

Improving Resource Discovery and Access through User-Controlled Adaptation: Exploring the Role of Library Metadata

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Abstract. Accessibility of library search tools is measured not only by their adherence to accessibility guidelines, but also by the ease they offer users to find accessible resources. This makes library metadata an object of study in library accessibility. Past studies encouraged exploring the application of metadata in fostering accessibility. The studies also recommend considering user requirements. This study aimed to examine the role of metadata in making the process of resource discovery and access accessible to people with low vision impairments. Based on recommendations of past studies, a simple prototype was developed to test the idea of allowing users to set their own metadata preferences on their search interfaces. Participants were recruited to explore the prototype. The initial findings showed that adding such option in preference settings may be more appealing to frequent users than “one-time” users. However, the participants were able to provide comments on what to improve for the next iteration.

Keywords: Digital Accessibility, universal design, accessible search, accessibility metadata, library metadata

1 Introduction

Search interfaces are what stand between users and multitudes of information resources such as ebooks, multimedia and others stored in digital library environments. Therefore, the way they are designed affects user’s experience in resource discovery and access. Literature shows that libraries are increasingly using developments in web accessibility to make their websites as well as search interfaces accessible to people with disabilities [1][2][3][4]. However, compliance to guidelines may not guarantee accessibility and usability of search interfaces in the overall user-information interaction partly for the following reasons:

- Library search tools are used by diverse group of users whose needs and preferences may contradict each other [5].

- For the average user, the search tools are about finding a resource. However, for people with disability, it could be about finding an accessible resource. Therefore, the accessibility of search interfaces is determined not only by their compliance to accessibility guidelines, but also by the ease they offer users to find resources accessible to them [5][6]. This extends the span of accessibility to include library metadata.

There have been studies conducted on accessibility of library search interfaces. However, there is a shortage of works that focus on the process of resource discovery and access. Moreover, there are very few that examine the role of metadata. This paper aims to examine the roles library metadata could play in making the process more accessible to users with low vision impairments.

Discussing best practices for designing search interfaces, Resnick and Vaughan [7:782] stated, “Any system that includes metadata must consider what fields are relevant”. Resnick and Vaughan also recommended that the process of creating metadata fields should be informed by user requirements. In this paper, we ask: which metadata fields are more relevant for users with low vision impairment? How could metadata be harnessed for enhancing user experience in resource discovery and access? To answer the questions, a simple prototype informed by past studies was developed to be tested by users with low vision impairments. The findings are compared with existing literature to recommend how library search tools could be augmented to serve the purpose of accessibility and inclusive design.

The rest of the paper is organized as follows: Next, a literature review is presented followed by explanations of the methodology used in the study. Then the findings are presented to be discussed in the section that follows. Finally, the paper closes with conclusive remarks and recommendations for the next iteration of the prototype.

2 Literature Review

2.1. Barriers of Access for People with Visual impairments

Library catalogs have evolved to the current web-scale resource discovery tools that provide improved interface to submit queries, receive results, and make content selections [8]. Depending on their design, they may include features such as a search box, search results, visual cues to the results, links, and tools for faceted navigation [8]. The overall evolution is partly driven by the need for improving users’ experience in resource discovery and access.

Studies, however, show that library search tools are complex to use when compared with Internet search engines [4][9][10]. For instance, Horwath [11] revealed that rich graphic interfaces and complex web designs would pose barriers to users of screen reader technologies. Beyene [5] also confirmed that such interfaces turn away some users with low-vision impairments.

Yoon, Dols and Hulscher [12] reported that the most common barriers their study identified were related to navigation. They categorized navigational problems as linearization and semantic issues. Linearization refers to the order screen reader technologies follow to read contents of HTML documents. Yoon et al. [12] claimed that linearization caused cognitive overload to their study participants by requiring

them “to “read” far more irrelevant text just to find the information they were looking for. The semantic issues included poor link labeling, lack of context in a surrounding text and lack of descriptive attributes in the HTML code [12]. The study by Beyene [5] confirmed the presence of such problems showing that there were links simply labeled as “link 1”, “link 2”, etc.

Beyene [5] illustrated that a user may finally succeed in searching and retrieving an ebook just to find that it is not accessible to screen readers or is behind a paywall. This would be frustrating for some users with visual impairments. Some studies recommend that adding metadata fields to describe resources by their accessibility attributes (e.g. whether a document is accessible to screen readers) would help a user to inspect the results list and judge whether a material is suitable for him [6][13][14].

The examples provided above show that the accessibility of library search tools is dependent not only on the designer’s compliance to accessibility guidelines but also on the knowledge representation and organization schemes followed by librarians or content (database) vendors. Moreover, the diversity in needs and preferences of users makes the problem even more complex. Some scholars, therefore, suggested complimenting the compliance-based approach with the adaptation approach to adapt the search tools to each user’s needs and preferences [15]. Beyene and Ferati [15] and Paternò & Mancini [16] therefore recommended tackling the problems by breaking them down into three categories: presentation level, information level and navigation level issues.

2.2. The role of metadata

Metadata provides users with input, control or informational support [17]. As part of the input support, metadata offers users the capability for lookup and exploratory searches [17][18]. Lookup search refers to the process of typing a query and checking the search results whereas exploratory search involves using faceted metadata to browse for a material of potential interest [18][19]. Examples of the control support could be the filters on search interfaces which are used to narrow down search results [17]. The informational support could be exemplified by the metadata information such as author, title, abstract and others which help the user to decide on a resource’s suitability for his/her needs. Therefore, a “well-designed use of metadata” can help in resolving problems at information and navigation levels mentioned above [17].

Scholars recommend considering metadata as integral component of search interface design [7][17]. Efforts aimed at designing accessible search interfaces thus need to incorporate the use of metadata for improving the search experience of users with disabilities. However, there are not many examples of related works. Few of the available works include an accessibility metadata project which is linked to the eLearning community and some digital libraries which incorporated the recommendations from the project for annotating their resources¹. The intent of the accessibility metadata was described as offering vocabularies for annotating resources by their accessibility attributes and making it easy for people with disability to find accessible resources [20].

¹ www.all1ymetadata.org

The study by Beyene and Godwin [6] entitled “Accessible Search and The Role of Metadata” provided design recommendations on how metadata could be employed to design accessible library search interfaces. The conclusions from that study and others mentioned above were that:

- Metadata could be used to improve accessibility of search interfaces to people with print disabilities. That can be done by providing information on the accessibility qualities of an information resource (e.g., accessible/not accessible to screen reader technologies, with/without caption, etc.)
- Information which is crucial for some could be irrelevant to others and vice versa. Current library search tools apply the view more/less toggle to limit the amount of information displayed with search results. However, users may need be given the opportunity to decide on which information should always be visible and which should be hidden behind a “view more/less” functionality.
- Users may opt to have shortcuts by faceted metadata; e.g. genre, resource type (audio books, braille, etc.), series, “popularity” and others to conduct exploratory searches.
- Therefore, it might be advisable to improve search interfaces, by augmenting the already existing preference settings to allow users configure their own tools, as they deem necessary.

3. Methodology

3.1. The prototype

An interactive hi-fi prototype, informed by the studies discussed above, was developed to be tested by users with low vision impairment. The search interface as shown by Fig.1. provides a single search box with sample shortcuts/filters for resource types such as PDFs, eBooks, audiobooks, Braille, Video and ‘new books’; which can be added or removed by the user.

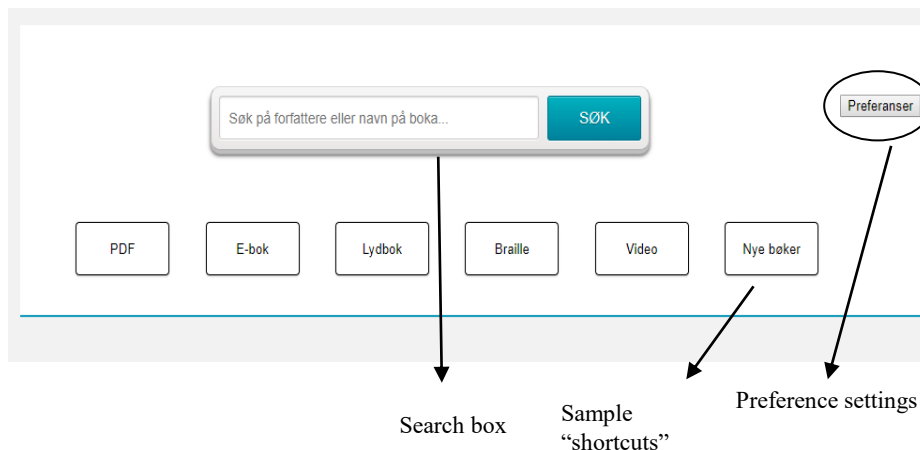


Fig 1. The search interface

The prototype includes a preferences setting, shown by Fig. 2, designed to give the user the option to limit the amount/type of metadata information that should always be shown in the results list above the view more/less options. As discussed in the literature review, this would help screen reader users to quickly go through the results list without reading “unnecessary information”. The intent is to offer the user the flexibility to configure the results list, as he/she deems necessary.

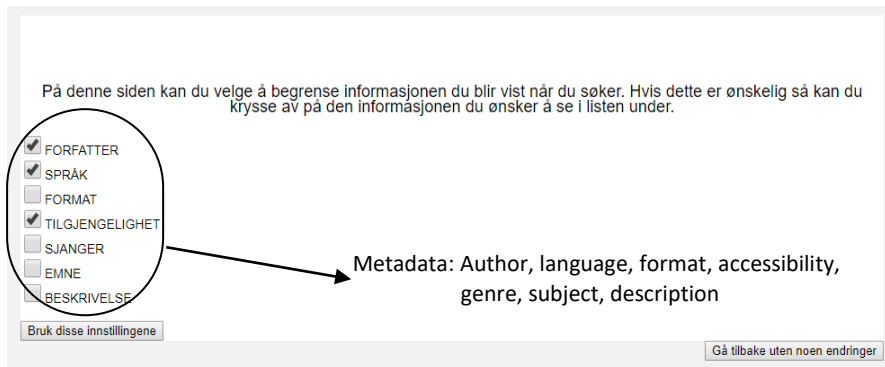


Fig 2. Preference settings

Figure 3 shows a sample search results presentation where a user has specified information on author, language, and accessibility to be visible while the rest is hidden behind the view more/less button.

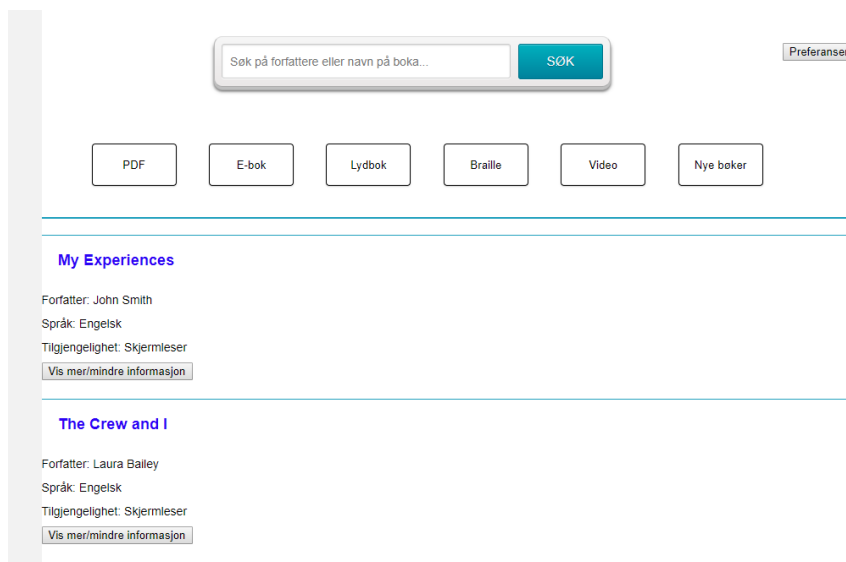


Fig 3. A sample search result with minimized information

Fig 4 shows what would happen if the user chooses to view the whole metadata information.

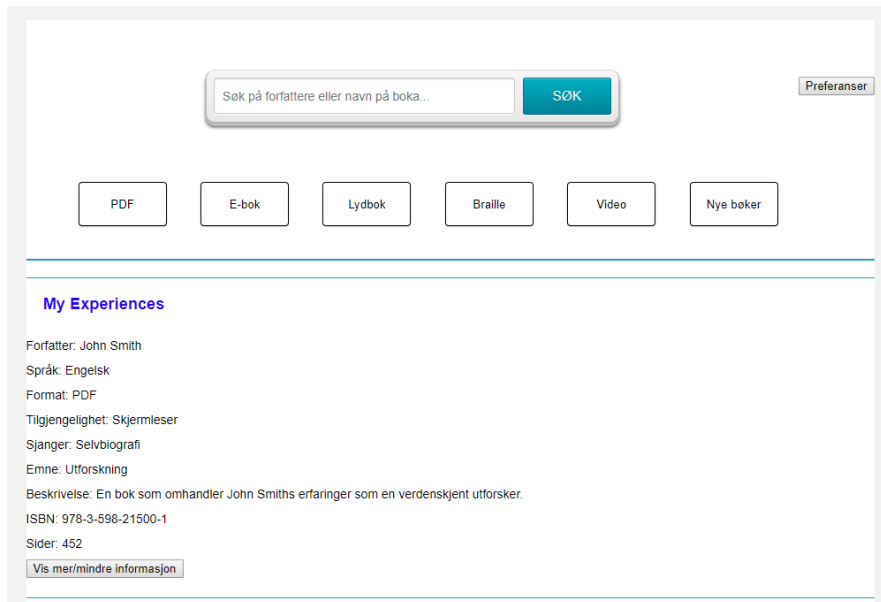


Fig 4. A sample results presentation

Moreover, the prototype included a sample searchable database. The prototype at this stage was designed as an initial opinion-gathering tool that can be improved for further interactions to include not only metadata preferences but also others related to fonts, backgrounds, and other features.

3.2. Participants

The literature of usability testing shows that there is no fixed law on the minimum number of participants to include in user tests. They state that it is dependent on the type of test and the time and money one has to conduct the test [21]. The cost-benefit analysis discussed by Nielsen [22][23] sets the optimal ratio of 3 to 5 users.

Efforts were made to recruit participants for this study through the disability-related advocacy organizations in Norway. However, the process has proved to be challenging, as we were able to recruit only three participants at this stage. Two of them were female while one of them was male. One of them uses screen reader technology whereas the others just used the magnification tools available on the web browser. One of them said that he is a retiree; one other said she works and studies while the other mentioned she is employed at some institution. All of the participants have provided informed consent to take part in the study.

3.3. Data collection and Analysis

The study is designed as a qualitative study. The participants were first guided through the prototype and given briefings on the purpose of the test. Moreover, as exemplified by Figures 2, 3 4, they were given pre-determined search tasks and were encouraged to test it with different preference settings. The sessions took from 30 to 60 minutes on a laptop presented to the participants. All of them needed screen magnification and making the mouse pointer bigger. As they progress through the tasks, the participants were encouraged to ask, “think aloud” and provide feedbacks. The conversations were recorded with an audio device and later transcribed for thematic analysis.

4. Results

All of the participants were quick to understand the idea behind the prototype, though one of them seemed to have some doubts on the need of adding metadata in the preference settings. That particular person said he would have preferred being able to choose different colors for the fonts and the background. After walkthroughs through the prototype and conducting search activities, the participants have given feedbacks that could be presented as follows.

4.1 Search Results Presentation and Metadata Preferences

The prototype included fields such as title, author, language, format, genre, subject, description, ISBN, number of pages, and accessibility. It surely did not include all elements in a particular metadata schema. The intent was to use these fields as starting points and invoke users to discuss what other type of information should be included. One of them said,

“A form of user reviews would actually be quite nice. I mean, the description is nice, but that’s usually written by the publisher, which wants to sell the book, so it’s often presented in the best way possible, but if I could read actual readers’ feedback, it would help me decide on whether I should get this book or not”

The other participant mentioned the need for information on alternative format. It was thought to see whether a material is available in audio and braille formats. One other respondent mentioned the need of subgenres. Speaking of her experience with library search tools, one of them said,

“... They have like 20000 results for “crime” novels, and I find that to be ridiculous, because that doesn’t help me at all. So I would like to be able to sort on subgenres again. Being able to choose subgenres [...] will let you limit the search result a lot before you search”

Existing library tools offer the capability of narrowing search results by different facets. It could, however, be a subject of further research to see to what extent those tools are helpful. One other feedback from a participant is to add a label “Research Results” just above the results list.

4.2. Setting Metadata Preferences.

Two of the participants explicitly stated that they don't like to see excessive information on search interfaces. Speaking of the metadata information presented after clicking a "view more" button, the other participant said, «I think this is a bit overwhelming». When experimenting with the preference settings, one of them selected author and subject, one other selected the field for accessibility (which states whether the book he selected is accessible to screen readers), and the other experimented with genre and subject. During the activities, they have been experimenting with the show more/less buttons.

When asked about the importance of controlling the metadata information in the way they did, all of them concurred that it could be a good idea. One of them however said that it might be meaningful for frequent users rather than "one-time" users. One other participant said that he could not see the full benefit of this functionality because of the small size of the database presented by the prototype.

4.3. Vocabularies

The participants also reflected on the use of keywords and terminologies for faceted metadata. One of them said the word "format", for her, signifies dimensions rather than file types. She recommended finding another expression such as "file format" or "file type". She also said the word "description" is also not clear. The word was meant to connote summaries, abstracts or more information about an item. Two participants commented on the use of the word "braille" and explained that "punkt" or "punktskrift" are the words used by Norwegian users [the language used on the prototype was Norwegian]. One of them said "lesepunkt" is the word used in the everyday speech. These feedbacks show the role vocabularies play to make search interfaces user friendly.

4.4. Shortcuts/Filters

One participant liked the idea of having one search box that can be used to perform searches either by author or by title. However, the need for alternative form of resource discovery was noted. One of them said,

“Sometimes you know exactly what you're looking for and then it'd be nice to filter, but other times it would be nice to just browse, [for instance], by resource format”

One participant said she liked the idea of creating shortcuts to some groups of resources on the home page of the search interface. She said she would prefer shortcuts by resource formats (ebook, braille, etc.), genre, 'last search', and common (popular) searches.

5. Discussion

The main purpose of improving accessibility is to identify and remove barriers that prevent users from accessing information, or give users the means to overcome the

barriers. In case of library search tools the barriers could be interpreted in terms of complex search interfaces, overwhelming amount of search results, overwhelming amount of metadata per search result, the difficulty to locate accessible resources, poor and faulty navigation, vocabulary and others which could largely be categorized as presentation, information and navigation level issues.

As discussed in the literature review, a “well-designed” metadata has the potential of resolving some problems related to information and navigation level [17]. Moreover as recommended in literature, the use of metadata in search systems should be informed by user requirements [7].

The intent of this study, therefore, was to answer the following questions: which metadata fields are more relevant for users with low vision impairment? How could they be harnessed for enhancing their experience in resource discovery and access?

5.1. “Relevant” metadata

The preliminary results didn’t show clear preferences to specific sets of metadata information. Two of the participants however recommended addition of information on “popular” resources and reviews from other users. Past studies show that users with print disability give high value to information about what other readers think about a resource [6]. This could be interpreted in different ways. One reason could be that they want to reduce their interaction with search systems and get an interesting or popular book. This would suggest the need of adding social metadata such as ratings, “likes”, and reviews on library search tools. The other more pronounced need the participants discussed was related to faceted metadata which was discussed in the relation to shortening navigation to a specific group of information resource.

The other issue is related to the nomenclature of metadata fields. Past studies already show that the vocabularies used on library search tools are difficult to understand to some users [24][25]. That by itself is a barrier to access. Participants of this study also affirmed the need for “user-friendly” resource descriptions. The case where a participant said the word “format” is ambiguous and the instance where the other participant discussed choice of terms for Norwegian language interfaces could be mentioned as examples.

The participants generally said they do not like excessive information to be shown on search interfaces. However, they didn’t discuss what type of information they don’t want to see. During the sessions, they were observed selecting fields from the preferences settings to experiment the view more/less options. From these simple experiments, it might be possible to say that it is important to leave the choice to the user in the manner demonstrated in the experiment.

5.2. Harnessing Metadata for Accessibility

One of the core objectives of this study was to see whether giving users the control over the search results presentation makes search interfaces easier and more effective to use. Studies show that users with print disability may not want to flip through many pages of results lists [5]. The option experimented in this study would help to squeeze more search results into the first page and thereby saving the user some

navigation overload. That would also make search interfaces handy for mobile interfaces.

It is worth mentioning that many library search interfaces do provide the view more/less option. However, they do not allow users to determine which information should be always visible. In this study, we tested giving users that control. Though the users understood the intent of the study, their reactions were mixed. As one of them said, that could be meaningful for the frequent users than for the “one-time” users.

As discussed in literature, there are studies that recommend labeling resources by their accessibility features [20]. This experiment intentionally included a metadata field for accessibility. One of the participants was seen experimenting with it. However, a study with a larger group would be necessary to assess the impact of accessibility metadata.

Faceted metadata has been used to filter search results after users submitted their queries [26]. The possibility discussed in this study was giving users the ability to set some of them as shortcuts at the home pages of their search interfaces. Berget and Sandnes [27] found that some users with disability would struggle to formulate queries on search tools which are intolerant to spelling errors and which don't offer autocomplete suggestions. Past studies [6] and this study show that filters such as ‘new books’, ‘popular books’, ‘past searches (history)’, ‘favorites’, ‘audio law books’ and others could provide an alternative way of searching by reducing the demand of keying in search terms.

5.3. Accessibility as Part of Preference Settings?

It would be worth remembering that library search tools and other search engines provide users with options for setting preferences by language, region etc. It would require research to see how well those functionalities are used. Nevertheless, the settings are there for whomever who chooses to use them. One recommendation from this study could be to augment those already existing functionalities to include options related to accessibility. That would help users to set their own accessibility preferences and control what should be displayed on their interfaces. That in the end would make the search tools usable and accessible to all to the extent possible.

5.4. Limitations

While our study shows that all participants understood the purpose of the study, the participants commented that the sample database included with the prototype was so small. Therefore, it did not give them enough chance to test and appreciate its advantage. Yet they recommended experimenting it with a larger set of database. Nevertheless, they did see a definite need for it in larger collections of resources. The other major limitation is the low number of participants who took part in the study.

6. Further work

For the next iteration of the prototype, we would improve all current features according to feedback gathered at the current stage. Some of the improvements will

be: increasing the size of the test database, improving the vocabulary and make them more user-friendly, and making the search results more distinguishable. Furthermore, the next iteration of the prototype will feature the possibility for the users themselves to control some of the design aspects of the search interface through additional sets of preferences. That includes things such as color, font types and sizes, and tools to add and remove shortcuts on the home page of the search interface. That would hopefully show how a search interface could be made adaptable to each user's needs and preferences. Furthermore, effort will be made to test the next iteration with a larger group of participants.

7. Conclusion

The value of this paper is more in the themes it offered for further research and the ideas it gathered for further improvement of the prototype. Based on the results found and the literature reviewed, we can however confirm that metadata has informational and navigational values that can improve accessibility and usability. Simplifying discovery of accessible resources and simplifying navigation amount to removing barriers of access to information. The solution tested in this study may be appealing more to frequent users. However, the idea of augmenting the preference settings of search interfaces to handle demands of accessibility would be an interesting undertaking for researchers as well as practitioners.

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