibility, according to Petrie et al. [1] are (a) people, (b) especially disabled and old users, (c) design and development, (d) can be access, use, interact, navigate, understand, and perceive, (e) in specific context, and (f) with using mainstream or assistive technologies.

Several factors have resulted in the growing need for the awareness and understanding of accessibility. Factors like the increase in the use of portable and easily available devices; easier to reach the world wide web audience instantly; the use of online systems by elderly users to live their life independently, have made it crucial for the site owners to assure accessible websites [3]. In addition, people with disabilities represent around 15% of the world total population [8]. Besides, accessibility ensures and respects the human rights of disabled people (United Nations, 2007); accessible systems are required by national and international laws [9]; and accessible systems are expected to increase the number of customers and furthermore the revenue [10].

However, despite the growing importance and multiple advantages of having accessible websites, several accessibility studies have shown that many organisational and governmental websites does not fulfil the basic criteria of web accessibility [11, 3]. Enhancing the accessibility level is not a trivial task, and one should adopt multiple strategies to adhere it [12].

Several studies have investigated what factors that hinders the process of designing and developing accessible web systems [13, 12, 14, 15, 9, 16], and the identified influencing factors are lack of

- publicity and awareness,
- accessibility compliance from the government,

- managerial interest in implementing accessibility,
- prioritisation of accessibility,
- integration of accessibility from the beginning phase,
- understanding of accessibility guidelines and its implementation in the real scenario,
- knowledge of the responsibilities in the organisation,
- in-house accessibility experts,
- routines for accessibility testing (automated testing, manual testing, and user testing), and
- budget and time allocation for the development of an accessible website.

Determining whether one or several of these factors are present in an organisation is of significant importance to the process of ensuring accessibility.

3 Method

The objective of this research is to understand the front-end development process of NRK and understanding accessibility among the team members. According to Lazar et al. [17], qualitative research emphasises on understanding the problems rather than producing numerical results or measuring, which is the motivation in this study. Thus, two different data collection approaches within the qualitative research methodology were selected and carried out. Firstly, open structure interviews were conducted with the objective of getting an in-depth understanding of the development process and the strategies of accessibility adopted by NRK into the process.

Secondly, based on the result from the interviews, a survey questionnaire was designed and conducted. The objective of conducting the survey was to reach and gather responses from the large number of developers and designers from the front-end section of nrk.no. The questions in the questionnaire were mainly focused on the issues identified from the semi-structure interviews. More specifically, the questionnaire focused on the strategies adopted by NRK for developing accessible website, the understanding of accessibility and its attributes among the respondents.

In total, two participants were interviewed using semi-structured interviews, each from design and development of the front-end section. Similarly, in the follow-up survey, eight respondents (Four designers, three developers, and one product owner) with different responsibilities responded to a given questionnaire. The participants were informed about ethical considerations during the data collection. They were informed about the objectives of this study, and were requested to sign the consent form after reading it, and could choose to leave the interview at any time.

4 Findings

In this section, the hindering factors in the design and development process in NRK that were discovered through this research are presented. These have been determined through comparing the findings from the data collection procedures with existing knowledge from the accessibility literature.

Lack of Prioritisation of Accessibility in the Development Process

The findings indicate that NRK is not giving sufficient priority to achieving accessibility in the development process. Having a focus on accessibility in the general company policy most likely will increase the probability of achieving the goals of universal design.

As an example of low priority, one of the developers responded that accessibility testing has not been part of the system policy, neither systematically or in practice. The same respondent added that they sometimes do the testing of a web page with the Apple iOS Accessibility Features available on the iPhone, however highlighted that this process is not part of a regular testing routine.

Moreover, through the online surveys, the respondents enhanced that accessibility has not been part of the development process yet. The respondents admitted that they are not assigned any responsibilities associated with the accessibility development and recommends giving priority to accessibility becoming part of the process.

Inadequate Understanding or Knowledge of Accessibility

Further, it was found that the developers and designers lacked adequate knowledge regarding accessibility and its attributes. Firstly, few respondents have shown a thorough understanding of the importance of accessible web and how it affects people's lives. However, in overall, analysing the majority of the responses, there is a need for broadening the knowledge of the participants as accessibility is far more than disabled people and making contents on the web easy to access.

Secondly, the inability and inconsistency of the participants in answering guidelines they have been exposed to or have knowledge of, also show that the participants do not have adequate knowledge regarding accessibility and its attributes. Lastly, in the surveys, none of the participants pointed out that they have expertise within the field of accessibility.

Insufficient Understanding or Knowledge of Accessibility Guidelines

In the semi-structured interviews, the designer failed to mention any specific accessibility guidelines, while the developer mentioned that he knows about WCAG 2.0. However, the developer admitted that he had not studied the guidelines in detail. Similarly, in the questionnaire, only half of the respondents mentioned that they knew WCAG 2.0 or have any particular knowledge about the content. The extent to how much the participants are exposed to the contents of the accessibility guidelines is not clear, but the responses they have provided in this matter show that the participants and respondents need more in-depth details of the accessibility guidelines for it to be useful in the design and development process.

No Accessibility Guidelines Followed

According to the respondents, the design team in NRK is developing their own guidelines which includes the constraints for designing the components of the website. The constraints in the guidelines include the size of the different type of buttons, the colour of the buttons, font type, font size, and the layout of the page etc. Furthermore, the participants and respondents provided colour inconsistent answers when they were asked about the accessibility guidelines.

Lack of Training

Only the developer from the semi-structured interview mentioned that there had been any training or workshop regarding accessibility in NRK. The developer also added that only a few team members from the front-end got to participate in the workshop. Similarly, in the questionnaire, six out of eight said that they had participated in accessibility testing. However, they got to participate in accessibility training either in their education period or during other projects which were not related to NRK. This generalises that the accessibility training has not been as often as needed to the developers and designers as required.

Lack of User Testing

The participants mentioned that there has not been a sufficient focus on regular user testing with real users. They informed that the user involvement takes place when there are major changes in the webpage of NRK. Furthermore, they mentioned that they have only done such kind of testing once.

Similarly, different respondents provided different responses in the questionnaire. One said that the real users are part of the feedback and testing process. Three other respondents mentioned that there were 4-5 real users, which tested the old design of the website. Another respondent mentioned that NRK involves users as early as possible when making any big changes. A few other participants responded that they had no idea as they had not worked long in NRK. These different findings indicate that there probably has not sufficient user involvement compared to general recommendations to achieve a user-friendly and accessible system in the end.

Lack of Accessibility Testing

The developer in the semi-structured interview distinctly informed that NRK has not included any accessibility testing systematically or automatically. The in-house developers conduct some accessibility testing using their iPhones, as the majority of the developers carry such devices and use the accessibility features available on the iPhone, like the screen reader. However, the issue is that this is not a normal flow, but rather a voluntary practice. Furthermore, the developer insisted that the goal of accessibility of the web site is not put into system, although governmental legislations have required all organisations to follow the accessibility guidelines and to make the system accessible for everyone.

Lack of an Accessibility Expert

First of all, during the interviews, both of the participants did not mention anything about the availability of any in-house accessibility training. Secondly, from the survey, nobody mentioned anything about having any accessibility expert available. Thirdly, in the survey, one of the respondents outlined that (s)he has the responsibilities of *Interaction Design*, *User Experienced Design (UX)*, and *Accessibility*. This indicates that NRK does not have any in-house accessibility experts in the design or development teams, which would be team members whose responsibilities is assigned to the accessibility of the NRK website.

5 Discussion and Recommendations

Findings from the research presented in this paper, indicates that there exist several factors hindering the accessibility of www.nrk.no. The barriers are drawn from the

study of the development process, organisational strategy, and web authors involved in the development process. The identified accessibility barriers from this research are as follows:

- lack of prioritisation of accessibility into the development process,
- insufficient accessibility training,
- absence of in-house accessibility experts,
- lack of accessibility testing, and
- no routines for following specific accessibility guidelines.

The following are the recommendations NRK can adopt to develop accessible website in their organisation.

High Prioritisation and Implementation of Accessibility Into the Process

Accessibility is not an afterthought aspect in the development of a website and therefore it should be planned properly from the beginning of the process [18]. Providing higher prioritisation and implementing it in the process will allow NRK to plan accessibility properly and from the early phase and help NRK to allocate enough budget and time required. Furthermore, it results in a focus on the accessibility guidelines they will follow throughout the development process, laws and regulations they are obliged to, tools and techniques to use that supports accessibility, and most importantly, they will include accessibility in the major phases during the development process.

Following or Customising Accessibility Guidelines

NRK should follow or customise accessibility guidelines. Accessibility guidelines can aid NRK in starting to implement accessibility practice into the process. For a smoother process, NRK can customise accessibility guidelines according to the requirements of the website. The accessibility guidelines can help NRK through:

- providing important resources to start implementing accessibility in the website and in the development process, and
- to ensure that the regulations enforced by the government are fulfilled.

Increasing Awareness among Stakeholders, Product Owners, and Team Members

The awareness of accessibility among the developers and the responsible people in the organisation are important in the development of an accessible website. Thus, NRK should train and raise awareness among the managerial, stakeholders, and product owners. Raising awareness among these people will help NRK to

- understand the accessibility and its importance,
- allocate enough budget and resources required,
- integrate accessibility from the beginning, and
- conduct proper accessibility evaluation.

Provide Training to Team Members

The other important aspect NRK should consider is providing sufficient training to its team members and recommending various helpful resources to broaden their knowledge about accessibility. Through the training and useful resources, team members at NRK can expand and broaden their awareness and understanding about accessibility commanding themselves into developing an accessible system [19]. Furthermore, the training and resources can help the team members to identify the correct tools and techniques to evaluate the systems they are developing, to integrate these techniques into their tasks, and to provide reliable and consistent results. Training can help the team members to

- expand their knowledge about accessibility, techniques, and guidelines in developing accessible website,
- understand the importance of accessibility,
- understand the accessibility evaluation and the procedure involved in it,
- get more confidence, and
- get up to date with the recent technologies, guidelines, and other aspects that could influence in the development of an accessible web system.

Having Accessibility Experts on the Team

NRK is a gigantic broadcasting organisation which is state-owned and provides various services through different web platforms. Therefore, it is inevitable to have an accessibility expert in the NRK. Since, the accessibility testing should be integrated into the major parts of the development process and in each step the procedure of the testing is different, it is essential to have an expert in the domain of accessibility testing to achieve best practice and a reliable result. The advantages of having expertise in the development team are [20, 21]:

- interpretation of the result effectively, efficiently, and confidently,
- can help to conduct training to the team members and responsible person, and
- to create an accessibility plan and to integrate accessibility from the beginning.

Accessibility Testing at the Major Development Phase

NRK needs to enact accessibility testing at the major phases of development like in project planning, designing, developing, testing, and during implementation. Integration of accessibility testing at major stages can ensure that the accessibility is achieved from the beginning and avoiding retrofitting at the end [22, 23]. Integration of accessibility into major phase will:

- ensure whether accessibility is according to the plan,
- will help to identify issue, if there are any, at early stage of the process, and
- will help to minimise the process of retrofitting at the end.

Accessibility testing is the process of identifying the barriers and making the quality of the system better than the previous. However, testing is not an easy task. Further, the evaluators with less experience can find themselves producing variable and unreliable results. To conduct the conformance testing with WCAG 2.0, WAI recommends having an expert on the field of accessibility [24]. There are various accessibility testing techniques NRK can implement like inspection, automated testing, screening techniques, subjective assessment and user testing.

Providing Knowledge about Automatic Evaluation Tools

The team members in the NRK should have knowledge about the automatic evaluation tools, its advantages, and the process in accessibility testing with the tools, and the kinds of errors the tool identifies. NRK should identify some automatic testing tools and provide training about it to the team members. Advantages of automatic evaluation can be:

- identification of accessibility issues at the early stages,
- saving of time and cost in the evaluation process, and
- the tools are easier to use for the non-expert team members.

However, it is not beneficial to always be reliable on the automatic tools to test the pages since it lacks the judgement from the human perspective.

Testing with Real Users

To ensure that everyone can use the site according to their preferences, NRK should conduct user testing with diverse special users. Testing of the system with the users is the essential part in ensuring an accessible website. Furthermore, such testing will help NRK to identify where the users have concerns in interacting with the website. Besides, NRK should consider different aspects before assigning the users for the testing. The attributes of users like their levels of expertise in using the computer, their knowledge in terms of accessibility may have effects on the result [13].

Conclusion

This research provides insight into accessibility barriers in development processes, organisational strategy, and people involved in the development process in NRK. The findings from this research depicts that there are several issues in the above factors and these need to be addressed. The known problems with inaccessible web is probably due to the lack of sufficient priority of accessibility into the process, lack of awareness among the team members and stakeholders, lack of accessibility training, lack of accessibility evaluation, absence of accessibility expert, and lack of integration of accessibility from the beginning. To mitigate the above identified barriers, NRK should highly prioritise accessibility into the development process, integrate accessibility from the beginning, raise awareness among stakeholders and team members, provide training to the team members, follow accessibility standard, hire accessibility expert in the development team, and conduct accessibility evolution.

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