RESEARCH-ARTICLE

"Using a Computer for the First Time, So I Feel It's Hard": A Qualitative Analysis of Usability Pain Points for Blue-and White-Collar Users in an 86-Participant User Study

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"Using a Computer for the First Time, So I Feel It's Hard": A Qualitative Analysis of Usability Pain Points for Blue-and White-Collar Users in an 86-Participant User Study

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Abstract

Digital library services often have diverse user bases, yet most usability studies have focused on white-collar users with better access to technology and training. This research thematically analyzes the transcripts of 56 blue-collar and 30 white-collar participants (N = 86) to identify problems (i.e., pain points) using two digital library systems for which the blue-collar participants were generally unsuccessful; the white-collar participants were all successful. Moderators played a much larger role in the blue-collar sessions, speaking 84.35% of the total words spoken, compared to 58.52% in the white-collar sessions. Our findings indicate that blue-collar participants encountered several usability issues, were hesitant to explore the system, and primarily expressed pain points related to their own experiences. In turn, white-collar participants had fewer usability issues, were willing to experiment by 'just clicking', and most pain points focused on the *system*. Blue-collar workers were also less able to articulate their usability issues. Findings highlight digital divide concerns in information access and the use of digital library services; we offer theoretical and practical recommendations to improve these services and for research with diverse occupational user groups.

CCS Concepts

• **Human-centered computing**; • **Human computer interaction (HCI)**;

Keywords

Underserved communities, user studies, usability, accessibility, digital bias

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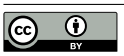

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1 Introduction

Libraries provide digital services, such as websites and apps, to deliver information and other services to an often heterogeneous user base. These digital services can contain *information resources, including searching, borrowing, reading, or interacting with digital content.* These digital library services (DLSs) [14] are typically offered by libraries, government agencies, or research institutes, among others. These DLSs [14] should be usable for a range of users, as access is often central to the mission of libraries and other organizations. However, if the DLSs are confusing [19], users may avoid them despite the valuable content offered [43].

A notable gap in research exists: usability challenges faced by workers outside traditional white-collar (WC) professions remain largely unexplored. User-centered design (UCD) research in human-computer interaction (HCI) has historically centered on students [73, 74], faculty, professionals, and other 'WC' workers [6, 25, 53, 61]–groups who most likely have digital experience and access to technology and training. Due to being less represented in UCD research, far less is known about the user experience (UX) of blue-collar (BC) workers in digital information environments [25]. BC workers, who often have jobs in manual labor or service industries, may have different levels of digital literacy, access challenges, and unique needs compared to WC segments. BC workers are individuals employed in manual labor or service-oriented roles. WC workers, by contrast, typically occupy office-based or professional roles that involve regular computer use and greater exposure to digital technologies.

These differences could translate into distinct usability challenges when navigating DLSs. Although WC users also face usability issues [43], there is a pressing need for more research in the HCI field on the BC population [25]. This research partially addresses this need by examining how BC and WC users experience the DLSs of a national library, specifically a website and native app, two common digital information services [14, 23, 61] of many information-providing organizations. Comparing pain points (i.e., challenges or problems related to system use [59]) can inform the design of more inclusive DLSs, ensuring these services are usable for diverse occupational groups, including marginalized and underserved communities. Drawing on the lack of prior work in the usability of DLSs among non-WC users, we formulate the following research questions (RQs) to guide our study:

RQ1: *What usability pain points do blue-collar users encounter when using digital library services?*

Table 1: Definitions and examples of key constructs used in the study: pain points. Pain points are system or user-related subtypes, illustrating usability challenges from the system itself or users' skills, expectations, or contexts.

Construct	Definition	Examples
Pain Points	*a specific source of frustration users encounter when interacting with a digital library system that hinders task completion, satisfaction, or continued use*	
System-related	*a usability issue inherent within the digital library system that directly impedes the user's ability to accomplish the user's goals*	poor navigation, confusing terminology, broken features
User-related	*a difficulty stemming from the user's skills, expectations, or context that affects how effectively a user can engage with the digital library system*	limited digital literacy, unfamiliarity with terminology

RQ2: *How do the usability pain points of blue-collar users compare to those of white-collar users?*

These RQs address underexplored factors in digital access via qualitative analysis by focusing on the usability pain points of these two distinct occupational groups—BC and WC workers. Qualitative analysis allows for an in-depth understanding of user behavior (UB), identifying usability issues and contextual factors that quantitative measures may overlook [1, 5, 22, 60]. In line with our qualitative approach, we use the phrase UB to refer to the observable actions, strategies, and responses that participants exhibited while interacting with the DLSs. Our findings inform the design of more inclusive DLSs that accommodate the needs of BC users and contribute to the scholarly investigation of providing equitable digital spaces. For our research, pain points can be of two types: (1) system-related and (2) user-related, as presented in Table 1.

2 Literature Review

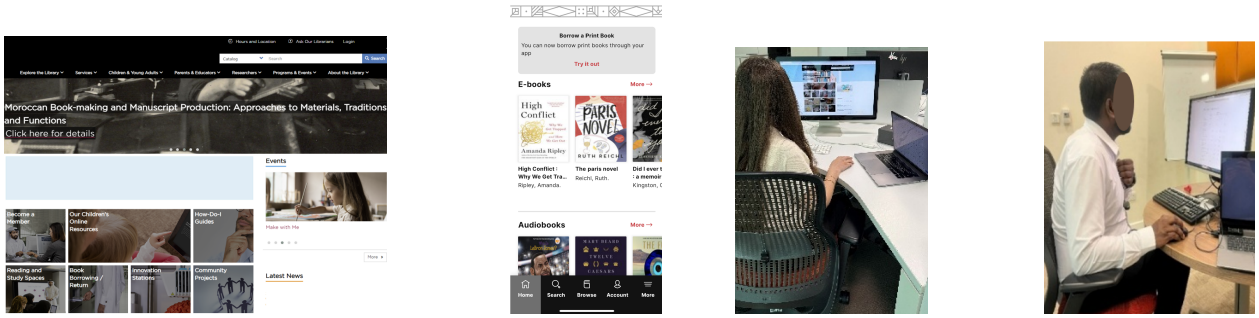
Usability pain points are a specific source of frustration users encounter when interacting with a digital library system that hinders task completion, satisfaction, or continued use. A pain point indicates a breakdown in the UX and often signifies problems in system design or task flow for a user segment, so identifying pain points can help designers improve usability by targeting areas where these users struggle most. Identifying pain points can enhance the usability of DLSs, especially for underserved users such as those from BC occupations.

Usability is critical to the adoption and effective use of these platforms, as it often hinges on good interface design and the simplicity of the system's components [34]. However, many DLSs integrate multiple features [47]; the resulting complexity of these services is a barrier to otherwise valuable content [3], leading some users to avoid these systems altogether [43]. Prior research on user pain points in DLSs highlights several recurring themes, though much of this user research has focused on WC user segments [36, 46, 58], with limited attention to BC users [26, 50]. Studies find DLSs are often perceived as hard to use due to non-intuitive navigation and inconsistent design across resources [24]. For example, Thong et al. [65] found that perceived ease of use is a key factor in adoption, especially for users with lower technical experience. White et al. [70] showed that novice users often feel overwhelmed by technical jargon and unclear pathways for finding materials. Panda and Kaur emphasized the potential of integrating technology to present knowledge in engaging and accessible formats [51]. These and other studies show user pain points as they struggle to locate and complete basic tasks due to poor information architecture and displays. These usability challenges [49] are central to the HCI domain [20, 39], seeking to design inclusive systems for underserved populations [55, 56, 62, 68].

Users with lower digital literacy, often non-WC users, can have difficulty forming effective search queries, interpreting results, or refining searches. Marchionini [42] highlighted the cognitive load of information interfaces and noted that less experienced users quickly become frustrated and abandon tasks. Different user groups can also have markedly different experiences with the same system interface. Kous et al. [35] reported on an evaluation of a library website with diverse user segments–including college students, working adults, seniors, and researchers–and found significant differences among these groups [35]. In some of the limited BC studies, Chatman [12] found that custodial workers had clear information needs but engaged in little information-seeking and made little use of the DLSs. Xie [72] found that users of a DLS lacked confidence in choosing the right search strategies, indicating user uncertainty and frustration due to a lack of experience.

Mobile access is critical for users who rely on smartphones, which is often the case with lower-income or non-WC users [54, 63]. Digital divide research [64] shows that disparities often correlate with occupation and income, with nearly a third of U.S. adults in lower-income households relying solely on mobile devices [12] and having lower rates of computer ownership [67]. However, DLSs are often optimized for desktop use, with mobile versions lacking functionality or being hard to navigate. McKay and Conyers [45] found that mobile users encountered broken layouts or missing features. Research notes that DLSs need to support the right model of access to be useful [43].

Several studies [16, 17] have found that users perceive DLSs as too complex. This is especially true for users who may not understand the value or scope of some DLSs. If users do not see how digital systems fit their immediate goals, they may quickly abandon attempts at usage, especially if the language or layout is academic or specialized. For example, Kules and Shneiderman [37] emphasized the need for a guided search, onboarding tutorials, and contextual help, features that are especially helpful for users with lower digital confidence. Several researchers [41, 44, 66] argue that the DLSs often reflect the values and workflows of WC users, ignoring the information practices of BC workers. When digital systems do not align with users' online practices, the systems are seen as burdensome or irrelevant.



(a) Website (b) App (c) White collar user (d) Blue collar user

Figure 1: The digital platforms, (a) website and (b) app. Organization identity masked. Photos of participants during the user study, used with their consent. Figure also shows (c) research assistant and (d) janitor (although the BC janitor is, ironically, wearing a white shirt).

While much of this prior usability work focuses on students and professionals, it strongly suggests that BC users will likely encounter greater friction and require more targeted support. This gap emphasizes the need for studies that explicitly examine and compare these pain points across occupational groups. Our study aims to partially address this need by examining how the usability pain points of two occupational groups differ when interacting with DLSs. Understanding the pain points differences among these disparate occupational groups can inform *theory* [13] by extending models of information behavior to new populations and *practice* by identifying design recommendations to make digital platforms more inclusive [10, 62] and user studies more inclusive [21].

3 Methods

3.1 Study Overview

We conducted a user study with 86 participants (56 BC and 30 WC; see Figure 1) using two DLSs—a website and a native app—of a major national library (see Figure 1). Each participant attempted five tasks on each platform. Demographic information was collected to contextualize each user's experience. A semi-structured interview that ended the session probed participants' overall impressions, specifically on pain points. We used a think-aloud protocol to capture their utterances. All portions of the sessions were recorded for speech to facilitate analysis [48]. We conduct a comparative qualitative analysis [15] of participants' utterances to address our RQs.

3.2 Study Procedure

Each participant was individually greeted, made comfortable, given an overview of the study's purpose, and asked to review and sign an informed consent form. The university's Institutional Review Board approved the study. Participants completed a short survey on their familiarity with the digital platforms. Participants were then randomly assigned to start with either the website or the mobile app (counterbalanced) and asked to complete five tasks (counterbalanced) (i.e., borrow an ebook, borrow an audiobook, return previously borrowed items, locate the library's hours and address, and register for an event) developed with input from subject matter experts. After completing the first set of tasks, participants responded to a usability survey before moving to the alternate platform, completing the same tasks and using different titles for the ebook and audiobook tasks. At the end of the session, participants completed a survey capturing usability impressions, satisfaction, demographic information, digital literacy, and language proficiency. Participants received a monetary gift ($27.50 USD) for participation.

3.3 Voice Recordings and Moderator Observations

Participants were asked to think aloud throughout the session [48], with each session audio-recorded and later transcribed. These transcripts captured qualitative data, including participant confusion, feedback, and responses to a brief interview conducted at the session's conclusion. Observing participant comments and navigation behavior offered valuable insight into their platform experience. A moderator was present for all sessions, providing guidance when needed and recording field notes documenting key observations such as verbal and non-verbal reactions, signs of frustration, or moments of confusion during task completion. These notes, combined with the transcriptions, contributed to a robust set of qualitative data.

Thematic analysis [8] was used to analyze this data, following a structured approach that began with open coding: two researchers independently examined the transcripts line-by-line to identify relevant user statements, excluding procedural dialogue. The researchers then collaboratively sorted these statements into subcategories under broader themes, resolving any coding differences through discussion. Disagreement was minimal, reinforcing the reliability of the final themes and ensuring they accurately reflected UEs as captured during the sessions. After finalizing themes, we interpreted what these findings meant to our RQs. We used triangulation by comparing interview findings with direct observation to check for alignment and participant success rates for the tasks [8, 33], which we report in the results section.

3.4 Participants

The within-subject experiment involved 56 BC and 30 WC participants. The BC demographic is often underrepresented in usability

research [28, 69], making their perspectives valuable for examining DLS usability beyond professional settings [58]. BC participants were recruited from four companies near the focus organization. WC participants were recruited from a research institute near the same location. The national library, the focus organization, was visible from all participants' workplaces. The study was conducted in the participants' workplaces over two weeks to accommodate work schedules.

BC participants were predominantly 25-34 years of age (n=28, 50.0%) and were primarily male (n=48, 85.7%). Nationalities of BC participants included India, Nepal, the Philippines, Bangladesh, Uganda, Kenya, Pakistan, and others. English was a first (n=14, 25.0%) or second language (n=42, 75,0%) for all participants, with self-rated proficiency averaging 6.9 (SD=2.4) and Internet skills averaging 3.8 (SD=0.7). Most used Android phones (n=43, 76.8%), and 96.4% (n=54) had no experience with DLSs. Most had some high school education (n=23, 41.1%) or a high school diploma (n=15, 26.8%), with the remainder having no high school education (n=4, 7.1%), some college education (n=8, 14.3%), or a college degree (n=6, 10.7%). Moreover, 48.2% (n=27) were unaware of the library's digital services, and 94.6% (n=53) had never used them. These demographic findings emphasize that the BC population remains largely overlooked as potential users, even for an organization missioned to provide services to this community.

To contextualize their relationship with the library, we asked BC participants whether they used non-digital (i.e., physical) library services. The BC participants showed strong interest in reading, often accessing books through informal means like borrowing from friends or downloading free PDFs, yet had limited engagement with formal library services. Only 6 participants (10.7%) reported ever visiting the physical library, and none reported doing so regularly. This was not due to a lack of interest but rather a perceived exclusion; many believed the library was only for university students or staff. Such perceptions highlight deeper issues of institutional inaccessibility, suggesting that both digital and physical library services may unintentionally exclude BC users by assuming familiarity with systems and norms shaped by WC experiences. This finding reinforces that both digital and physical library services remain underutilized by BC users, suggesting broader issues of awareness, perceived accessibility, and cultural alignment with the institution, issues that extend beyond interface design into institutional outreach and inclusion.

WC participants were mainly 18-24 (n=28, 93.3%) and were nearly gender balanced (male, n=16, 53.5%; female, n=14, 46.7%). Nationalities of WC participants included Jordan, Egypt, Libya, India, Bangladesh, the Philippines, and Germany. English was a first (n=14, 46.7%) or second language (n=16, 53.3%) for all participants, with self-rated proficiency averaging 9.0 (SD=1.0) and Internet skills averaging 4.6 (SD=0.3). Most used iPhones (n=24, 80.0%), and 100% (n=30) had experience with DLSs. Also, 96.7% (n=29) were aware of the library's digital services, and 73.3% (n=22) had utilized them. These demographic findings reinforce the sharp contrast between BC and WC users regarding device usage, digital literacy, and awareness of (and engagement with) DLSs.

4 Results

4.1 Exploratory Results of User Study

For foundational insights into our comparative qualitative analysis, Figure 2 shows the task success rates.

Success Rates: Of the tasks shown in Figure 2 for the website, 35.7% (n=20) of the BC participants completed zero of the tasks successfully. We considered participants overall successful if they completed four or more of the five website tasks (n=22, 39.2%). For the app, 21.4% (n=12) of the participants completed zero tasks successfully; 50.0% (n=28) completed four or more app tasks. Only 14.2% (n=8) BC participants were successful in both the website and the app. Seven of the participants (12.5%) were unable to complete any tasks on either of the platforms. Of the tasks shown in Figure 2, 93.3% (n = 28) of WC participants completed all tasks using the website, while 96.7% (n = 29) completed them using the app. The BC population was generally unsuccessful on both platforms, and the WC participants were almost always successful. A one-way between subjects ANOVA was conducted to compare the success rates of BC and the WC participants. There was a significant difference between the success rates of the BC and WC workers at the $p<.05$ level for the two groups [$F(1, 85) = 44.73$, $p < 0.0001$], with the WC participants significantly more successful.

Session Transcripts: In both groups, the moderator spoke more than the participants, with the difference much larger in the BC group; the moderator spoke five times more than the BC participants compared to 1.41 times more than the WC participants, as shown in Figure 3. Moderators in the BC group dominated the conversations, speaking 84.35% of the total words spoken in the session. In contrast, moderators in the WC group spoke 58.52% of the session, indicating that moderators played a much larger role in the BC sessions, while there was more participant engagement in the WC sessions. WC participants spoke much more, accounting for 41.48% of the total word count; BC participants contributed only 15.64%, indicating that WC participants were more vocal than BC participants.

We calculated the moderator's average word count per participant. For the BC sessions, the moderator spoke 1,954.9 words per participant; for the WC sessions, the moderator spoke 633.1 words per participant. We conducted a one-way between-subjects ANOVA comparing the moderator words spoken in the BC and WC sessions. **There was a significant difference between the words spoken by the moderators between the BC and WC sessions at the $p<.05$ level [$F(1, 85) = 28.65$, $p = 0.000$].** The moderators spoke significantly more with the BC than with the WC participants. The moderators spoke 3.09 times more per BC than per WC participant. From moderator notes, the BC participants were hesitant to speak and took continual prodding from the moderators to continue thinking aloud. The BC participants also needed significantly more assistance from the moderators to complete the sessions compared to the WC participants, indicating challenges with usability studies involving BC participants.

BC Participant Sessions: During analysis of the session transcripts, 326 pain points were identified, of which 273 were in the post-task interview (83.7%), 45 during the task execution (13.8%), and the remainder (n=8, 2.4%) during the introduction and closing remarks.

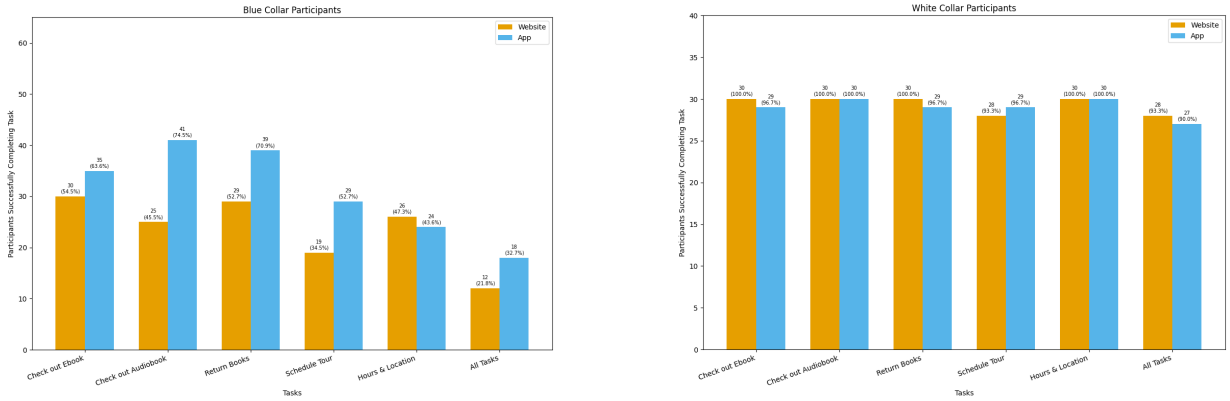


Figure 2: Distribution of task completion success for website and app tasks. This bar chart displays the number and percentage of participants who completed each task using either the website or the app. (a) represents blue-collar participants, while (b) represents white-collar participants. For Figure 2(b), although the participants were generally successful, some participants only completed 4 of 5 tasks on the website and the app.

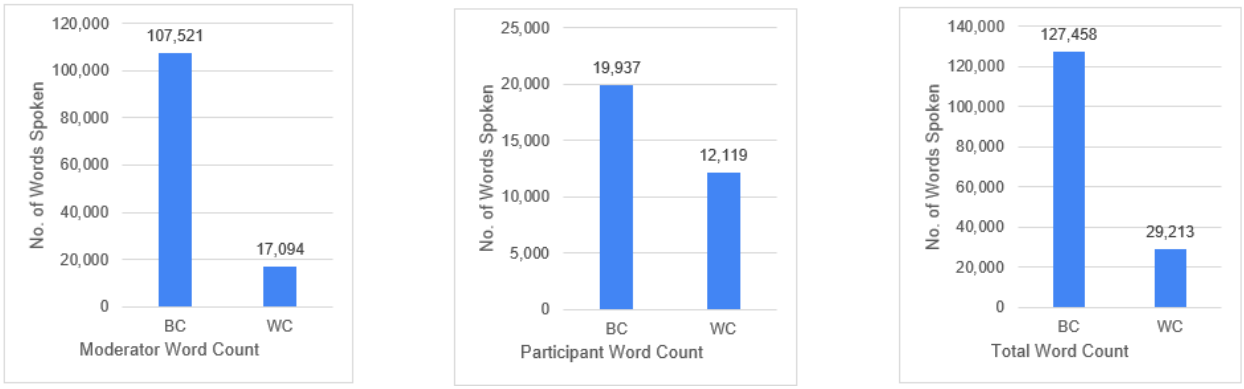


Figure 3: Word count analysis for WC and WC groups for moderator, participant, and total.

WC Participant Sessions: During analysis of the session transcripts, 160 pain points were identified, of which 153 were in the post-task interview (95.6%) and 6 (3.8%) during the task execution. Table 2 shows the categorization of the pain points. These pain points were identified by using thematic analysis [7, 8, 33] followed by axial coding [71], which involved grouping these codes into categories based on their underlying causes. These categories represent key system or user-related pain points, further organized into subcategories.

4.2 Usability Pain Points for BC and WC Participants

Addressing RQ1, of the 326 pain points, 108 (33.1%) were system-related (P37: "Like directions on how to use the app like or videos on how to show how to use them. Because it's my first time to use the library app."), and 218 (66.9%) were user-related (P38: "I know only today, but I need to learn more. Used to practice. Then I can find it and everything will be easier."), as shown in Table 3.

Regarding system pain points, BC participants struggled primarily with Terminology (38% of all system pain points) (P40: "For instance, where it says to return the title. As I said, if it was return, I am more familiar with book. If you say title I, I will not be thinking of the book. I will think of a title."), system Features (25%) (P47: "You can't easily recognize that it is a search button."; P30: "OK, but in the website it's quite hard to find where exactly it is, just a little bit I find it difficult,"), and the look and feel of the platform Interfaces (18.5%) (P33: "Unless the color of the website is not in a good shape for someone to see, it needs some open colors.").

Regarding user pain points, many of the BC participants were limited by their prior experience, having used only mobile devices (41.7% of user pain points) (P47: "Actually for me the mobile app is more good."), with many participants not knowing how to use a mouse (requiring lessons from the moderator during the session). Many BC participants exhibited low self-efficacy [4] in their ability (Confidence, 17.9%) (P27: "Problem is my problem because I cannot read.") and a lack of Experience accessing DLSs (17.9%) (P18:

Table 2: Categorization of the pain points identified during thematic analysis of session transcripts.

System Pain Points	User Pain Points
Terminology: Unfamiliar or technical language made it difficult for users to understand key options or functions.	**Mobile**: Experience limited to smartphones
Features: Users struggled locating or using specific features, especially when hidden or unintuitive.	**Confidence**: Uncertainty in their ability to navigate the system, often second-guessing their actions
Interface Look and Feel (L&F): Visual design and aesthetic of the platform made it appear outdated or untrustworthy	**Experience**: Limited prior exposure to digital information services hindered users' ability to complete tasks efficiently.
Mobile: Using the platform on mobile devices was frustrating due to limited functionality or poor optimization.	**Access**: Hesitancy or lack of awareness about the availability of these digital platforms, or uncertainty about whether they were intended for their use.
Concerns: Users expressed doubts about the reliability or trustworthiness of the system	**Digital Divide**: Socioeconomic disparities (i.e., outdated mobile devices) contributed to a lack of digital literacy
Ease of Use: The system was perceived as too complex or difficult to use without assistance	**Confusion**: Tentative about what to do next, especially when instructions or feedback were unclear.
Structure: Issues relating to the general layout and configuration of the platform, not related to the interface	**Understanding**: Difficulty interpreting system language, icons, or processes leading to misunderstandings/errors

Table 3: Blue collar participant pain points by system and user focus.

Pain Points (Blue Collar Participants)					
System	No.	%	User	No.	%
Terminology	41	38.0%	Mobile	91	41.7%
Features	27	25.0%	Confidence	39	17.9%
Interface	20		Experience	39	17.9%
Functionality	1		Access	18	8.3%
Search	6		Digital Divide	16	7.3%
Interface L&F	20	18.5%	Confusion	9	4.1%
Mobile	8	7.4%	Understanding	4	1.8%
Concerns	7	6.5%	Confusion	1	0.5%
Information Sharing	4		Frustration	1	0.5%
Content, Security, Text	3				
Ease of use	5	4.6%			
Total	108	100.0%	Total	218	100.0%

Table 4: White collar participant pain points by system and user focus.

Pain Points (White Collar Participants)					
System	No.	%	User	No.	%
Interface	139	89.7%	Confidence	3	50.0%
Features	11	7.1%	Confusion	2	33.3%
Interface	2		Access	1	16.7%
Functionality	8				
Structure	3	1.9%			
Terminology	1	0.6%			
Total	151	100.0%	Total	6	100.0%

"Something I could not understand. Yeah. So maybe that's why I said I need to know much more"). There were also user pain points related to not knowing that these services existed or, more disturbing, available to them (Access, 8.3%) (P40: "Because personally, I've been asking myself, the library, is it even open to all of us¿') and Digital Divide pain points (7.3%) (P03: "To use computer as my first time, so I feel hard to it's my first time so."), such as no computer or outdated mobile devices. Contrary to prior digital divide findings, there were no pain points concerning a lack of connectivity.

Addressing RQ2, in comparison, the WC participants had 160 expressions of pain points (see Table 4), with 154 (96.3%) being system-related (P100: "No, no. I was trying to sign in to get like a membership card.") (P101: "OK, so the website was kind of confusing, at least when I had to return the books I feel like.") and only 6 (3.8%) being user-related (P114: "It's probably my mistake."). For system pain points, WC participants expressed the most pain points with Interface issues (89.7%) (P105: "The website, sorry the website, it was a bit confusing in the beginning. Trying to navigate the trick. There was a lot to look at, but in the beginning was hard for me to find where to go and like follow the tasks.") and Feature issues (7.1%) (P103: "I would not recommend it to anyone, especially when I borrowed the book. It opened another tab and just confusing for no reason."). There was only one pain point with Terminology (0.6%) (P106: "The return thing it says is that return titles are confused, like what title. Maybe they can refer to as a book"). One new system pain point surfaced with WC participants (Structure, n=3, 1.95) (P101: "It's just like it goes to the same page and I feel like it takes you to another website."), with some WC participants noticing that the web platform was composed of multiple sites, each with a different layout, which these users found off-putting. These WC participants expressed few user pain points. The one Access pain point relates to a lack of marketing by the organization (P105: "Advertised more or like if they're marketing. Yeah, they should, because it's really it's really helpful."), with WC pain points. Contrasting pain points revealed distinct differences. The BC participants focused more on themselves or their abilities, expressing user-related pain points twice as often as system-related ones. The pain points of WC participants are nearly all system-related, with few related to personal limitations.

5 Discussion and Implications

5.1 Interpreting the Findings

Our results highlight mostly divergent usability pain points between the two groups. For example, BC users struggled with Interface features, but BC users appear to be uniquely hindered by Terminology (i.e., jargon or assumptions of prior knowledge, such as library terminology). WC users overcome such jargon, experiment by 'just clicking', and are frustrated by inefficient workflows that slow their productivity. This inefficiency slows WC participants, but BC participants are often stymied by these inefficiencies, as shown by the low task success rates.

Specifically, reverting to our RQs, our findings show that BC and WC users have d*iffering usability experiences using DLSs.* Our study confirms that BC users face greater hurdles in using DLSs [35] and provides evidence that an occupational context is critically under-researched in the HCI domain. BC participants consistently expressed a range of system pain points, aligning with prior work that these classes of users need more supportive interfaces [35]. Conversely, WC users show higher confidence but perhaps higher expectations (demanding more seamless experiences); this could reflect their greater exposure to these systems and, thus, a lower tolerance for ineffective design. This difference between the two occupational groups highlights that usability challenges are not solely a function of the system's design but are also influenced by users' experience with technology, their language proficiency, their understanding of technical terms, and how easily they can adjust to using different online platforms. BC users are hampered by user pain points, such as Confidence, Experience, and Digital Divide, reducing their effectiveness with DLSs (RQ1) compared to WC users (RQ2).

BC workers' heavier reliance on mobile devices for online access [67] could explain why they were more unsuccessful on the website than the mobile app (although they were generally unsuccessful on both). Our pain point analysis noted that BC users expressed intimidation or discomfort (P33: "This was hard for me."), relating to Chatman's concept of information worlds and potential information poverty [12], a mindset that might limit engagement with these digital resources. Additionally, BC users struggled to clearly explain their usability challenges, often using general terms like "easy" or "hard" rather than specifying particular issues. This may be due to limited language proficiency or digital literacy, further reinforcing their discomfort with digital systems. Conversely, WC users bring a more transactional view (P102: "Booking or registering for a tour? I just was confused. Where can I find this one? Is this in the services or is it in and then I found it in a weird place.") [43], and they could better describe the usability problems they encountered. Our findings can thus be situated in the various theories of information behavior [11], extending them to consider 'occupational culture' as an influencing variable. This occupational culture is reflected in the nature of reported pain points: BC users experienced both system-related and self-related issues, whereas WC users primarily reported system-related issues, with minimal self-reflection.

5.2 Theoretical Implications

This research contributes to the understanding of the diversity of users' UB [11, 29] and the interplay among users and digital systems [18, 27, 38] by empirically demonstrating how occupational background shapes usability experiences. Our findings offer evidence that BC users face usability pain points that are qualitatively distinct from those of WC users, highlighting not only differences in system interaction but also confidence, familiarity, and digital expectations. Theoretically, this underscores the need to refine existing usability and UX models to explicitly incorporate occupational context as a core dimension. Current frameworks often assume relatively homogenous digital competence or overlook how social and professional structures influence interaction. We argue for the integration of an occupational usability lens, a perspective that considers how job roles, training environments, and workplace cultures shape digital practices, a unified but flexible design philosophy grounded in inclusive design principles. The goal is to create systems that accommodate a wide range of user capabilities and contexts without fragmenting the user base. Features such as simplified onboarding, adaptive interfaces, and language clarity can benefit all users while reducing barriers for those with lower digital literacy from BC occupations.

Thus, inclusive design does not mean parallel systems, but rather the integration of features that make a system equitably usable by diverse user populations, including both BC and WC groups. This necessitates an expansion of UX and UB theories to include 'occupational culture,' which we define as *the shared communication norms, tools, and expectations shaped by one's professional domain and which*

mediate how individuals seek, interpret, and act on digital information. Such a lens offers a more granular and inclusive approach to theorizing digital interaction across diverse user populations.

Our findings contribute to the growing discourse on inclusive design [15, 52, 62] by demonstrating how DLSs are implicitly shaped around the expectations and literacies of WC users, particularly in terms of language, navigation structures, and interaction conventions. This design bias systematically marginalizes BC users, whose digital experiences, device access, and self-efficacy differ markedly from those of WC users [43]. While WC participants encountered pain points, their higher digital fluency enabled them to adapt and recover; BC participants, by contrast, often lacked the digital scaffolding necessary to persist through comparable challenges. This asymmetry reinforces digital inequity and highlights the need for HCI and UCD approaches to embed equity as a core principle. Our study thus reinforces prior calls [25, 58] for HCI theory and practice to broaden their scope and incorporate diverse occupational user groups as a fundamental axis of inclusion, rather than as an edge case. Though our study draws on core HCI concerns such as usability and digital inclusion, extensions of this research can build on this empirical foundation by connecting the findings to other theoretical constructs. For example, interaction paradigms, such as conversational interfaces, could be explored to assess their appropriateness for BC users. Also, models of users, such as personas [30, 57], could enrich understanding of how occupational culture intersects with UB.

5.3 Practical Implications

Our results offer actionable insights for improving access to often beneficial DLSs among underserved populations.

BC User and System Usability: Our findings show that BC users have unique usability hurdles requiring a dual system and user approach to addressing access for these users. Two prominent hurdles involved the system's terminology and users' access to devices. Concerning devices, mobile-first design is a must, given the reliance on smartphones among BC users [67]. Given the numerous pain points expressed by BC users on the interface look and feel and the mobile-only experience (e.g., several BC participants had never used a computer, were unfamiliar with using a mouse, or did not own a computer), our findings emphasize that non-mobile platforms are nearly insurmountable by non-WC users. However, addressing this requires more than just offering mobile access; it must be 'Mobile + *x*,' where *x* represents additional BC-specific issues. Systems must be mobile native, avoid domain-specific jargon, and reduce complexity [13] (i.e., *Mobile+Terminology*) using clear labels to better serve the BC user population.

Micro-Short Courses and Marketing: Many BC participants were unaware of available digital services, aligning with prior research showing that people often do not know what libraries offer [2]. Libraries and other organizations with DLSs must invest in outreach to make these resources visible to those who could benefit. Many digital literacy issues can be addressed in micro-short courses (i.e., how to use a mouse, borrow a book, click a link, etc.). Organizations aiming to reach these BC users can offer these micro-courses—possibly in collaboration with their employers—, alongside marketing campaigns that reassure BC populations that they can use these services.

Unique User Study Procedures for BC Participants: User studies with BC participants require procedures and affordances that differ from typical user studies involving WC professionals. Moderators and WC participants are often from the 'same world' and speak the 'same language' due to shared digital experiences. In contrast, BC workers often lack shared experiences with moderators, resulting in 'different worlds' and 'different languages'. BS participants may be reluctant to speak up, and they are cautious in expressing their needs or criticizing, possibly due to limited trust in the moderator or lacking the vocabulary to do so. Thus, special attention is required to build trust formation with BC users, perhaps through warm-up discussions and creating a friendly environment for voicing true opinions. Also, the confidence of BC participants tends to be lower, requiring more positive reinforcement. Moderators should consider these factors in their verbal and non-verbal communication and integrate them into the design of user studies with BC participants.

While our study is situated within the context of DLSs, the practical implications offer varying degrees of generalizability. Mobile-first design with reduced complexity and tailored user study procedures for underserved populations reflect broader design principles applicable across many digital systems accessed by BC users. These recommendations align with inclusive design practices for mobile-first populations and low-digital-literacy users more broadly. Focused on outreach and micro-short courses, is more domain-specific, as it presumes institutional settings like libraries that have a mandate for public engagement and education. Similar strategies may be adapted by other service providers seeking to reach underserved or digitally excluded populations. Thus, some recommendations are context-bound, and others have relevance across domains where digital inclusion is a priority.

5.4 Strengths, Limitations, and Future Work

A strength of this study is its focus on BC users, an underrepresented user group in HCI research. By comparing BC and WC users, we highlight insights that might be overlooked in studies focusing on primary WC participants, which is the most common focus [58]. The study has limitations that need to be addressed in future research. Occupational categories are broad; 'BC' and 'WC' encompass many differences. Variations within each might not be fully captured [40]. The next step is to segment these occupational categories further and examine BC users' interactions with DLSs in naturalistic settings, using methods such as log analysis [31, 32]. Future research should also explore subgroups within the broader occupational categories to understand how intersecting attributes, such as age, prior DLS experience, and digital literacy, affect usability outcomes. For instance, WC participants without prior DLS experience or older WC users may face challenges more similar to those observed in BC users. Conversely, younger BC participants with digital exposure or DLS familiarity might exhibit fewer pain points, suggesting that experience and digital context may sometimes override occupational classification. Segmenting participants along these dimensions would provide a more nuanced

understanding of how usability barriers emerge and persist beyond occupational labels.

6 Conclusion

This research examines how BC and WC users experience DLSs differently due to usability challenges and user skills [35, 43]. As BC users are understudied [25], this research addresses a pressing concern regarding inclusive digital services. [12]. The study employed pain points to identify issues [7, 33] as these users engaged with the systems [9]. By identifying the pain points specific to occupational groups, HCI design professionals can better integrate BC concerns into DLS design and user research, and it introduces occupation as a research design variable.

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