

# Navigating an online bookstore: User experience insights from eye-tracking and think-aloud

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## Abstract

Browsing online bookstores and library catalogues with the purpose of finding and selecting books for leisure reading can be difficult, especially when people want to engage in a more exploratory and serendipitous search. Using a combination of screen recordings with eye-tracking and concurrent think aloud, our study examines how users navigate and select a novel in an online bookstore and how user interface elements and information organisation in an online bookstore influence the user experience. Using qualitative analysis, we created path visualisations and mapped the emotions and perceptions expressed by users to different elements and features of the online bookstore tested. Our preliminary results show that most negative emotions during the search and selection process were due to insufficient metadata and resulting usability issues, which most affected the user experience and evoked feelings of distrust and frustration, especially in light of previous experiences with more sophisticated systems. This highlights the importance of the quality and consistency of book metadata in meeting user expectations, helping them navigate and select novels, and ensuring that they will use the online bookstore again in the future.

## Keywords

online bookstores, user experience, fiction search, user studies

## 1. Introduction

Browsing online bookstores and library catalogues with the purpose of finding and selecting 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. There has been some renewed interest in understanding how people search for novels [1] by studying people's search tactics in libraries and bookstores [2, 3], examining people's selection of books by their covers [4], and search behaviour in online library catalogues [5, 6]. These studies focused primarily on identifying metadata needed in different information systems to support searching and selection of novels. Our paper extends these studies by addressing potential connections between users' emotions and perceptions during exploratory search for novels and the organization of information in an online bookstore.

Using eye-tracking and questionnaires, our previous research [7] found correlations between the intuitiveness of a digital library homepage, especially the search box, and the user experience, particularly experienced emotions and perceptions of the 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?

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## 2. 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 have different tastes in books that can vary across categories of readers [1]. 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 [8]. However, 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 [9, 10]. In such open-ended browsing scenarios, query-based approaches play a minor role, and close examination of results lists and book metadata becomes crucial for successful book discovery [11]. To support the diverse ways people search for and select fiction books – either for themselves or for others – it is therefore important to explore novel taxonomies for the description, retrieval, and organisation of fiction [9, 12]. The evolution of web-based tools such as Goodreads, Gnooks and BookBrowse exemplifies the potential for library catalogues and online bookstore to incorporate new access points that foster serendipitous discovery and browsing, informed by deep understanding of users' needs and experiences in searching for fiction books.

Despite the limited number of user studies in this field, several have utilized eye-tracking observation to track and analyse users' book search processes. Prasse [13], for example, pointed out that eye-tracking allowed them to see how users interacted with results in WorldCat and Google Books that would otherwise go unnoticed, and to obtain data that might be difficult for users to verbalise. In this study, users fixated primarily on areas rich with textual information, such as titles and descriptions. Li, Che and Yuan [14] analysed eye-tracking data for two online bookstores and found that participants focused most of 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 to the study of fiction search, employing eye-tracking [3, 5, 6, 10]. 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 a book 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, not many studies have focused on the influences on user experience in this type of search. User experience extends beyond traditional notions of usability and includes subjective aspects such as enjoyment, pleasure, trust, and fun [15]. It encompasses perceptions and reactions that users have before, during, and after interacting with a system [16]. They are the result of users' expectations as well as the pragmatic and hedonic qualities of a system [17]. An interesting study in this direction was done by Lee and Koubek [18], who found that content organization, together with navigation systems and visual organization, were the most important factors in influencing user preferences in the case of online bookstores. In our study we wish to explore this further and investigate whether we can find out how different interface features influence the emotions and perceptions of users as they are searching for fiction books.

## 3. Methodology

The study was carried out in autumn 2021. Due to pandemic restrictions, we used snowball sampling to recruit 33 volunteers for the study, comprising of 17 women and 16 men, with an average age of 29 ( $M = 29.9$ ,  $Mdn = 29$ ). While we did not ask about their educational background, 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; task 2: *Mdn* = 233.4).

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 attributed 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 focused 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 enhance the interpretation of the data, we complemented it with information from the concurrent think-aloud (CTA) data. 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, the participants' comments from CTA were transcribed and imported into MAXQDA software. Transcriptions were completed for a total of 20 sessions, as some recordings were affected by technical issues and not all participants commented on their actions despite being prompted by the researcher. The transcriptions were analysed using content analysis [19]. Codes defined in an open coding process were then 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 result 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 task', which included codes about the search process and selection of a book, and
- 'user experience', that grouped codes for different aspects of user experience, namely emotions experienced during the search, perceptions of the system, and expectations of the system.

Code System	Count
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:** Code system for the CTA analysis.

After the coding was complete, we used 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. Results

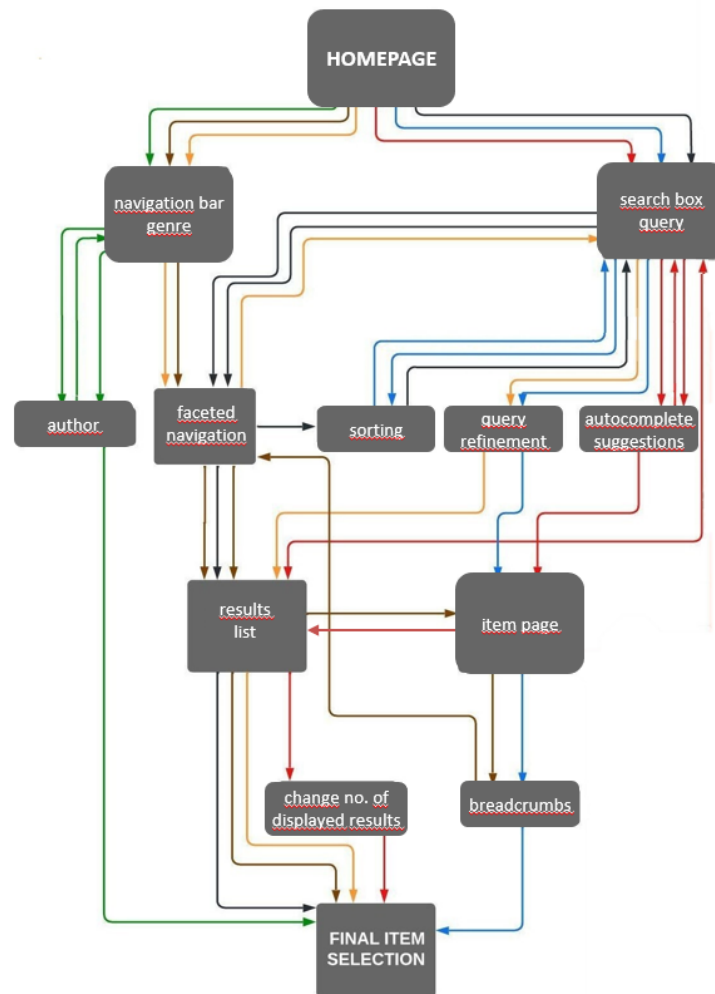
### 4.1. Navigation and selection

Using recordings with average task duration and diverse search strategies, we created visualizations of sample user paths to examine how participants navigated the online bookstore from the beginning of the search to the final book selection. In the first task, searching for a leisure book on a topic of their choice, participants either browsed by genre or typed in a search query (Figure 2). In the second task, where they were looking for a similar book, they typically started their search by typing in the title of the sample book or its author (Figure 3).

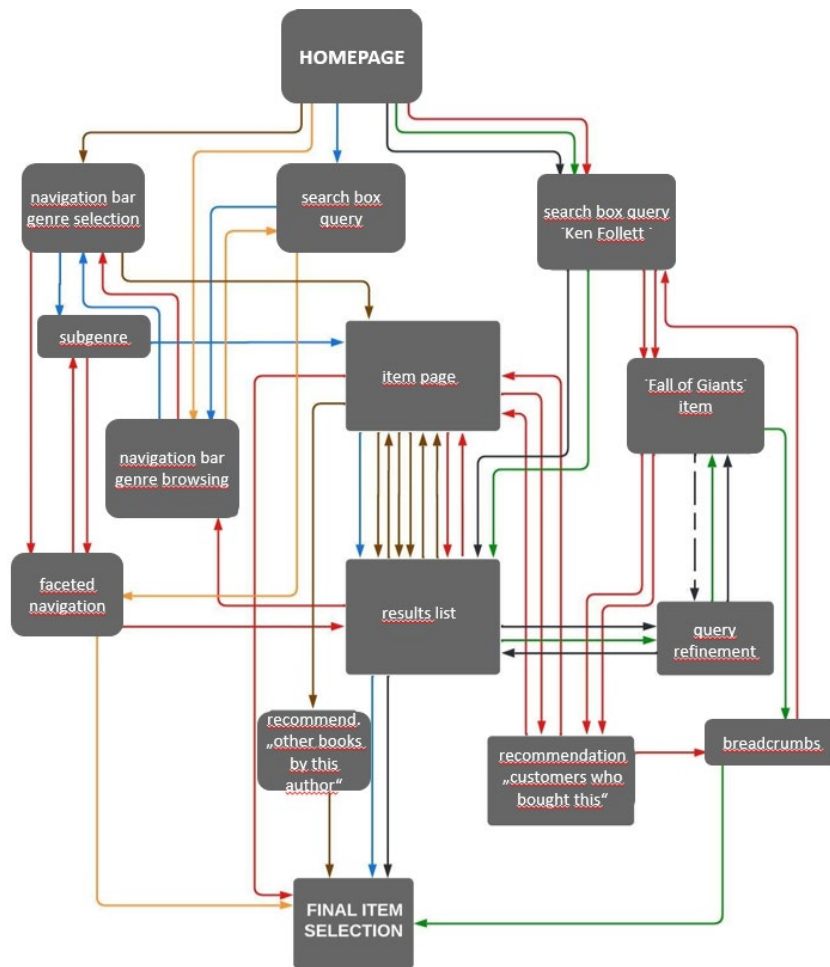
Participants typically interacted with the search box multiple times, changing, or refining the query because they were not satisfied with the initial search results. Although both tasks were more exploratory in nature, where one would expect people to primarily use browsing possibilities, visualization of user paths suggest that was not the case. Out of six sessions analysed in detail for task 1, only one participant made the final book selection by choosing a genre category in the navigation bar. The second participant, who initially started the search via genre navigation bar, later used 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 browsed and selected a genre from navigation bar, while other participants started out their search by typing in the name of the author. Based on participants' comments, we learned that they found the categorization in the navigation bar

inconsistent because it mixed genres and formats, authors, and literary characters (e. g., first level categories: books, children’s books, romance, fantasy, softcover and upon selecting a category, a dropdown menu would present a random list of popular authors, popular literary characters, and selected subgenres). The inconsistent categorization in the navigation bar not only made it difficult for participants to find what they were looking for but also influenced their trust in the system. As a result, they were more inclined to use search queries which they perceived as more reliable.

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 generally continued to browse, sort, or even perform a new query in between, suggesting that the available facets were not effectively narrowing the results in the desired manner. This observation was further supported by participants' comments, where they expressed interest in utilizing faceted navigation but found only the language filter to be useful. A similar pattern was observed with recommendations, where participants examined but rarely clicked on the choices presented.



**Figure 2:** User paths of six participants for task 1 (each colour represents one participant)



**Figure 3:** User paths of six participants for task 2 (each colour represents one participant)

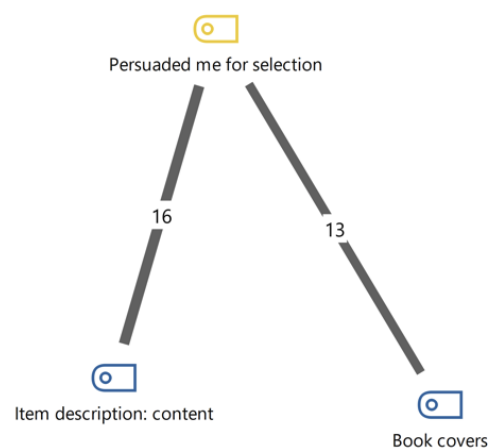
Eye-tracking data of the results list shows that participants spent more time looking at the cover images than reading the title and price information (Table 1). In their CTA, participants commented that they focused on the covers because there was not much other data available in the results list. Their final choices were typically based on the appeal of the cover and the description of the book’s storyline (Figure 4). They did notice other metadata such as star ratings or recommendation lists, but they did not play an important role in the decision-making process as participants did not find them implemented in a way that was particularly useful or trustworthy - ratings were often missing or were based on a single review, and recommendations were not helpful. An interesting observation may also be that participants fixated on the navigation bar quite late in the interaction (average “time to first fixation” was 33 s). According to the “total visit duration” measure, they also did not spend a lot of time looking at that area of the user interface. Faceted navigation, on the other hand, was fixated on sooner, more often, and for a longer duration of time.

**Table 1**  
Eye-tracking measures on results page AOs ( $n = 26$ )

	Time to first fixation	Total visit duration	Number of fixations
	<i>M (s)</i>	<i>M (s)</i>	<i>M (N)</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

*Note: The default display of the search results list presents books in two rows of six items, which is identified as row 1 and row 2 in the table.*



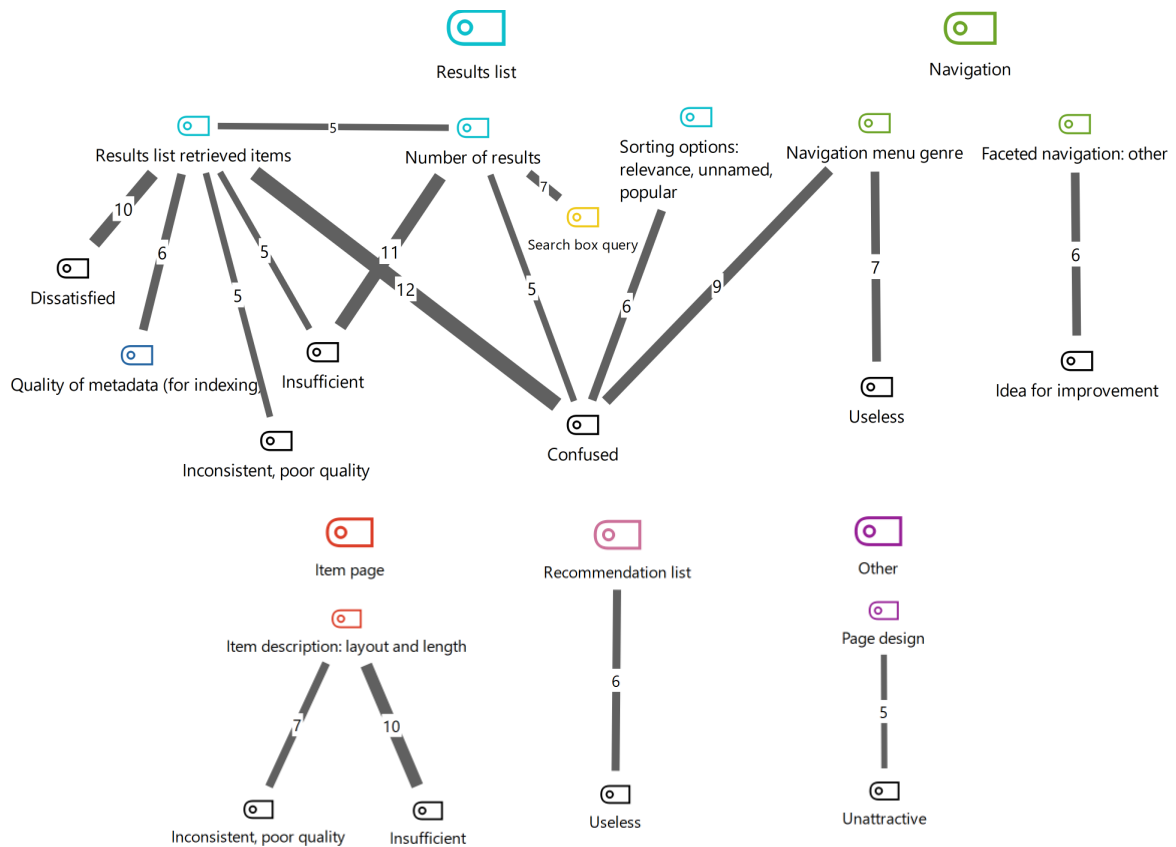
**Figure 4:** Co-occurrence of codes in CTA analysis connected with the final selection of a book ( $n = 20$ )

## 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.

Most negative emotions, particularly confusion and resulting dissatisfaction, occurred when participants interacted with the results list (Figure 5). 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. It was evident from participants' comments, where they frequently made comparisons with other systems, that their experience with more sophisticated user interfaces influenced their expectations and impacted their perceptions of the online bookstore's usability, elicited emotions, and overall experience.

An important aspect that influenced participants' experience was also the unintuitiveness of the information architecture. They found the navigation bar with genre categories to be confusing, and as a result some considered it useless for the task at hand. They also experienced the layout of the item page to be inconsistent or poor quality. These issues likely contributed to some negative comments regarding the unattractiveness of the page design.

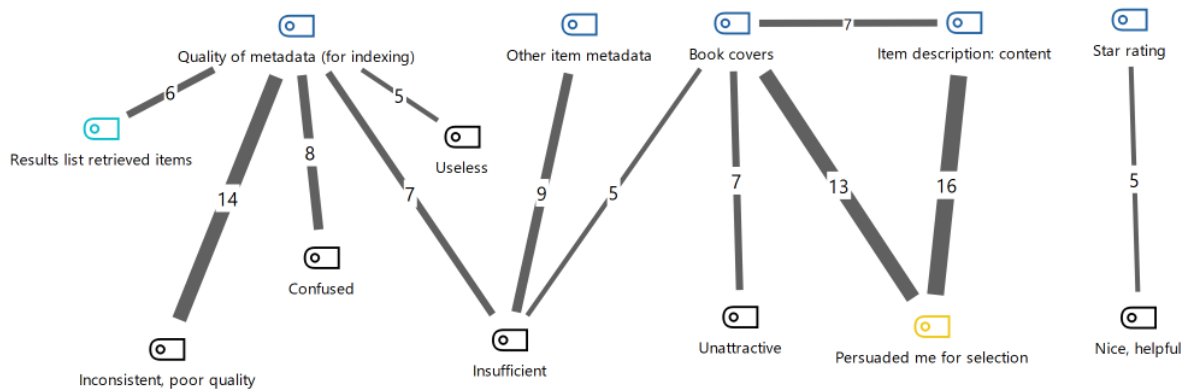


**Figure 5:** Codes intersection between interface features and aspects of user experience ( $n = 20$ )

In many cases, negative perceptions and emotions related to various interface features, such as relevance of retrieved items, navigation, and recommendation lists, were due to the poor quality and use of metadata. Problems with metadata were frequently mentioned by participants when interacting with the online bookstore (Figure 6). They were often distracted by inconsistencies in metadata: some books were described in more detail than others, and metadata was displayed in different places and even in different languages. Also, participants gave negative comments when a book cover was missing or was perceived as generic (e. g., the same cover for different editions), as they found this insufficient for their decision making. To support their selection, participants also expressed a desire for more extensive description of the storyline and more detailed metadata about the publication itself. Interestingly, most comments about metadata were negative, while the only positive feedback that appeared more frequently (more than five times) was related to star ratings. Although some participants criticised the lack of star ratings for most books, they still considered this feature as nice and helpful, and something they had come to expect in such a system.

Overall, participants expressed that their experience could have been improved by more consistent and richer metadata (both in form and content). They would have liked the ability to preview the content of each book, personalization options, and thematic recommendation lists based on content-based filtering rather than collaborative filtering such as “others bought also”. Additionally, participants wished that such an online bookstore would be integrated with other systems (e. g. Goodreads, dobreknjige.si) to include their ratings and reviews. This would have helped them to make a selection without having to resort to external websites for sufficient information.





**Figure 6:** Codes intersection between metadata and aspects of user experience ( $n = 20$ )

## 5. Discussion and conclusion

Using two methods, we aimed to gain a deeper understanding of the user experience and navigation process when selecting novels. However, our findings are limited by the design constraints of the specific online bookstore used in our test. Participants made their choices 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 identified in the literature review. In our study, queries still played an important role because browsing options were not well supported due to inadequate metadata and the genre taxonomy. If there had been more metadata 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 the online bookstore. This variability sometimes makes it difficult to compare user sessions and draw reliable conclusions. 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, as well as the emotions they experienced during the interaction.

As in physical bookshops, the attractiveness and the information conveyed through book cover design played an important role in the selection process of our participants. Unlike physical bookshops, where it is possible to gather more information about the book by examining the copy, the lack of information was much more pronounced in the online environment. Therefore, it was the insufficient metadata and resulting usability issues that had the most impact on the user experience, creating a sense of mistrust and confusion. Negative emotions and perceptions were far more frequently expressed by the participants in our study than any positive comments. Although all the participants finished the given tasks, 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 reaffirmed that high-quality and rich book metadata, along with a genre taxonomy that supports browsing, are crucial to meeting users' expectations, supporting them in navigation and novel selection, and ensuring users' continued engagement with the online bookstore in the future. We believe that further studies are needed to explore features that have the potential to improve user experience in fiction book search that goes beyond the known item search. Novel genre and mood taxonomies should be tested in end-user interfaces and further studies conducted to understand which metadata are most important to users in their search process.

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