"Do You Need a Little Help?": A Mixed Methods Analysis of 961 Nudges for Blue-Collar and White-Collar Participants During a User Study of Two Digital Information Services

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Abstract

Usability studies often overlook valuable insights from moderator-to-participant interventions. This study proposes that these interventions, moderator-provided "nudges", are a rich source of insights on user needs, cognitive load, and system design gaps. We analyzed transcripts from 86 sessions involving two digital library systems and 56 blue-collar (BC) and 30 white-collar (WC) participants, and identified 962 instances of moderator interventions (i.e., nudges). Findings show significant disparities in both the volume and composition of nudges across groups. BC participants required 21 times as many nudges (N=919) as WC participants (N=43). Of the BC participants' nudges, 737 (80.2%) were system-related, and 182 (19.8%) were user-related. Treating nudges as usability insights for HCI research enables researchers to identify where system scaffolding, such as explicit language, progressive guidance, or simplified workflows, is necessary. The study contributes to inclusive design theory by demonstrating how occupational background influences interventions in user studies and provides design implications for making digital information services more inclusive across occupational groups.

CCS Concepts

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

Keywords

Underserved communities, user experience, accessibility, inclusive design, digital inequality

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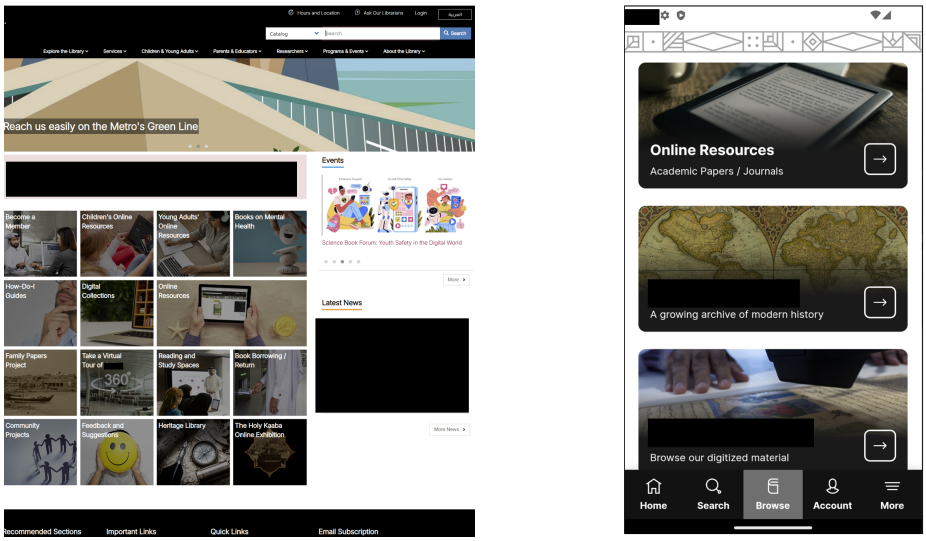
1 Introduction

HCI usability research in professional settings has overwhelmingly focused on white-collar (WC) populations, including students, faculty, and professionals who typically possess the training, experience, and institutional support needed to navigate digital systems effectively [64, 75]. In contrast, blue-collar (BC) workers have received considerably less attention, even though early scholarship identified that individuals with lower levels of information skill operate within distinct information worlds and encounter different forms of constraint [27, 59]. Research on occupational information practices further illustrates the digital barriers faced by BC workers in specialized domains, such as welding [45]. As digital technologies become embedded across user segments, this imbalance in research attention poses a risk to equitable system design and inclusive human-computer interaction (HCI) research [30].

Organizations are increasingly delivering information services through digital platforms, such as websites and mobile applications. These *digital information services* (DISs) provide access to content collections, search functions, and user support in ways that reflect contemporary expectations for information access [1, 26, 46]. Yet confusing navigation, unclear terminology, or poorly aligned system features can lead users to disengage despite the availability of valuable content [60, 68]. Within HCI, user studies serve as a primary method for uncovering usability challenges of DISs, particularly when participants' interactions reveal friction points that might otherwise remain hidden. This is a particular concern for BC users, who may lack advanced digital skills to use these services.

Within usability studies, moderator-participant interactions are often overlooked as valuable sources of insight into user experience (UX) [48]. When user study participants struggle, moderators often



(a) Website (b) App

Figure 1: The digital platforms, (a) website and (b) app. Organization identity masked.

need to intervene with subtle prompts or gentle guidance. We conceptualize these moderator interventions as *nudges*, as support that enables progress without limiting participant autonomy. Nudges emerge when participants encounter difficulty, and the forms of assistance that help them continue are useful to HCI researchers. They provide indicators of real-world usability challenges. If a user in a controlled study requires a nudge, users in natural settings are likely to encounter similar friction at the same point. Unlike traditional system error logging, which captures only breakdowns, nudges reveal both the point of struggle and the scaffolding required to move forward. In doing so, they make visible the cognitive processes, contextual constraints, and unarticulated needs that shape user engagement and overall UX, thereby making nudges valuable sources of user insights.

Although WC users also encounter usability challenges [64], the needs of BC users often diverge due to factors such as limited access to training, greater reliance on mobile devices, and lower digital self-efficacy [6, 30]. Accounting for these differences is essential for inclusive design. This study takes a comparative approach by examining how moderators interact with BC and WC participants while using a national library's website and native mobile application (see Figure 1), two widespread DIS modalities [44, 46]. Analyzing nudges during user study sessions moves beyond identifying only breakdowns to examining the forms of intervention that sustain user engagement and the surface design implications, particularly for BC participants. This reframing complements prior usability research by positioning moderator assistance as an integral component of UX and a vital source of data for user-centered design (UCD) and HCI research.

2 Research Questions

This study advances HCI research by treating moderator interventions, conceptualized as nudges, as data during user studies, thereby viewing them as a previously underutilized yet valuable source of UX and UCD insights. By examining how nudges facilitate engagement during user study sessions, we extend the limited empirical work on moderator intervention and identify the specific forms of assistance required by BC participants, distinct from those required by WC users in DIS contexts. This perspective highlights not only where participants encounter challenges but also how support mechanisms shape their ability to proceed. To guide this analysis, we pose the following research questions (RQs):

RQ1: *What types of nudges do blue-collar workers require when using digital information services?*

RQ2: *How do these nudges for blue-collar users compare to those required by white-collar users?*

RQ3: *How can moderator nudges enhance insights garnered during user studies?*

These RQs address an underexamined dimension of digital information access by focusing on how BC (RQ1) experience and require assistance during user studies, and how these experiences and requirements compare with those of WC participants (RQ2). Centering on moderator-provided interventions reveals practical barriers that can limit the equitable use of DISs (RQ3). Without nudges, many participants might fail to complete study tasks, obscuring usability issues that remain undetected. By examining where and how nudges occur, this work contributes to the design of more inclusive systems that address the needs of BC users while advancing scholarly understanding of information accessibility. To capture these interactional dynamics, we employ a mixed-methods analysis that identifies contextually rich patterns in text that quantitative metrics alone cannot reveal [13, 15, 43].

We categorize nudges into two types: (1) *system-focused* and (2) *user-focused* (see Table 1). System-focused nudges guide participants in navigating or completing tasks by making system interactions more apparent or accessible. These may include pointing

Table 1: This study examines the definitions and examples of the primary constructs related to nudges. Each construct is broken down into system- and user-related subtypes, illustrating how usability challenges and subtle interventions arise from either the system's design or from users' abilities, expectations, or contexts.

Construct/Sub-construct	Definition	Examples
Nudge	An often subtle intervention or prompt from a moderator that guides participants toward desired behaviors or choices without restricting their options	(see below)
System-focused nudge	*A prompt addressing a usability issue inherent within the system that impedes the user's ability to accomplish the user's goals*	highlighting a system option explaining a system feature discussion of the system intent
User-focused nudge	*A prompt that addresses participants' skills, expectations, or situational needs to encourage successful engagement with the system*	confidence-building feedback, encouragement assistance with basic digital literacy, such as using a mouse.

out an interface option or clarifying terminology displayed on the screen. User-focused nudges address participants' skills, expectations, or situational needs to support effective engagement. Examples include encouragement, confidence-building feedback, or assistance with foundational digital actions such as using a mouse.

3 Review of Literature

Conceptually, a 'nudge' has garnered much attention in a variety of domains, in making better decisions without loss of freedom of choice [66]. In the context of our research, nudges are subtle moderator interventions that direct users toward a course of action without eliminating choice [75], in line with the notion of the researcher being an active instrument in the research [22, 72, 79]. In the context of DISs, nudges occur when the system, or, in user studies, a moderator, provides supportive cues, feedback, or scaffolding that enables users to continue their task. Recognizing these moments is especially important for underserved groups such as BC participants, for whom usability barriers may be more pronounced. During user studies, nudges not only prevent participants from stalling or abandoning tasks but also enable richer data collection by sustaining user engagement during the sessions.

Caraban et al. identified 23 nudging mechanisms grouped into six categories, drawing on 15 cognitive biases [8]. These mechanisms include default settings, framing effects, feedback loops, choice architecture, guided search, error prevention, confidence-building feedback, and interface personalization. Subsequent reviews demonstrate that digital nudges have been implemented across domains ranging from recommender systems to e-learning platforms, where they improve decision-making, reduce cognitive load, and enhance engagement [2, 27, 44]. Recommender systems in particular offer fertile ground for digital nudging, as interface cues and personalized suggestions can steer decisions while preserving user autonomy [27]. Sobolev further emphasizes how design and data practices shape digital nudging across contexts such as consumer behavior, health, and the workplace [63].

Despite extensive work on system-implemented nudges, moderator-provided nudges, such as verbal prompts, contextual guidance, or clarification during user study tasks, have received little attention in the HCI literature. These interventions can shape user engagement and performance in ways that are often overlooked in conventional usability session analyses. Wadden et al. found that moderator involvement in online mental health conversations enhanced engagement and encouraged users to confront sensitive topics [71], suggesting the broader potential of facilitator interventions in digital contexts. However, that work focused on mental health communities and not controlled user-study settings, leaving a gap in understanding how moderator-provided nudges serve as a data source in HCI research. This research takes a step in this direction for the HCI community.

Usability plays a key role in the successful adoption and effective use of DIS platforms, which rely on clear interfaces and a simple, straightforward system design [30, 35]. Yet many DISs integrate numerous features, creating complexity that obstructs access to otherwise valuable content [1, 54] and discourages use altogether [41]. Moreover, research on DIS usability has primarily examined WC users [32, 43, 58], with limited attention to BC populations [24, 52]. Prior studies consistently report challenges, such as non-intuitive navigation and inconsistent resource use [21]. Thong et al. [67] reported that perceived ease of use has a strong influence on adoption, especially for individuals with lower technical expertise. Similarly, White et al. [76] observed that novice users frequently experience confusion with technical jargon and unclear navigation paths. Panda and Kaur emphasized the importance of presenting information in accessible and engaging formats [53]. Other studies have similarly noted that some users find DISs overly complex [12, 13], especially when they cannot see how the system aligns with their immediate goals or when language and layout appear excessively academic. Kules and Shneiderman [33] highlighted the importance of guided search, onboarding tutorials, and contextual assistance features, noting their particular usefulness for users with limited digital confidence.

Additional work suggests that DISs often reflect the assumptions and workflows of WC designers, neglecting the information-seeking behaviors of BC workers [37, 42, 43]. When systems do not align with users' online behavior, they are perceived as irrelevant or burdensome. Across these studies, users benefit from design interventions or prompts that steer them toward successful outcomes despite poor information architecture or confusing displays. Such

usability challenges [51] remain central to HCI research [16, 36], particularly efforts aimed at designing inclusive systems for underserved communities [56, 57, 62, 73]. Our research suggests that identifying moderator nudges for participants during user studies can also yield valuable data to enhance the usability of these systems.

Users with lower digital literacy, often working outside WC occupations, may have difficulty formulating effective search queries, interpreting search results, and refining their searches. Marchionini [40] emphasized the cognitive demands imposed by information interfaces, observing that inexperienced users often become frustrated quickly and give up on tasks. Even with the same interface, UX can vary widely. Kous et al. [31] evaluated a library website with college students, working adults, seniors, and researchers, and found substantial differences across these groups. Limited studies on BC users further reveal distinct challenges. Chatman [9] found that custodial workers had precise information needs but engaged in minimal information-seeking activities and rarely used DISs. Xie [78] found that users lacked confidence in selecting appropriate search strategies, leading to uncertainty and frustration. These findings suggest that targeted nudges, such as navigation cues, error-prevention mechanisms, or confidence-building feedback, may be particularly beneficial for BC participants who struggle to articulate or resolve challenges in real-time interactions, thereby making information services more inclusive for underserved populations. We continue and expand this line of inquiry in this research.

While most existing usability research focuses on students and professionals, evidence suggests that BC users face more obstacles and have a greater need for tailored support. This emphasizes the importance of conducting research that explicitly examines and compares nudges across occupational groups. Our study addresses this gap by analyzing moderator nudges during participant interactions with DISs from both BC and WC. Understanding how these groups receive and respond to nudges can extend HCI theory [10] by tailoring models of information behavior to new user populations, and inform practice by generating design recommendations that make more inclusive digital platforms [7, 62] and more supportive user studies [17]. Incorporating BC participants in our research helps address the underrepresentation of non-WC populations in HCI research.

While digital nudges have been explored in other settings, little is known about how they vary across occupational groups or which forms of assistance are most effective. Moderator-provided nudges have received minimal attention in prior HCI research. Likewise, the potential of moderator nudges to improve accessibility and usability for BC users remains underexamined, and few studies investigate how occupational background shapes the reception or impact of DISs. These gaps motivate the present study, which compares the nudges provided by the moderator for BC and WC participants to understand how the occupational context influences usability needs and to inform the design of more inclusive DISs.

4 Methods

4.1 Study Overview and Procedure

We conducted a user study with 86 participants (56 BC and 30 WC) who interacted with two DISs: a website and a native mobile app of a major national library. Each participant attempted five tasks on each platform. Demographic and usability data were collected to provide context for the experiences. We employed think-aloud [18] to capture participants' utterances, and all sessions were recorded and transcribed for analysis [49]. Each participant was greeted individually, provided an overview of the study's purpose, and consented under IRB approval. Participants first completed a brief survey assessing their familiarity with the platforms. They were then counterbalanced to begin with either the website or the mobile app and asked to carry out five routine library tasks (borrow an ebook, borrow an audiobook, return previously borrowed items, locate the library's hours and address, and register for an event), designed with input from subject-matter experts from the library, who emphasized these were common online tasks for patrons. After the first platform, participants then repeated the tasks on the alternate platform (with different titles for ebook/audiobook).

Though not used for the nudge analysis reported here, participants completed five surveys: a *Digital Platform Familiarity Survey* (DPFS) before any web or app tasks, the *System Usability Scale* (SUS) [7] after completion of the website and app tasks, the *Internet Skills Scale* (ISS) [14, 15], and a *Demographic Information Questionnaire (DIQ)*, which included a short interview. Digital proficiency was assessed using the ISS [15], which includes four dimensions: operational skills, information navigation skills, social skills, and mobile skills. Results of these survey instruments are reported in a separate work [1]. The survey instruments are provided to the research community at an Open Science Foundation repository.

The think-aloud protocol was implemented to capture participants' reasoning without interfering with task performance. Participants were instructed to verbalize what they were noticing, thinking, or attempting at each step. Moderators used only neutral reminders (e.g., "please keep talking") when participants fell silent for extended periods, and no moderator feedback was provided during think-aloud utterances. To ensure moderator assistance was consistent across sessions, moderators followed a standard protocol: offering guidance (i.e., nudges) when participants stalled or requested help, and otherwise allowing participants to proceed unaided.

Two trained moderators conducted all user study sessions using an identical procedure. Moderators were assigned to participants based on scheduling availability, with each moderator facilitating sessions across both occupational groups (BC and WC) and both platforms (web and app) to reduce any systematic pairing effects. Both moderators followed a shared, pre-defined facilitation protocol developed before[1] data collection. This protocol specified that nudges could be delivered only under three conditions: (1) when a participant explicitly requested help; (2) when observable task progress stalled (e.g., extended inactivity or repeated unsuccessful actions); or (3) when the continued line interaction risked task abandonment. The lead researcher trained moderators who were unaware of the study hypotheses, were aware of participants' occupational categorization, and consistently implemented the study protocol. Moderators provided the minimal intervention necessary to enable progress. Interventions were phrased as nudges, brief, non-directive prompts but not instructions. Moderators controlled

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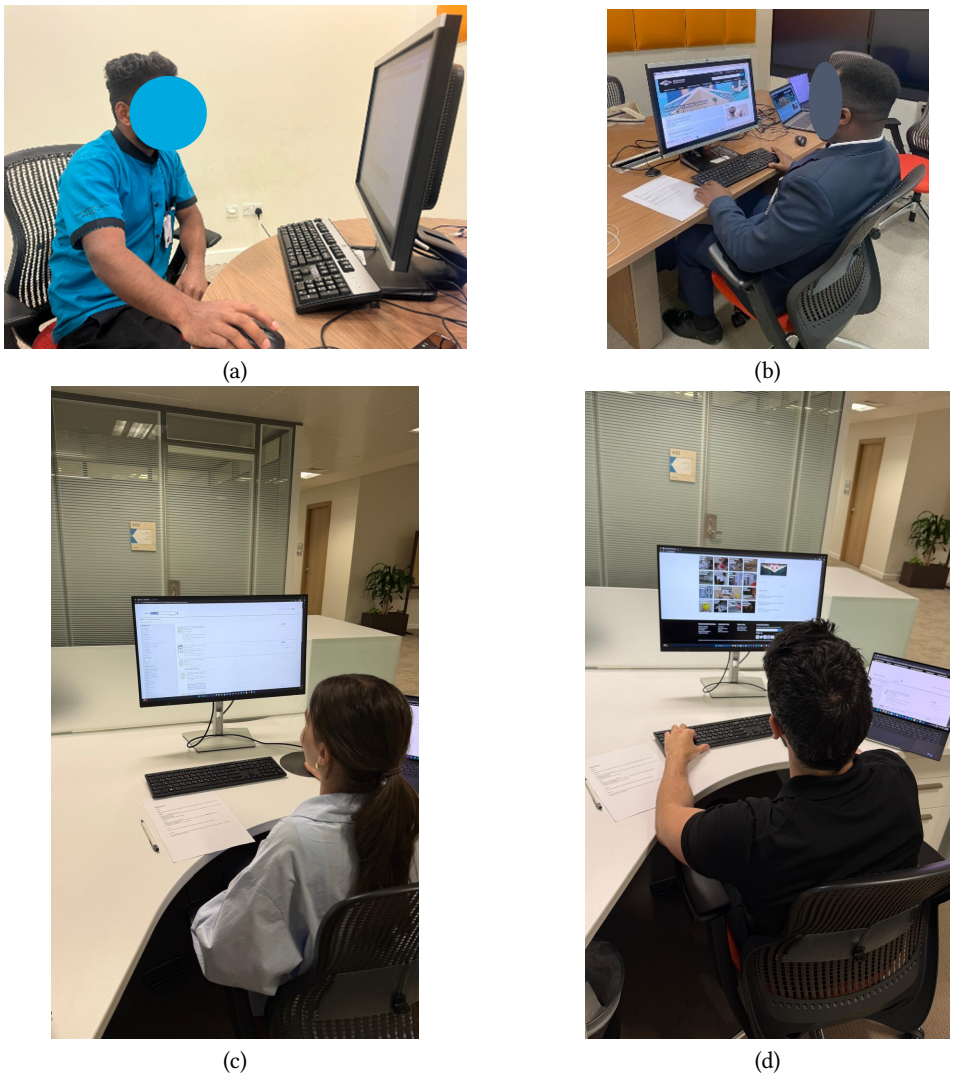


Figure 2: Photographs of participants during the user study, shared with their consent. The images show (a) a janitor, (b) a security guard, (c) a research assistant, and (d) a research intern

the timing and scope of assistance across sessions to ensure consistent delivery of nudges, while allowing participants to retain control.

4.2 Participants

The 56 BC participants were recruited from four companies, and the 30 WC participants were recruited from a research institute. We recruited the BC and WC participants similarly: first obtaining their supervisors' approval, then recruiting both online and in person, with inclusion limited to those who agreed to participate. Sessions took place at participants' workplaces over two weeks, aligning with their work schedules. The national library (i.e., the focus organization) was visible from all workplace locations (see Figure 2, which includes images of BC and WC participants).

4.3 Voice Recordings, Transcripts, and Moderator Observations

Participants were instructed to think aloud throughout the session [49]. All sessions were audio-recorded and transcribed, capturing participant confusion, feedback, navigation behaviors, and brief responses from the end-of-session interviews. A moderator attended all sessions, assisting when necessary and taking field notes on key observations, including verbal and nonverbal reactions, signs of frustration, and moments of confusion. The notes and transcripts together formed a robust dataset; however, the moderator interventions are the core material for analysis. Moderator and participant talk time was quantified to contextualize nudge frequency and account for differences in facilitation intensity across sessions. All transcripts were segmented by speaker (moderator or participant),

Table 2: Categorization of nudges beyond system nudges and user nudges. Note that these nudges subtypes could be applied to both system nudges and user nudges.

Nudge	Definition	Example [P##] refers to the participant receiving the nudge from the moderator
Cognitive Prompt	Prompt to encourage participants to think carefully about the task, reflect on options, or plan their actions, asking them to rethink their approach or utilize familiarity from a previous task.	"Do you think there's another way to find them besides searching, since you're worried you might not be able to find them that way?" [P23]
Error Prevention	Strategies or prompts that help participants avoid mistakes before they occur, such as warnings or tips about potential pitfalls.	"Stop for a moment. Look here, your books are listed. You're moving too fast. You want the ebook version, so check the one that says 'ebook."[P36]
Misconception Correction	Intervention aimed at correcting participants' misunderstandings or incorrect assumptions about how the system works or the task they need to perform.	"You are searching in the catalog box, but this is only for the catalog. You need to search on the main website to find it." [P19]
Misspelling	Nudges correcting spelling errors or guiding participants to type correctly to ensure successful system interaction.	"Put that S at the end there." [P22]
Motor Assist	Support to physically perform actions on the device, such as clicking, scrolling, dragging, or tapping. For some, it involved guiding them in using mice and keyboards.	"If you want to type, you gotta move the cursor in there. Alright, see what's in there now. Now you can type." [P25]
Navigation Cue	Guidance to help participants locate or move through different parts of the digital library interface, such as hints about buttons, menus, or search features.	"Yeah, maybe try the search option here." [P04]
Pace Adjust	Prompts to slow down or speed up participants' actions, helping them maintain an effective task pace.	"Spend a little time looking at the list. Don't just jump." [P11]
Reassurance	Encouragement or confirmation to reduce uncertainty or anxiety, letting participants know they are performing tasks correctly, especially when the moderator notices hesitation.	"OK, now, don't overthink these. Just got our first reaction." [P12]
Task Understanding	Explanations or clarifications aimed at helping participants understand the goals, steps, or rules of a task.	"Return it. Yes, exactly. Exactly because the library wants their books back." [P04]

and word counts were computed separately for each session, distinguishing between moderators and participants. Talk time [80] was operationalized as the proportion of total session words spoken by the moderator, providing a normalized measure that accounted for variation in session length across participants. This measure was included because nudge delivery is inherently tied to moderator verbosity; reporting talk time enables interpretation of nudges relative to interactional load and avoids conflating higher assistance needs with longer or more verbal sessions.

4.4 Nudge Annotation and Coding

A nudge is a gentle way of steering users towards a specific action without limiting their choices. Table 2 presents the categories of identified nudges. These were derived through thematic analysis. [4, 5, 29] followed by axial coding [77], which grouped codes according to their presumed underlying causes. Coding proceeded inductively across all transcripts, with two researchers independently reviewing moderator exchanges line by line to identify any intervention that enabled task progress. Codes were initially descriptive and grounded in the interactional context (e.g., navigation guidance, reassurance, motor support), without using a predefined taxonomy. Through iterative comparison, overlapping codes were merged, yielding a codebook that captures recurrent forms of nudging.

The nudge types identified in this study extend prior (primarily digital) nudging frameworks by operationalizing them in a moderator-participant user study context. *Cognitive Prompts* reflect guided decision-making and reflection mechanisms [8]. *Error Prevention* builds on anticipatory constraint and feedback design to reduce user mistakes [50]. *Misconception Correction* relates to feedback loops for recalibrating user mental models [75]. *Misspelling* relates to input validation and error-recovery mechanisms [47]; *Motor Assist* extends accessibility interaction support for physical input actions [61]. *Navigation Cue* aligns wayfinding support [33]. *Pace Adjust* reflects temporal scaffolding to regulate interaction flow and cognitive load [19]; *Reassurance* corresponds to confidence-building feedback mechanisms to sustain engagement [8]. Finally, *Task Understanding* aligns with instructional scaffolding for clarifying goals and procedural steps [70].

In the subsequent axial coding phase, these initial codes were grouped based on their underlying focus: whether they addressed system affordances or user capabilities. This process explicitly

linked the interventions identified through open coding to the conceptual structure used in the analysis. The resulting categories distinguish between system-focused and user-focused nudges, with distinct subtypes under each. The analysis drew on session transcripts with the following base fields: Participant ID, Timestamp, Speaker, Message, and Session Phase (intro, task, interview, conclusion). We added three extra columns for annotation: Nudge (Y/N), Nudge Type (System/User), and Refers-to Subtype. The subtype labels could be used for both kinds of nudges. The unit of analysis in this study was the moderator's utterances (not the participants). Participant utterances were used as contextual grounding to interpret why a nudge occurred, but they were not themselves coded as nudges. This analytic focus reflects the study's aim to examine moderator intervention as a response to participant struggles [28].

We group nudges into two main types: system-focused and user-focused. *System-focused nudges* draw attention to functional interface elements or make specific actions easier, such as pointing out an interface feature or clarifying on-screen terminology. *User-focused nudges* respond to participants' skills, expectations, or immediate needs, offering support through encouragement, confidence-building feedback, or assistance with basic digital actions, such as using a mouse. We conduct a comparative mixed-methods analysis of moderator nudges between occupation (BC vs. WC) and platform (web vs. app), supported by simple counts to identify overall patterns. We combined insights from session transcripts and moderator notes, organizing the findings around our research questions.

- **Volume and rate**: counts per session, per minute, and per 100 moderator words (normalizing by moderator verbosity in each session).
- **Mix:** proportion of System- vs. User-focused nudges, and subtype distributions, by occupation and platform.
- **Temporal placement:** nudge density by session phase (intro/task/interview/conclusion) and along task timelines.
- **Sequences**: common two-step nudge sequences (e.g., Navigational Cue → Reassurance).
- **Outcome linkage**: proximity of a nudge to immediate progress signals in the transcript (e.g., successful navigation step, completion confirmation), and triangulation with task-level outcomes as reported previously.

Two researchers jointly discussed coding criteria and then calibrated on a stratified subset of approximately 10–15 sessions, balanced by occupation and platform, to establish a common baseline before coding independently. Inter-rater reliability was assessed using Cohen's Kappa (κ), which accounts for chance agreement [11] and is typically interpreted following Landis and Koch [34]. Agreement was good for identifying the presence of a nudge ($\kappa \approx 0.90$) and substantial for distinguishing between system- and user-focused families ($\kappa \approx 0.76$). Subtype classifications achieved moderate agreement ($\kappa \approx 0.73$), reflecting the interpretive complexity of differentiating fine-grained forms of assistance. All disagreements were resolved through discussion, and the finalized dataset reflects a consensus coding approach.

5 Results

5.1 Participant Characteristics

BC participants were predominantly 25–34 years old (M = 34, SD = 6.96), primarily male (n = 48, 85.5%), mostly Android users (n = 43, 76.4%), and had limited prior awareness or use of the library's digital services (n = 54, 96.4%). WC participants were mainly between 18 and 24 years old (n = 28, 93.3%), were nearly evenly split by gender (male n = 16, 53.5%; female n = 14, 46.7%), were largely iPhone users (n = 24, 80.0%), and were generally familiar with DISs (n = 22, 73.3%). These contrasts situate differences in digital familiarity, expectations, and assistance needs (see Table 3).

5.2 Task-Related and Exploratory Results of User Study

Success rates differed significantly between groups: Among BC participants using the website, 35.7% (n = 20) completed none of the tasks, and only 39.2% (n = 22) completed four or more of the five tasks. On the app, 21.4% (n = 12) did not complete any tasks, whereas 50.0% (n = 28) completed four or more. Only 14.2% (n = 8) completed tasks on both platforms, while 12.5% (n = 7) were unable to complete any tasks on either platform. In contrast, 93.3% (n = 28) of WC participants completed all website tasks, and 96.7% (n = 29) completed all app tasks. Overall, BC participants tended to be unsuccessful on both platforms, whereas WC participants were nearly uniformly successful. **A one-way between-subjects ANOVA comparing success rates confirmed a significant difference between groups at $p < .05$ [$F(1, 85) = 44.73$, $p < 0.0001$], with WC participants performing significantly better.**

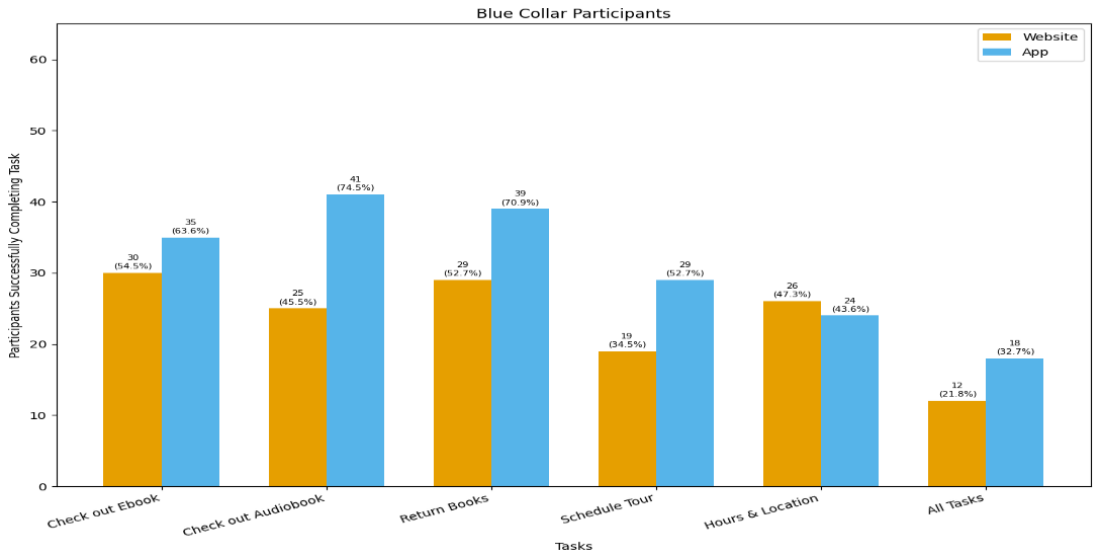
The lower task success rates among BC participants are likely due to difficulties with interface comprehension and navigation, as well as unfamiliarity with digital library terminology, as indicated by the nudges needed. In contrast, the high performance of WC participants suggests that they are more comfortable and familiar with digital tools and can adapt quickly when solving problems across different platforms. This pattern is consistent with prior research showing that users with limited digital experience often require additional support to complete tasks that appear straightforward to experienced users [69]. The fact that BC participants did slightly better on the app suggests that the simpler mobile workflows may make it easier for newcomers to use (see Figure 3).

Moderator and participant talk time highlights disparities across occupational groups. In both conditions, moderators spoke more than participants; however, the imbalance was far greater in BC sessions. Moderators contributed 84.35% of the total talk in BC sessions compared to 58.52% in WC sessions (see Figure 4).

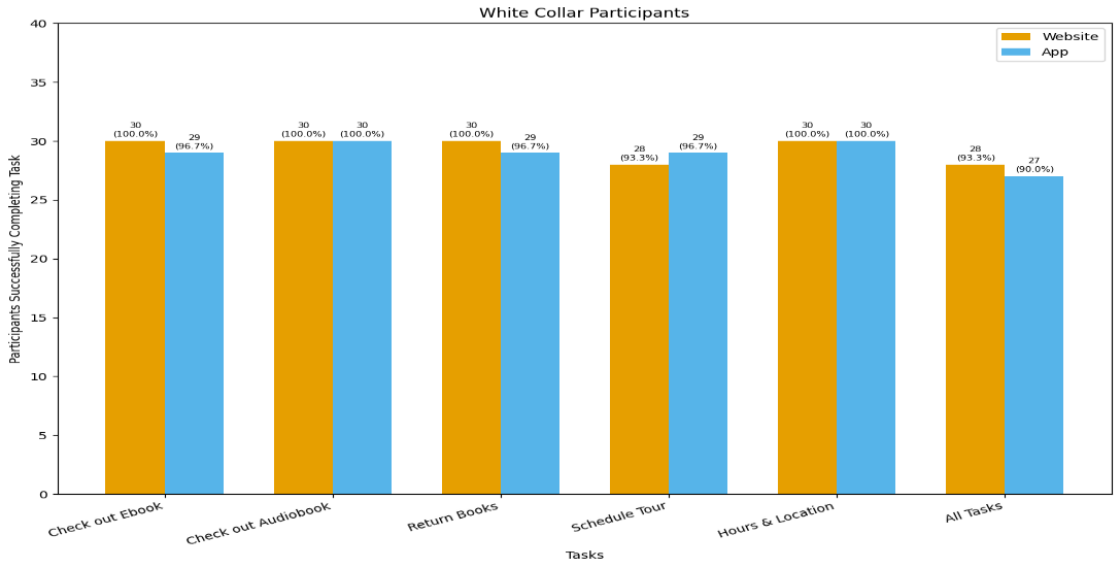
Moderator notes indicated that BC participants were hesitant to talk and required repeated prompting to engage in thinking aloud. They also required many more nudges to complete session tasks, highlighting the additional effort needed to facilitate usability studies with BC participants. These conversational differences highlight differences in confidence, familiarity, and cognitive load between the groups. BC participants' limited verbal contributions may be due to uncertainty about how to express their thoughts, discomfort speaking aloud, mental strain, or low confidence. In contrast, the greater verbal engagement of WC participants reflects both greater

Table 3: Participant demographics.

Characteristic	BC Participants	WC Participants
Age	Predominantly 25–34 years (n= 28, 50.0%)	Mainly 18–24 years (n = 28, 93.3%)
Gender	Primarily male (n = 48, 85.5%)	Nearly gender balanced (male n = 16, 53.5%; female n = 14, 46.7%)
Primary Device	Mostly Android (n = 43, 76.4%)	Mostly iPhone (n = 24, 80.0%)
Digital Library Experience	Limited prior use/awareness (n = 54, 96.4%)	Generally experienced (n = 22, 73.3%)
Language Fluency	Fluent in the study language	Fluent in the study language



(a)



(b)

Figure 3: Distribution of task completion success for website and app tasks. (a) represents blue-collar participants, (b) represents white-collar participants. In Figure 2(b), although most white-collar participants were successful overall, a couple completed only 4 of 5 tasks on both platforms.

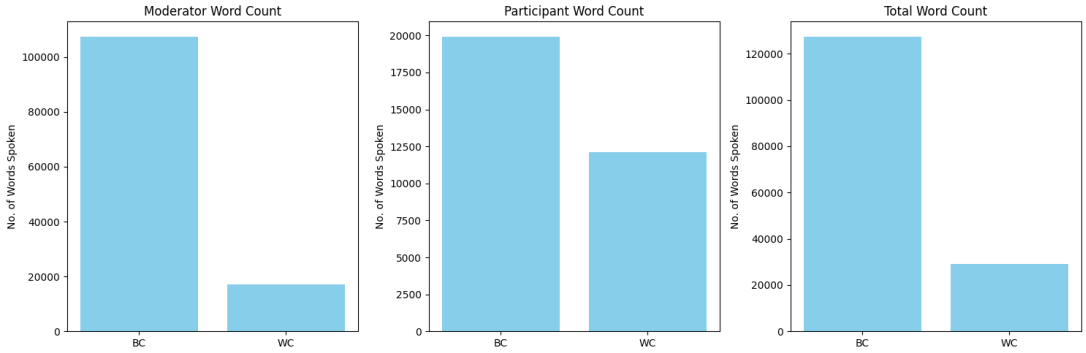
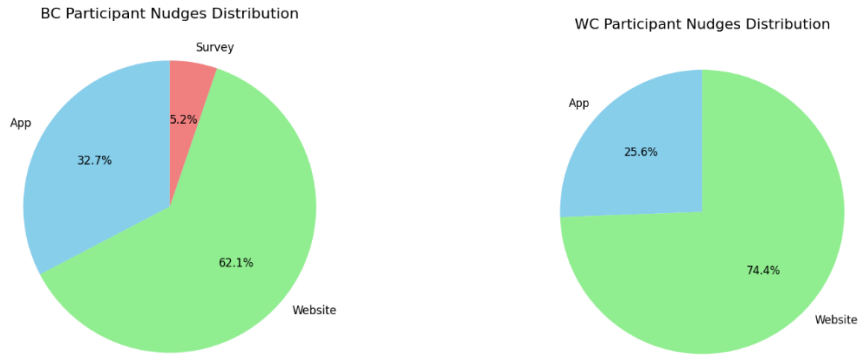


Figure 4: Word count analysis for BC and WC groups for moderator, participant, and total (combined) word counts.



(a) (b)

Figure 5: Distribution of nudges for BC participants on the left (a), and for WC participants on the right (b). App nudges provided participants with moderator assistance while they used the app. Website nudges were when the participants were using the website. Survey nudges were assistance provided by the moderator while the participants completed one of the study surveys.

familiarity with using digital tools and greater ease in explaining their reasoning aloud. The findings suggest a need for adaptive moderator strategies that support engagement, particularly for BC participants, without affecting task outcomes.

Moderator-provided nudges differed noticeably by occupational group. For BC participants, moderators issued 919 nudges in total. Of these, 300 (32.6%) occurred while participants used the app, 570 (62.0%) while using the website, and 48 (5.2%) while completing the survey; one additional nudge (0.1%) occurred outside segments that could be attributed to a specific platform. In contrast, WC participants received 43 nudges: 11 (25.6%) on the app and 32 (74.4%) on the website, with none during the survey. Overall, moderators provided about 21 times as many nudges to BC participants as to WC participants (see Figure 5).

The volume and distribution of nudges suggest that BC participants encountered significantly more challenges on the website than on the app. This may be due to the website's higher information density, more complex navigation, and less intuitive task flows. The presence of survey-related nudges (absent among WC participants) suggests that structured input tasks posed additional difficulty for some BC users. These patterns align with earlier findings on task success, in which BC participants performed better on the app, reinforcing the idea that usability barriers differed by platform. For WC participants, the low overall number of nudges indicates high task competence. The slightly higher number of website nudges compared to app nudges suggests minor navigation challenges but not barriers to success. The absence of survey nudges further shows greater familiarity and ease with structured digital input. Collectively, these findings show that user studies are interactive processes in which moderator interventions respond to and reveal participant difficulties. Nudges make moments of struggle visible, offering a rich source of insight for HCI research. They also emphasize design implications, including the need to simplify web interfaces and improve consistency across platforms, as well as insights for conducting user studies with BC participants. According to the moderators' observations, participants received nudges in the helpful intended spirit. Participants typically acknowledged the nudge (either verbally or by following through)

and proceeded with the task with no hesitation or observable resistance. There was no disruption to the task flow following nudges (which brought participants back on track), suggesting that nudges served as intended facilitative scaffolding.

5.3 Nudges for BC and WC Participants

Addressing RQ1 (*What types of nudges do blue-collar workers require when using digital information services?*), of the 919 nudges for BC participants, 737 (80.2%) were system-related nudges, and 182 (19.8%) were user-related (see Figure 5), with the number and percentage of each nudge type shown in Table 3. BC participants struggled primarily with:

- Navigation (n=726, 79.0%) ("Yeah, maybe try the search option here." [P04])
- Motor Assistance (n=79, 8.6%) ("If you want to type, you gotta move the cursor in there. Alright, see what's in there now. Now you can type." [P25], "If you move the mouse around, it goes left, right, up, and down. Now click right here, and keep the cursor steady." [P08])
- Misconception Correction (n=35, 3.8%) ("You are searching in the catalog box, but this is only for the catalog. You need to search on the main website to find it." [P19])
- Error Prevention (n=18, 2.0%) ("Stop for a moment. Look here, your books are listed. You're moving too fast. You want the ebook version, so check the one that says 'ebook'." [P36], "Yeah, you don't search, it doesn't work for this task." [P56])
- Cognitive Prompts (n=16, 1.7%) ("Do you think there's another way to find them besides searching, since you're worried you might not be able to find them that way?" [P23])
- Reassurance (n=13, 1.4%) ("OK, now, don't overthink these. Just got our first reaction." [P12])
- Task Understanding (n=12, 1.3%) ("Return it. Yes, exactly. Exactly because the library wants their books back." [P04])
- Misspellings (n= 12, 1.3%) ("Put that S at the end there." [P22], "You got a misspelling" [P27])
- Pace Adjusts (n=8, 0.9%) ("Spend a little time looking at the list. Don't just jump." [P11]). We note that the quotes are the moderator nudges, and the [P] represents the participant to whom the nudge was directed.

Addressing RQ2 (*How do these nudges for blue collar users compare to those required by white-collar users?*), in comparison, the WC participants had only 43 expressions of nudges, with 43 (100.0%) being system-related, and none (0.0%) being user-related (see Figure 6 above). WC participants got the most moderator nudges regarding:

Navigation (n = 27, 62.8%) ("Maybe try to click on to access digital title." [P121])

Misconception Correction (n = 12, 27.9%) ("You don't need to write the whole thing." [P122])

Cognitive Prompts (n = 3, 7.0%) ("Did you try looking in the account?" [P125]

Task Understanding (n = 1, 2.3%) ("You're trying to return these books" [P122])

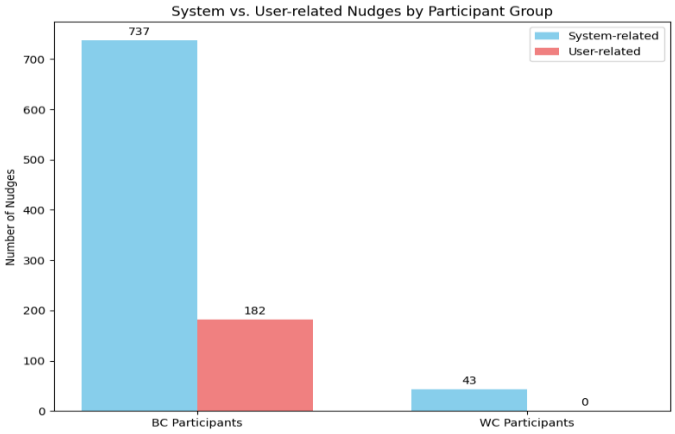


Figure 6: Distribution of system vs. user-related nudges by participant group.

This comparison shows differences in the cognitive load between the two groups. While WC participants encountered minor system-related challenges, the absence of user-related nudges suggests that their task difficulties were almost exclusively interface-driven and not stemming from fundamental misunderstandings or motor skill limitations. BC participants received a large volume of nudges overall, with the majority being system-related, while a smaller proportion reflected user-related struggles. In comparison, WC participants expressed far fewer nudges, all of which were system-related, with no evidence of user-related challenges.

Addressing RQ3 (*How can moderator nudges enhance insights garnered during user studies?*), the findings suggest that nudges are not incidental interruptions but integral signals of users' difficulty engaging with digital systems. The contrast between BC and WC participants highlights a digital divide: BC participants experienced more frequent breakdowns, progressed more slowly, and relied heavily on nudges to complete basic tasks. These nudges illuminate both the location and nature of usability barriers, providing insights that might otherwise go unnoticed in studies that focus only on completed actions or error counts (see Table 4).

Overall, the analysis of nudges suggests that moderator–participant interactions actively influence the trajectory of task completion, generating data on cognitive load, help-seeking behavior, and interface comprehension. Moderator nudges, especially when compared across occupational groups, inform about structural inequities in digital access and fluency. The high frequency of both system- and user-focused nudges among BC participants helps identify areas where interface assumptions fail, where instructions lack clarity, and where digital skills are not sufficiently supported. These nudges expose overlooked design flaws, such as overly complex navigation, dense layouts, or jargon-heavy terminology, and pinpoint the types of scaffolding required for successful engagement. They also reveal emotional and cognitive dynamics, such as hesitation, confusion, or reliance on reassurance, which are typically absent from quantitative usability metrics.

Table 4: Categorization of nudges with the number of occurrences and percentages for both BC and WC participants.

Nudge	# BC	% BC	# WC	% WC
Cognitive Prompt	16	1.7%	3	7.0%
Error Prevention	18	2.0%	0	0
Misconception Correction	35	3.8%	12	27.9%
Misspelling	12	1.3%	0	0
Motor Assist	79	8.6%	0	0
Navigation Cue	726	79.0%	27	62.8%
Pace Adjust	8	0.9%	0	0
Reassurance	13	1.4%	0	0
Task Understanding	12	1.3%	1	2.3%
	919	100.00%	43	100.00%

Importantly, nudges convert what might otherwise be moments of failure into moments of learning for researchers. Without moderator intervention, many BC participants would have stalled or withdrawn, resulting in little usable data and potentially masking systemic design shortcomings. Because nudges enable participants to continue, they create opportunities to observe deeper interaction patterns and identify redesign priorities. Analyzing nudges thus moves HCI research beyond documenting whether users complete tasks to understand how they persist, where they falter, and what forms of intervention are necessary for equitable participation. This reframes moderator support as a methodological asset that surfaces usability challenges and advances more inclusive design and not a contamination of user behavior studies.

6 Discussion and Implications

6.1 Interpreting the Findings

Our results show apparent differences in the kinds of intervention needed by the two occupational groups when user studies are viewed as interactive sessions and not sterile, detached measurement studies. BC participants required far more moderator involvement and a distinct mix of nudges compared to WC participants. Moderators also spoke significantly more often in BC sessions, indicating that ongoing intervention was necessary to keep the tasks moving forward. Instead of treating these prompts as noise or interference, which might be common in an idealized version of user studies, our framing positions moderator nudges as meaningful indicators of misalignment between system design and user expertise. The timing, frequency, and type of nudges (i.e., who needs them, when, and for what purpose) provide a lens into the practical challenges participants face and the kinds of support that help them complete tasks [6, 20]. These interaction patterns reveal where navigation breaks down, where assumptions about literacy or terminology fail, and where gaps in confidence or comprehension interrupt engagement. In this light, nudges are not deviations from idealized study behavior, but empirical evidence of the support people need to use systems equitably.

The most significant difference is in the types of nudges used. BC sessions featured a high prevalence of user-focused interventions, including Motor Assistance, Reassurance, and Pace Adjustment. These nudges required moderators to normalize confusion, slow the pace, break tasks into smaller steps, and support even fundamental interactions. In sharp contrast, WC participants required no user-focused nudges. While WC sessions still involved assistance, it was almost exclusively system-focused, primarily Navigational Cue, indicating that participants were comfortable exploring the interface and only needed light directional nudges to stay on track. This finding reflects broader dynamics documented in digital nudging research, where just-in-time guidance is practical only when users already possess a baseline level of confidence and digital fluency [6]. It also aligns with HCI work on design marginalization, which shows that hidden affordances, opaque labels, and domain-specific terminology disproportionately impede users with different digital histories or lower perceived competence [20]. The absence of user-focused nudges in WC sessions should not be viewed as an indication of a lack of support, but evidence that system design and participant expertise were more closely aligned. In contrast, the density and type of nudges in BC sessions expose both usability breakdowns and the scaffolding required to prevent disengagement.

Revisiting the RQs, the findings show that BC and WC users require different forms and intensities of assistance when interacting with DISs. For RQ1, BC participants required substantially more nudges overall, including a large share of user-focused interventions. These nudges, such as reassurance, pacing, and motor assistance, functioned as interpersonal scaffolding, enabling participants to stay engaged long enough for system-level issues to emerge. Without this support, many usability breakdowns would likely have gone undocumented.

The predominance of navigation-related nudges points to the importance of spatial orientation and menu design for BC participants. Motor assistance nudges indicate that some struggled with basic interactions such as cursor control and text entry, revealing accessibility barriers. Misconception correction and cognitive prompts further indicate misunderstandings of task goals or instructions, suggesting mismatches between the system design and users' prior knowledge. These patterns suggest that the challenges faced by BC participants stem from both interface complexity and limited digital skills. All 56 BC participants required some form of nudge to complete at least one task. Without moderator intervention, many would have been unable to proceed, resulting in lost opportunities to observe participant-system interaction. When annotated systematically, nudges not only enable task completion but also yield additional UX data that would otherwise remain inaccessible.

For RQ2, WC participants primarily benefited from system-focused nudges that clarified labels, highlighted interface elements, or facilitated navigation. Their higher baseline familiarity and confidence meant that fewer nudges were needed to maintain task flow, and nudges served to fine-tune progress. Across both groups, nudges operate as usability insights instead of disruption to a user study or something to be avoided in such studies. The presence, timing, and type of nudges expose where embedded supports, such as more precise terminology, progressive guidance, mobile-native onboarding, or micro-feedback, could reduce friction for real-world users [6, 20].

Addressing RQ3, moderator-participant interaction reflects broader inequities in access to digital support. Prior research shows

that both the availability and quality of help are unevenly distributed across socioeconomic groups [23]. Our findings extend this insight to the micro-context of usability sessions, demonstrating that BC participants' ability to progress often depends on nudges that compensate for limited digital confidence or experience. Viewing user studies as consequential interactional settings reframes the moderator's role: nudges are not contaminants to be bracketed out. Nudges are empirical observations of the scaffolds that real users require. Treating nudges as data reveals where support must be embedded, enabling DISs to move toward equitable states in which essential guidance is designed into the system, not supplied ad hoc in the testing room.

6.2 Theoretical Implications

Researchers often treat the lab as a neutral or contaminant-free environment; our findings position moderator nudges as theoretically meaningful data on user-system interaction. The classification of these nudges reveals that occupational background can identify distinct assistance profiles, with BC and WC participants eliciting different types and frequencies of interventions. This provides a theoretical contribution to HCI by reframing moderator nudges as signals of system-user misalignment and not artifacts to be avoided. Nudges surface where design assumptions break down, where cognitive or interactional scaffolds are required, and where future redesign efforts should concentrate. In this way, moderator nudges become an analytic lens through which usability challenges and inequities can be systematically understood and addressed.

Occupational usability lens. This research advances understanding of moderator-participant interaction in user studies by demonstrating how occupational background shapes the nudge profiles that emerge. We leverage occupation as a contextual analytic lens [39]; we do not employ it as a causal determinant. Factors such as confidence, digital expectations, and prior technology exposure likely underlie variations in nudge distributions; we did not disentangle these factors in this study. An advantage of using occupation is its practical observability in real-world settings, making it a useful proxy for other factors that are otherwise difficult to measure directly. The findings support integrating occupational background into usability and UX/UB theory, as patterns in nudge intensity and composition reflect differences in confidence, digital expectations, and prior technology exposure. Accounting for these factors extends existing HCI models beyond assumptions of default digital competence and supports the development of an occupational usability lens that explains variation across user groups. Our analysis shows that BC participants required significantly more nudges overall, primarily driven by user-focused interventions such as motor assistance, reassurance, and pacing. In contrast, WC participants required system-focused nudges, such as navigation cues and clarification of task elements.

Nudges as a HCI UX construct. Nudges observed during user studies can be conceptualized along two dimensions: nudge intensity (i.e., the extent of moderator prompting required for participants to progress) and nudge composition (i.e., the relative balance of user-focused versus system-focused support). Framing nudges in this way positions moderator interventions as analytically meaningful, offering a structured lens for theory-building in HCI [38]. This perspective aligns with earlier work demonstrating that moderator behavior systematically produces outcomes in usability testing [39], suggesting that interaction is an integral part of the empirical phenomenon and not noise to be minimized. Moderator-to-participant interventions indicate where systems fail to support users effectively. Nudges reveal the dependencies between interface design and user background, showing when and how intervention is necessary to maintain task continuity. Treating nudges as usability insights enhances explanatory models of usability by exposing the system-user gaps. For the HCI community, this perspective repositions user studies from passive observation to active analysis of support needs, placing nudges as a core construct in understanding UX and informing inclusive design.

Advancing inclusive design theory. The findings contribute to inclusive design theory by demonstrating how DISs are often implicitly tailored to the literacies, expectations, and workflows of WC users, while marginalizing BC users through hidden affordances, specialized terminology, and brittle interaction patterns [20]. Viewing nudges as diagnostic signals makes these disparities legible and translatable into actionable scaffolds, such as simplified onboarding, more precise language, and progressive guidance, which reduce barriers for users with lower digital confidence while enhancing usability for all. This direction aligns with calls to embed equity into HCI as a foundational principle [1, 6, 20]. In this framing, user studies are not neutral test beds but interactional contexts, and the nudge patterns that surface within them serve as critical evidence for how systems should allocate support across occupational groups.

6.3 Practical Implications

Treating the user study as an interactional space, not a sterile, scripted setting, recasts moderator-participant exchanges as design relevant signals. Because BC participants required both more frequent and qualitatively different nudges than WC participants, these interventions can be leveraged and productized in the design of digital services [6] to improve UX. However, incorporating such scaffolding must be done in ways that do not reinforce inequities or diminish user agency [20, 44].

Designing online systems with embedded assistance: The system-focused nudges observed, such as Navigational Cue and Correcting Misconception, translate directly into interface improvements, including more labels and help microcopy [35], visible and persistent search entry points, progressive disclosure for complex workflows, inline definitions for domain-specific terms, confirmatory micro-feedback, and recoverable error paths. User-focused nudges, such as Motor Assistance and Pace Adjustment, signal the need for mobile-native onboarding, simplified interaction patterns, chunked multi-step flows, larger touch targets, and affordances that lower the risk of exploration. Together, these interventions embed assistance into the system architecture and remove it from' just the lab' [6, 27], providing actionable guidance for addressing design for BC populations [20]. Designing and testing DISs with these insights form nudges support on-screen improved usability for all users while materially lowering barriers for those with less digital confidence [1, 6, 20, 27, 44, 45]. Embedded nudges do have potential risks; they can increase cognitive load and disrupt task

flow. Prior work on digital nudging points to nonintrusive interventions [44, 75]. To mitigate these risks, digital nudges should be adaptive and user-controllable via dismissible prompts, for example, ensuring support is available when needed without frustrating users.

Using nudges as evaluation data, not noise. For HCI practice, assistance in user studies should be treated as measurable. Designers and researchers can standardize help protocols by logging nudges, normalizing them by session duration and proportion of moderator–participant talk, categorizing nudges by type and subtype, and identifying where they cluster during task flows. Metrics such as assistance intensity and assistance mix should be complemented by traditional usability measures, such as task success and time-on-task, to inform redesign. Moderator training should incorporate calibrated nudging protocols, including consistent thresholds for when and how to intervene, and the use of shared nudge libraries to ensure comparability across sessions and studies [45].

Ethical considerations in nudging. Nudges exchanged between moderators and participants can reveal not only usability breakdowns but also organizational inequities in who receives help, when, and in what form. Treating assistance as an embedded design feature raises ethical responsibilities around transparency, agency, and fairness. Operationalizing nudges requires safeguards to avoid coercive defaults, protect user autonomy, and monitor for disparate impacts during implementation and rollout [44]. Assistance should not obscure underlying design flaws, mask exclusionary assumptions, or differentially burden certain groups. Establishing nudge protocols in user studies is therefore not only a methodological concern but an ethical one. Even when subtle, moderator nudges can shape user behavior, influence participants' decision-making processes, and raise questions about user agency. We controlled for this in this study. Moderators provided minimal, non-directive prompts. These nudges can be both helpful for collecting UX data, but we recognize that such interventions can still influence user trajectories. Consistent criteria for when to intervene, how to intervene, and how interventions are recorded help ensure that participants are supported without being steered or silenced.

7 Strengths, Limitations, and Future Work

A key strength of this study is its focus on the nudges required by BC participants, a group that remains underrepresented in HCI and digital systems research [1, 74]. The fact that we recruited participants from multiple organizations and conducted the study in workplace contexts helps reflect the real-world conditions under which BC users typically engage with digital services, often with limited time, support, or digital confidence [1, 6]. Including WC participants provides a direct occupational contrast, making visible how nudges differ in frequency, form, function, and dependency across user populations. Methodologically, analyzing moderator interventions through the lens of nudging is another significant strength. Whereas prior studies have emphasized mainly breakdowns or error points, this approach foregrounds the supportive actions that enabled participants to continue engaging with the system. This shift provides insight into how digital scaffolds can be designed to reduce friction and promote inclusion [3, 27, 44].

Further, the study advances HCI by examining moderator-provided nudges, an aspect of user studies that is typically overlooked or treated as contamination, as insightful UX data. By treating facilitation as an empirical resource, the research demonstrates how in-session interventions can identify design mismatches and translate them into system-level supports.

Some limitations temper these contributions. First, the study focuses on a single national library's website and mobile application, which may limit transferability to other domains such as e-government portals, workplace platforms, or health and financial services systems [32, 41, 52]. The nudge needs identified here may manifest differently in environments with distinct task structures, stakes, or design conventions. Second, categorizing participants into broad occupational groups (BC and WC) risks masking within-group variability. Differences in age, education, language proficiency, and prior digital experience can influence how nudges are needed, received, and interpreted [1, 23, 74]. Future work could refine these categories or incorporate intersecting demographic variables to better capture nuance.

Third, nudges were identified retrospectively from transcripts, which may introduce potential bias. Variations in facilitator style, timing, and conversational framing may have contributed to both the frequency and the form of nudges recorded [45]. Similarly, the think-aloud protocol and the moderator's presence may have inflated certain types of interventions or suppressed others [42]. Power asymmetries may exist in user study sessions. Participants may perceive moderators as authority figures, shaping responses to nudges; however, viewing the power relationship as one-way (moderator to participant) is simplistic. Participants exercise meaningful authority (as the research depends on their cooperation), and they can accept, ignore, or reinterpret nudges as they see fit. Though outside the scope of this study, future work should examine moderator and participant positionality to disentangle these effects.

Finally, the study's recruitment context, rooted in a specific sociocultural and organizational setting, along with gender imbalances among the BC participants, might limit the generalizability of the findings. Different institutional expectations, linguistic norms, or workplace cultures may shape when and how nudges become necessary [55, 56]. Cross-context and cross-cultural replications would help test the robustness of these patterns and extend the occupational usability lens across settings.

Future research can extend these findings in several directions. First, design-based studies should translate moderator-derived nudges, such as navigation cues, reassurance, and error-prevention prompts, into embedded interface features and evaluate their impact through controlled experiments [3, 27, 64]. This would test whether in-room scaffolds can be productized as on-screen support without overburdening or constraining users. Second, the equity implications of digital nudges require deeper examination. Interventions intended to reduce friction may, if poorly designed, reinforce divides in literacy, language, or access [23, 57, 62]. Evaluating who benefits from different nudge types and who may be excluded or over targeted is essential to ensuring nudges do not become a new site of inequity. Third, segmentation within occupational categories warrants closer analysis. Differences among younger versus older workers, migrants versus locals, or novice versus digitally experienced users may shape how nudges are required, perceived, and

enacted [1, 65, 74]. Examining these intersections would refine the occupational usability lens and account for intra-group diversity.

Fourth, regarding participants' responses to nudges (which we did not formally investigate), future research should examine how users interpret, accept, or resist nudges more effectively to better understand their impact on agency and user experience. These future implementations should account for how moderator discretion and underlying power dynamics may shape intervention patterns, particularly when implicit expectations differ across participant groups. Ultimately, longitudinal and cross-domain research is necessary to evaluate the durability and adaptability of nudge effects. Studies in contexts such as e-government portals, workplace systems, and public service platforms can test how nudges scale across settings and whether their benefits persist over time [32, 56, 78].

Additionally, it would be interesting to conceptualize moderator nudges as human-in-the-loop support, with real-time assistance complementing system design to enable task completion. Findings from our study indicate that human intervention can serve as an adaptive layer of technology support, raising essential questions about integrating and scaling such nudge support into hybrid human–system assistance in digital environments.

Overall, by situating nudges as context-sensitive forms of digital support, this study contributes to the ongoing conversation on inclusive design in HCI. Our analysis complements prior work on pain points [25]. Shifting attention from barriers to the interventions offers a new perspective on how digital services can be designed to better support both BC and WC users. Importantly, by demonstrating the value of moderator-provided nudges, the study not only surfaces a neglected area of HCI inquiry but also points toward new design opportunities for translating real-time facilitation into sustainable, embedded features within digital library systems. Positioning nudges as context-sensitive forms of digital support contributes to broader conversations on inclusive design in HCI. This perspective reframes moderator assistance as actionable evidence of where systems fail to provide sufficient guidance and how they might be redesigned to better support both BC and WC users. We also demonstrate the analytical value of moderator-provided nudges, which could yield new opportunities for integrating real-time facilitation into system design. Translating these in-session scaffolds into interface-level supports, such as progressive guidance, clarifying microcopy, or built-in reassurance, can strengthen the accessibility and inclusiveness of digital library systems. In doing so, nudges become not just a moderator practice but a design resource for advancing equitable digital experiences.

8 Conclusion

This research investigates the benefit of nudges during user studies by examining how BC and WC users experience DISs differently when the user study is treated as an interactional space and not a sterile environment. We analyzed moderator nudges (i.e., subtle, choice-preserving prompts during sessions) and found that nudges were more prevalent and differently composed for BC participants than for WC participants. Framing these nudges as valuable signals for HCI research and not noise (or something to be avoided) aligns with digital-nudging scholarship that advocates the benefits of just-in-time guidance. The value of nudges during user studies also aligns with broader efforts to prevent digital design marginalization. Identifying nudge patterns unique to occupational groups can assist HCI practitioners in more effectively incorporating the needs of BC users into the design and evaluation of DISs (e.g., mobile-native onboarding, clearer terminology, progressive guidance) and in refining moderator procedures for underserved populations in future user study protocols. In sum, this work extends the field of usability evaluation by introducing nudges as design variables for research and practice in inclusive information systems.

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