

Navigating an Online Bookstore: User Experience Insights from Eye-Tracking and Think-Aloud

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Abstract: Navigating online bookstores and library catalogues for leisure reading can be challenging, especially when people want to engage in a more exploratory and serendipitous search. This study investigated how users navigate and select novels in an online bookstore environment, focusing on the impact of individual user interface elements and information architecture on their experience. Employing a combination of screen recordings with eye-tracking and concurrent think-aloud, the study examined user interactions to understand their navigation patterns, emotional responses, and perceptions related to various interface elements and functionalities. We created

path visualizations through qualitative analysis representing participants' actions and pages visited during search sessions. Additionally, search behavior was examined using eye-tracking data from the results list page. Users' emotions and perceptions expressed during concurrent think-aloud were then mapped to specific elements and features of the tested online bookstore. Preliminary findings indicate that negative emotions experienced during the search and selection process were predominantly linked to insufficient metadata and resulting usability issues, which impacted user experience and evoked feelings of distrust and frustration. This was especially pronounced when participants compared their experiences with those on similar platforms. The study highlights the critical role of high-quality, consistent book metadata in meeting user expectations. Effective metadata not only facilitates easier navigation and selection of novels, but also increases the likelihood of users revisiting the online bookstore. Our study contributes to a deeper understanding of digital browsing behaviors in selecting leisure reading and offers insights for designing more useful user interfaces.

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1.0 Introduction

Browsing online bookstores and library catalogues to find and select books for leisure reading can be difficult, especially when people do not have a particular book or author already in mind and want to engage in a more exploratory and serendipitous search. Recently, there has been a renewed interest in understanding how people search for novels (Saarinen and Vakkari 2013). This question has been explored in various ways. For example, researchers have studied people's search tactics in libraries and bookstores (Buchanan and McKay 2011; Oksanen and Vakkari 2012), examined how people select books based on their covers (Gudinavičius and Šuminas 2018), looked at search tactics for finding similar books (Zhang et al. 2024), and investigated search behaviour in online library catalogues (Mikkonen and Vakkari 2016; Mikkonen and Vakkari 2017). While these studies focused mostly on information behaviour and metadata needed to support searching and selection of novels, our paper extends these studies by addressing potential connections between users' emotions and perceptions during the exploratory search for novels and the organization of information in an online bookstore.

Using eye tracking and questionnaires, our previous research (Kuhar and Merčun 2022) found correlations between the intuitiveness of a digital library homepage, especially the search box, and the user experience, particularly users' emotions and perceptions of the system's hedonic qualities. This motivated us to further explore the influence of different elements on user experience, this time via eye-tracking and concurrent think-aloud (CTA) in online bookstores. Our preliminary analysis was guided by two research questions:

- RQ1: How do users navigate an online bookstore and make a selection?
- RQ2: How do user interface elements in an online bookstore impact user experience? What influences the user experience when browsing in an online bookstore?

2.0 Literature review

2.1 Searching fiction

Searching for and selecting a book that aligns with one's criteria of "goodness" is a complex process, as people's tastes in books vary and can differ across categories of readers (Saarinen and Vakkari 2013). Different tools for searching fiction, such as online bookstores, library catalogues, and reader advisory databases, utilize standard metadata such as title, author, publisher, year, edition, and ISBN to facilitate known-item retrieval (Adkins and Bossaller 2007). How-

ever, when searching for "a good book", people may not always have specific authors or titles in mind. Instead, they may be looking for characteristics such as a particular genre, mood, emotions elicited, interesting characters, literary style, setting, or plot (Cho et al. 2023; Vakkari and Pontinen 2015; Zhang et al. 2024). In such open-ended browsing scenarios, query-based approaches play a minor role, and close examination of the results list and book metadata becomes crucial for successful book discovery (Vakkari and Mikkonen 2020). To support the diverse ways in which people search for and select fiction books, whether for personal use or for others, it is essential to explore novel taxonomies for the description, retrieval, and organisation of fiction (Cho et al. 2023; Saarti 2019). The evolution of web-based tools such as Goodreads, Gbooks, and BookBrowse exemplifies the potential for library catalogues and online bookstores to incorporate new access points that can foster serendipitous discovery and browsing, informed by a deeper understanding of users' needs and experiences when searching for fiction books.

Despite the limited number of user studies in this field, several have used eye-tracking to observe and analyse users' book search processes. Prasse (2011), for example, pointed out that eye-tracking allowed them to see users' interactions with results in WorldCat and Google Books that would otherwise go unnoticed, as they might be difficult for users to verbalise. The study found that users fixated primarily on areas rich with textual information, such as titles and descriptions. Li et al. (2018) analysed eye-tracking data for two online bookstores, discovering that participants primarily focused their gaze on the navigation bar and images on the homepage but paid little or no attention to details about the books. Finnish researchers have also made notable contributions by employing eye-tracking to study fiction search (Mikkonen and Vakkari 2016; Mikkonen and Vakkari 2017; Oksanen and Vakkari 2012; Vakkari and Pöntinen 2015). They studied search moves and the use of metadata in book selection in different online library catalogues. They found that users quickly decide if a book is uninteresting but take significantly more time to evaluate it when it seems somewhat interesting (but not very interesting). They also provided evidence that enriched book metadata can help users find interesting books more quickly.

2.2 User experience

While we know something about how users search for fiction, few studies have delved into the factors influencing user experience in this type of search. User experience goes beyond traditional notions of usability, incorporating subjective aspects such as enjoyment, pleasure, trust, and fun (Rico-Olarte et al. 2018). It encompasses users' perceptions and reactions before, during, and after interacting with a

system (ISO 2019). These experiences are the result of users' expectations as well as the pragmatic and hedonic qualities of a system (Hassenzahl 2005). Lee and Koubek (2010) conducted an interesting study in this direction and found that content organization, navigation systems, and visual organization were the most important factors influencing user preferences in online bookstores. In our study, we wish to explore this further and investigate how different interface features affect the emotions and perceptions of users as they search for fiction books.

3.0 Methodology

The study was carried out in autumn 2021. Due to pandemic restrictions, we used snowball sampling to recruit 33 volunteers, comprising 17 women and 16 men, with an average age of 29 ($M = 29.9$, $Mdn = 29$). We did not inquire about their educational background, but most participants were familiar with searching and selecting books, as they reported reading several books a year ($M = 5.85$, $Mdn = 4$).

All participants were given two task scenarios in an online bookstore of Slovenia's largest publishing house. To stimulate exploratory search, both tasks were kept very open-ended. The first task asked participants to find a leisure book on a topic of their choice, while the second task instructed participants to search by analogy and find a similar novel that would be given as a birthday gift. Additionally, participants were encouraged to provide verbal commentary throughout the tasks, articulating their actions and expressing any thoughts or reflections that arose during the process. Each task took participants around four minutes to complete (task 1: $Mdn = 253.3$ s; task 2: $Mdn = 233.4$ s).

Sessions were recorded with Tobii X3-120 screen-based remote eye-tracker. To analyse how participants navigated the bookstore, we used Tobii Studio Pro software and designated areas of interest (AOI) to different interface elements. After an initial review of the recordings, we excluded two sessions from the screen recording analysis due to technical issues and an additional five recordings from eye-tracking analysis due to insufficient quality of gaze samples. Consequently, our screen recording analysis was based on 31 user sessions, while eye-tracking analysis was conducted on 26 sessions. Given the participants' exploration of various pages, our analysis primarily involved a qualitative examination of the eye tracking and screen recording data, occasionally selecting a smaller subset of sessions for more in-depth analysis. To enrich the interpretation of the data, we complemented it with information from concurrent think-aloud (CTA). By triangulating the qualitative data from CTA with the eye-tracking and screen-recording data, we gained a more comprehensive understanding of how participants interacted with the interface.

For detailed analysis, participants' comments from CTA were transcribed and imported into MAXQDA software. Transcriptions were completed for 20 sessions, as some recordings were affected by technical issues, and not all participants provided commentary on their actions despite being prompted by the researcher. The transcriptions were analysed using content analysis (Williamson and Johanson 2018). Previously defined codes in an open coding process were further refined and finally grouped through axial coding to create broader categories. In total, 16 main codes emerged in the open coding process, which were then grouped into four main categories (Figure 1):

- 'Interface features', which included codes related to the results list, navigation, item page, and recommendation lists.
- 'Metadata', which grouped codes related to different book metadata, such as description of book content, star ratings, or target audience.
- 'User tasks' encompassing codes about the search process and book selection.
- 'User experience', which grouped codes for various aspects of user experience, namely emotions experienced during the search, perceptions of the system, and expectations of the system.

Code System	845
Interface features	0
Item page	19
Navigation	53
Other	10
Recommendation list	26
Result list	61
Metadata	0
Quality of metadata ...	20
Book covers	23
Target audience	6
Item description: co...	25
Other item metadata	14
Star rating	16
User experience	0
Emotions	151
Expectations	29
Perceptions	145
User tasks	0
Search	89
Selection	32

Figure 1. Coding system for the CTA analysis.

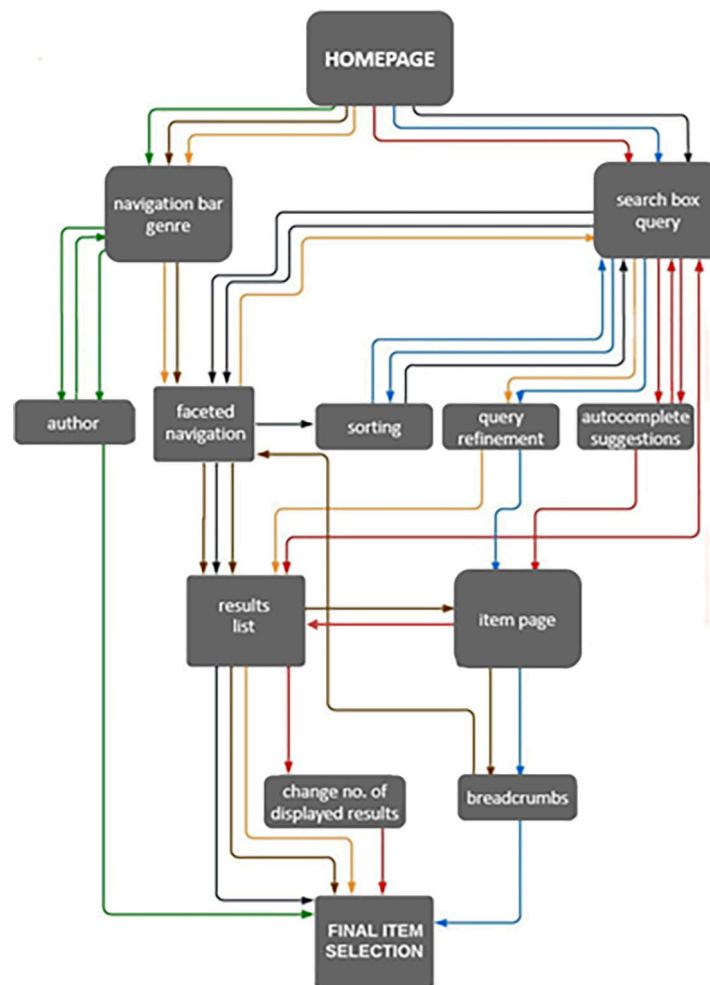


Figure 2. User paths of six participants for Task 1 (each colour represents one participant).

After the coding was complete, we used the MAXmaps tool to create preliminary visual representations of the connections between the codes identified in our analysis. The visualizations displayed connections that appeared at least five times and enabled us to explore potential relationships between interface features, metadata, user tasks, and different aspects of user experience.

4.0 Results

4.1 Navigation and selection

Using recordings with average task duration and diverse search strategies (6 for each task), we created visualizations of sample user paths to examine how participants navigated the online bookstore from the beginning of their search to the final selection of a book. In the first task, which involved searching for a leisure book on a topic of their choice, participants engaged in browsing by genre or entered a specific search query (Figure 2). In the second task, where partici-

pants had to find a book similar to a given sample, they generally started their search by typing in the title of the sample book or its author's name (Figure 3).

Participants typically interacted with the search box multiple times, changing or refining their query because they were not satisfied with the initial search results. Although both tasks were designed to be more exploratory, encouraging users to primarily employ browsing possibilities, the visualization of user paths suggests that this was not the case. Out of six sessions analysed in detail for Task 1, only one participant selected the final book by choosing a genre category in the navigation bar. The second participant, who initially started the search via the genre navigation bar, later switched to using the search box instead. The third participant navigated to an item but then used breadcrumbs to select a more specific genre category. Also in Task 2, some participants began by selecting a genre from the navigation bar, while others initiated their search by typing in the name of the author. Participants' comments revealed that they found the categorization in the navigation bar inconsistent

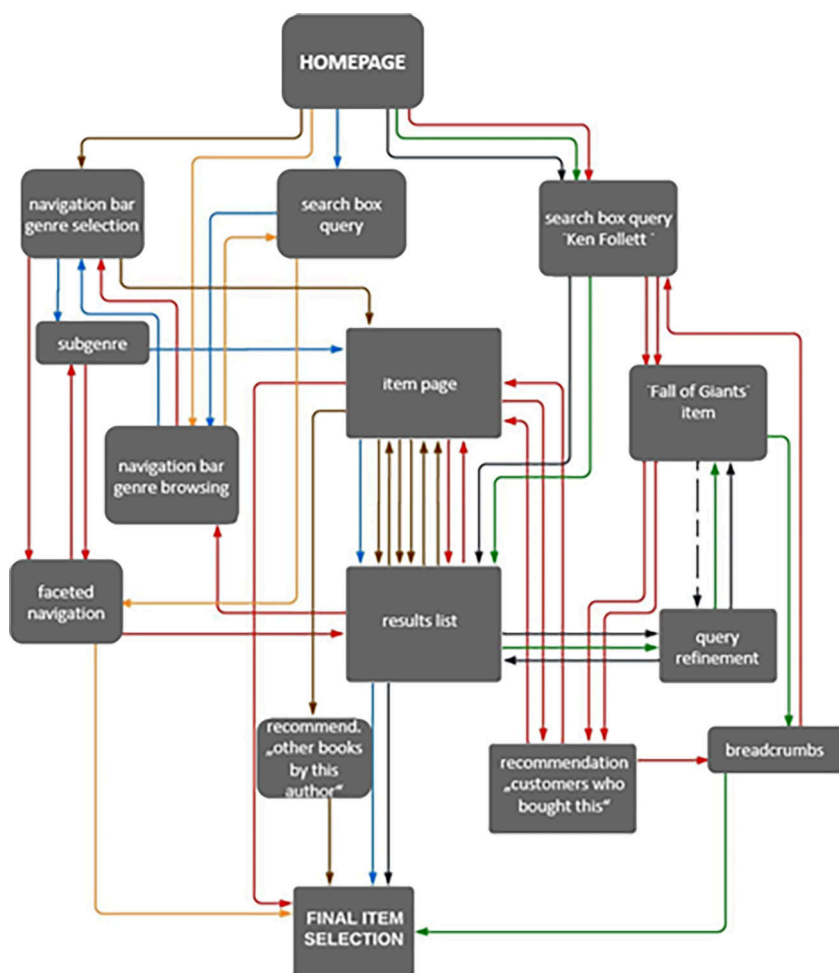


Figure 3. User paths of six participants for Task 2 (each colour represents one participant).

due to its mixture of genres, formats, authors, and literary characters. For example, first level categories, such as books, children's books, romance, fantasy, and softcover, led to a dropdown menu offering a seemingly random list that included popular authors, literary characters, and selected subgenres. The inconsistent categorization in the navigation bar made it difficult for participants to find what they were looking for and influenced their trust in the system. As a result, they were more inclined to use search queries, which they perceived as a more reliable method.

In the sessions depicted on the visualization, faceted navigation never led directly to an item selection, even though eye-tracking data showed it received the second-longest average dwell time. Instead, participants typically continued to browse, sort, or even initiate a new query, indicating that the available facets did not effectively narrow down the results as desired. This observation was further supported by participants' comments, where they expressed an interest in utilizing faceted navigation but found only the language filter to be useful. A similar pattern was observed with recom-

mendations, where participants examined but rarely clicked on the suggested options.

For eye-tracking analysis, areas of interest were marked on the layout of the default results list, as depicted in Figure 4. Eye-tracking data from this results list revealed that participants spent more time viewing the cover images than reading the title and price information (Table 1). In their CTA, participants commented that they focused on the covers because of the limited amount of other information available in the results list. Their final selections were typically based on the cover's appeal and the book's storyline description. This finding emerged from analysing the co-occurrence of codes in the CTA analysis connected to the final book selection, as illustrated in Figure 5. While participants did notice other metadata, such as star ratings or recommendation lists, these elements did not play an essential role in their decision-making process. Participants reported that these features were not implemented in a particularly useful or trustworthy way. Ratings were often missing or were based on a single review, and recommendations were not

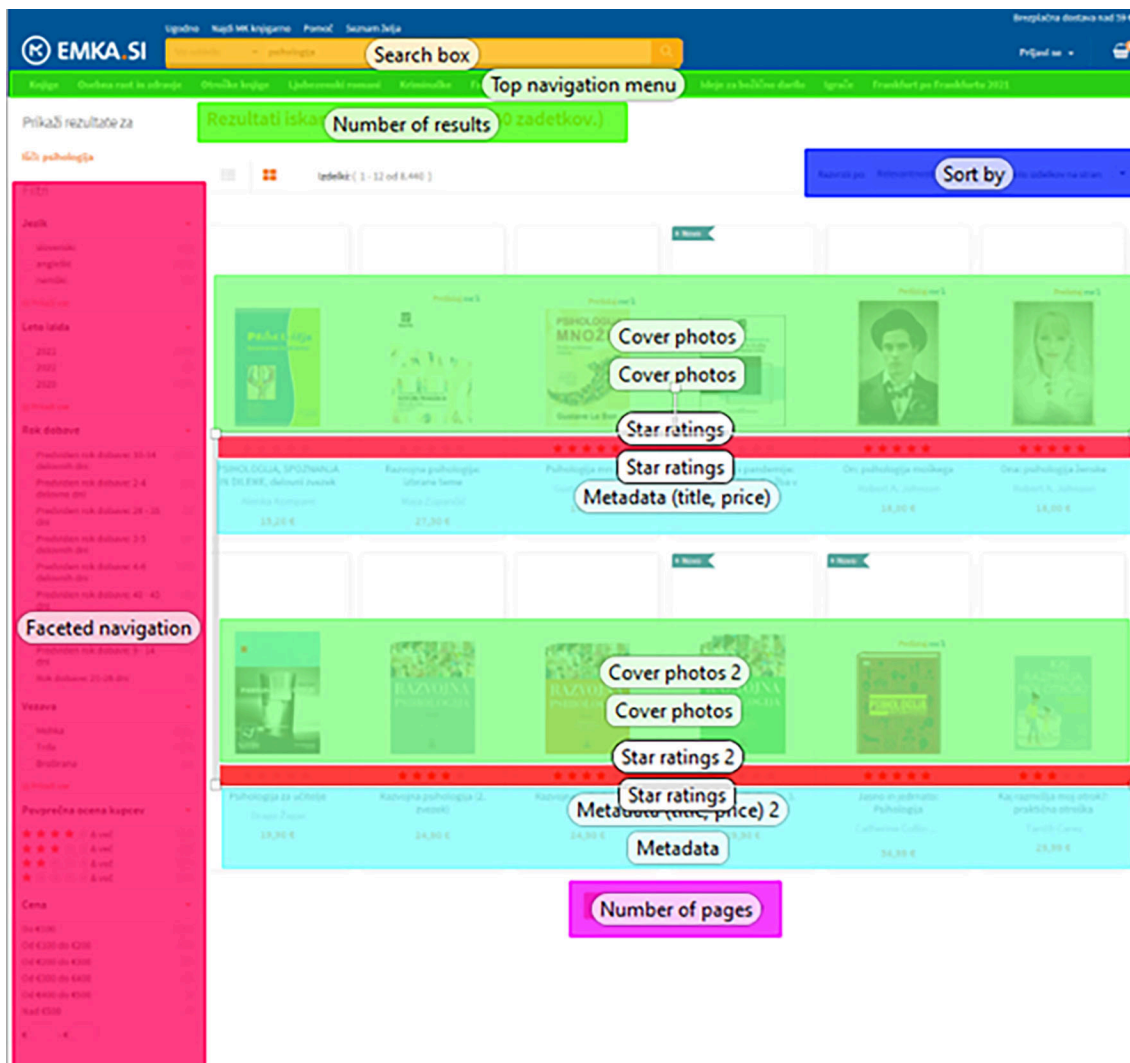


Figure 4. A default two-lined results list page with assigned eye-tracking areas of interest.

considered helpful. This sentiment is captured in a participant's comment: "No book on the results list has a star rating. I would find this function helpful for selection, but since it is not available for any of the books on the list, displaying this function is redundant."

An interesting observation may also be that participants fixated on the navigation bar relatively late in their interaction, with the average "time to first fixation" being 33 seconds. According to the "total visit duration" metric, they also did not spend much time viewing this user interface area. Faceted navigation, on the other hand, attracted fixations sooner, more frequently, and for a longer duration of time.

4.2 Influences on the user experience

To explore influences on the user experience when searching for fiction in an online bookstore, we focused primarily on CTA data and looked for co-occurrences between the

codes that depicted aspects of user experience (emotions, perceptions, expectations) and codes that marked a particular interface feature or metadata element. Figure 6 shows emotions and perceptions expressed in relation to results lists, navigation, item page, recommendation list, and page design.

Most negative emotions, particularly confusion and resulting dissatisfaction, occurred when participants interacted with the results list. They expressed disappointment with the retrieved items and the (limited) number of hits displayed per results page. Participants were also confused by the sorting mechanism and expressed a desire for improved filtering options in the faceted navigation. Participants' comments often included comparisons with other systems, highlighting how their experience with more sophisticated user interfaces shaped their expectations and influenced their perceptions of the online bookstore's usability, emotional responses, and overall experience.

Area of interest	Time to first fixation	Total visit duration	Number of fixations
	<i>M</i> (s)	<i>M</i> (s)	<i>M</i>
Cover photos – row 1	0,8	18,8	86,7
Cover photos – row 2	11,0	13,9	63,0
Metadata: title, price – row 1	5,7	12,3	57,1
Metadata: title, price – row 2	16,4	12,6	58,0
Metadata: star ratings – row 1	18,1	1,8	10,6
Metadata: star ratings – row 2	30,4	1,9	11,8
Faceted navigation	17,0	16,3	66,7
Number of results	17,0	2,4	13,2
Search box	26,6	2,9	12,2
Sort by	27,0	2,1	10,5
Navigation bar: genre top line	33,0	3,3	15,1
Pagination	41,3	4,0	16,6

Table 1. Eye-tracking measures on results page areas of interest ($n = 26$) (Note: The default display of the search results list presents books in two rows of six items, which are identified as row 1 and row 2 in the table.).

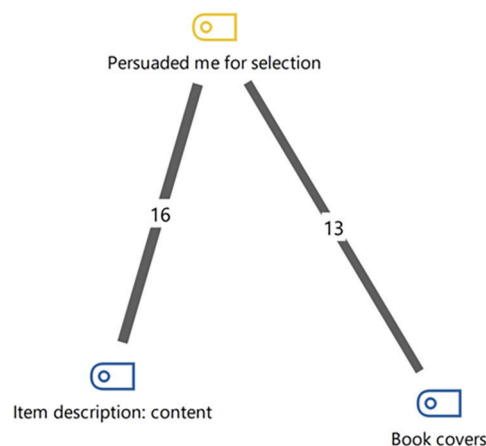


Figure 5. Visualization of code co-occurrence in the CTA analysis related to the final book selection ($n = 20$).

The unintuitive information architecture was another critical aspect that negatively influenced participants' experience. They found the navigation bar with genre categories confusing, and as a result, some considered it useless for the task at hand. When browsing the genre categories in the navigation bar, one participant said: "*When looking for personal growth category, I noticed categories crime fiction and paperback. Genres and formats are mixed together, which is weird.*" Another participant expressed concerns about the overall inconsistency in navigation menu dropdown lists, stating: "*Besides genres, I also get offered a list of fictional characters. Hm, but I do believe Dan Brown is actually an*

author. This is weird and confusing. I also cannot click on these items on the list. I believe everything here on the dropdown menu should be clickable."

As demonstrated by the intersection of codes for interface features and aspects of user experience in Figure 6, participants also experienced the layout of the item page as inconsistent or of poor quality. These issues likely contributed to some negative comments regarding the overall unattractiveness of the page design.

In many cases, negative perceptions and emotions regarding various interface features, such as the relevance of retrieved items, navigation, and recommendation lists, were

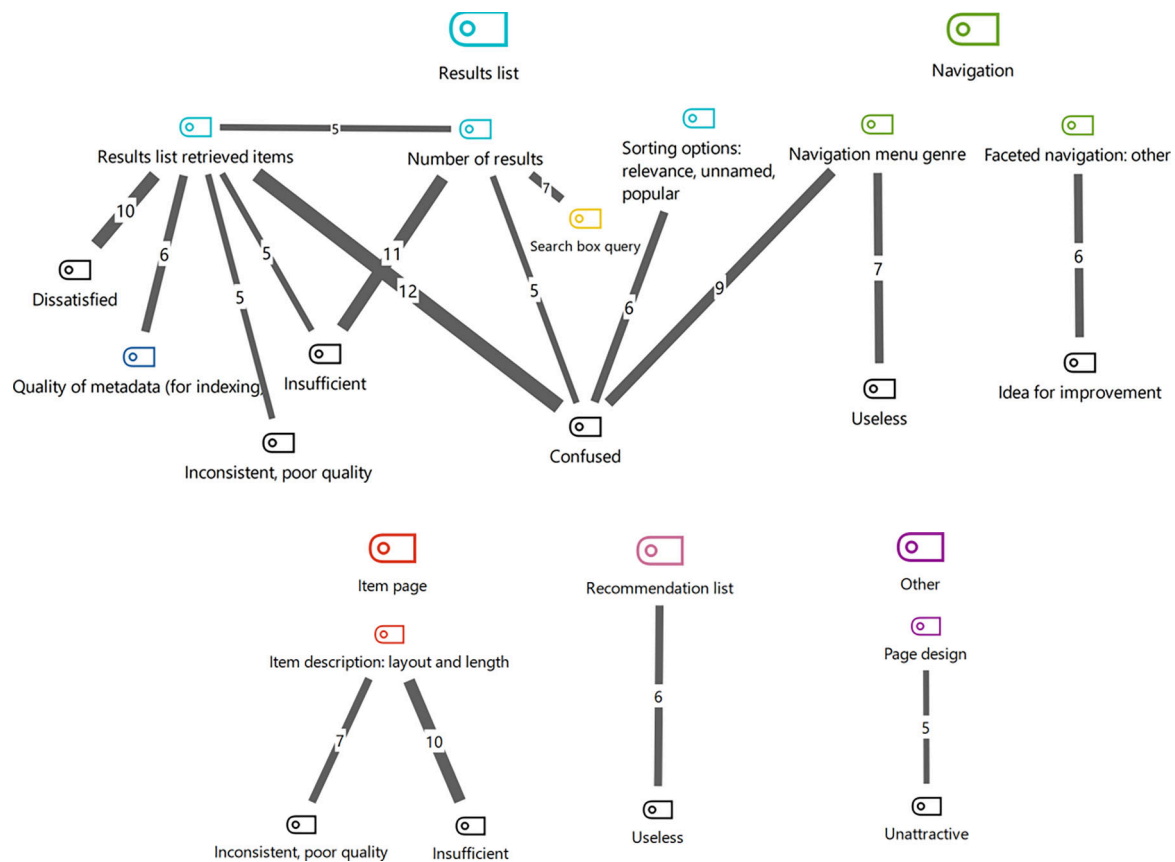


Figure 6. Codes intersection between interface features and aspects of user experience ($n = 20$).

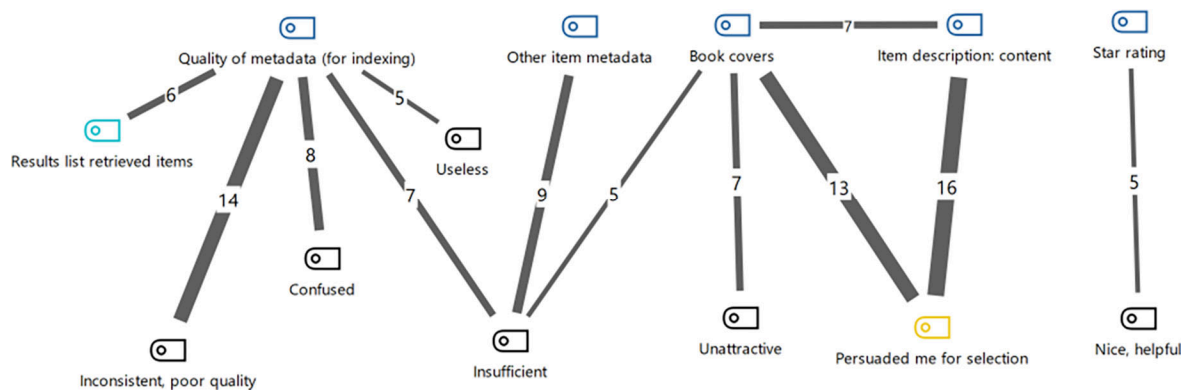


Figure 7. Codes intersection between metadata and aspects of user experience ($n = 20$).

due to the poor quality and use of metadata. The intersection of codes depicted in Figure 7 shows that participants frequently mentioned problems with metadata while interacting with the online bookstore. They were often distracted by inconsistencies in metadata, noting that some books were described in more detail than others, with metadata displayed in different places and sometimes even in different languages. Participants also expressed dissatisfaction when book covers

were missing or appeared generic (e.g., the same cover for different editions), as they found this insufficient for informed decision-making. To support their selection, participants also wished for more extensive descriptions of the storyline and more detailed metadata about the publication itself. Interestingly, most comments regarding metadata were negative, while the only positive feedback that appeared more frequently (more than five times) was related to star ratings. Alt-

though some participants criticised the often missing star ratings, they still considered this feature nice and helpful, and had come to expect it in such a system.

Overall, participants indicated that their experience could have been improved by more consistent and richer metadata (both in form and content). They would have liked features like book content previews, personalization options, and thematic recommendation lists based on content-based filtering rather than collaborative filtering that suggests what “others also bought”. They verbalized this as: “*Aha, below on the item page I see the list of recommended books. But I cannot say these recommendations align with this book.*”, “*There is a list of other books by this author, a list of what other people bought. But what I miss is a list of books with similar content.*” and “*I would love to look inside this book, but the function is absent. The book description is sparse. I wish there were more information to base my decision on.*” Additionally, participants wished that such an online bookstore would integrate ratings and reviews from other platforms (e.g., Goodreads, dobreknjige.si). This would enable them to make selections without resorting to external websites for sufficient information.

5.0 Discussion and conclusion

In this study, we employed two methods to better understand user experience and navigation process when selecting novels. However, our findings are limited by the design constraints of the online bookstore used in our test. Participants made their selections based on the available metadata and adjusted their search actions according to the functionality and limitations of the online bookstore. Therefore, the search actions observed in our study may not align perfectly with those discussed in prior literature. In our study, query-based searching still played an important role because the browsing options were not well supported due to inadequate metadata and unclear genre taxonomy. If more metadata was available for each book and a wider range of navigation options, participants’ search processes and attention to different elements would likely be different.

Analysing exploratory search is challenging due to the diverse starting points and paths users take while navigating an online bookstore. This variability sometimes makes comparing user sessions and drawing reliable conclusions difficult. By comparing the eye-tracking data with users’ comments, we observed that the latter were essential for accurately interpreting the eye-tracking data and gaining a better understanding of the search process and user experience. Overall, we found the use of CTA highly beneficial in capturing the user experience, as participants’ comments primarily focused on different aspects of user experience: their perceptions and expectations of the system and the emotions they experienced during the interaction.

As in physical bookshops, the visual appeal and information conveyed through book cover design played an essential role in the selection process. However, unlike in physical bookshops, where one can gather additional information about the book by direct examination, the absence of more detailed information about books in our tested online bookstore presented a significant shortcoming. Consequently, the insufficient metadata and resulting usability issues impacted the user experience, creating a sense of mistrust and confusion. Participants in our study expressed negative emotions and perceptions far more frequently than positive ones. Although all the participants finished the given tasks, many had to change their desired search tactics or be satisfied with a book that was not exactly what they wanted. Their user experience with the online bookstore was not particularly positive and did not really support them in the process of finding and selecting “a good book”. Our study confirms the finding by Lee and Koubek (2010) regarding the critical role of content organization, navigation systems, and visual organization for positive experiences in online bookstores. It also highlighted the importance of high-quality, rich book metadata and an effective genre taxonomy to meet user expectations and aid in finding and selecting novels. Without a strong organization of content based on quality metadata, online bookstores and similar platforms will continue to struggle to support the exploratory search for leisure reading.

Conducting our research using an existing online bookstore with limited functionalities and metadata, our study could not investigate the impact of novel features on user experience. Future studies should examine novel taxonomies and user interface features that represent diverse characteristics of fiction books, exploring their influence on user experience. This would help identify the metadata essential for enabling serendipitous discovery of novels online and impacting user satisfaction and engagement.

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