



# Navigating Interface Issues: A Comprehensive Review and Analysis

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## *Abstract*

This comprehensive literature review navigates the complex landscape of interface issues, encompassing user interface design, human-computer interaction (HCI), and usability challenges across diverse digital environments. By synthesizing a wide array of research findings, theoretical frameworks, and empirical studies, this review offers a comprehensive analysis of interface issues prevalent in contemporary digital platforms. The review employs a systematic search strategy across various academic databases and search engines, utilizing keywords and controlled vocabulary to identify relevant literature. Screening and selection processes rigorously apply inclusion/exclusion criteria to ensure the inclusion of studies aligned with the review's focus. Data extraction involves the development of a structured form to capture essential details from selected studies, facilitating the synthesis and analysis of key findings. Through this review, common themes, trends, and emerging perspectives in interface design and HCI are identified, shedding light on current challenges and proposing avenues for future research and practical implications. This review serves as a valuable resource for researchers, designers, and practitioners seeking to navigate interface issues and enhance user experiences in digital environments.

**Keywords:** interface issues, user interface design, human-computer interaction (HCI), usability challenges.

## 1. Introduction

The paper reviews how software usability can be enhanced for users with limited computer literacy by extracting user interface design principles (Darejeh & Singh, 2013). It identifies three key user groups requiring special attention: elderly users, children, and individuals with mental or physical limitations (Huppert, 2003). By comparing previous research, commonalities in user interface needs are identified, leading to the extraction of principles such as reducing feature complexity, avoiding technical terms, and providing customization options (Dudley & Kristensson, 2018). Implementing these principles can address usability issues and increase user satisfaction for individuals with less computer literacy.

Additionally, it highlights the increasing complexity of human-computer interfaces due to rapid digital technology advancements (Lance et al., 2012). Users of digital interactive products need to continuously learn various interfaces, programming languages, and environments. The question arises whether complaints about bad interaction design stem from

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product design flaws or users' lack of understanding of human-machine interaction logic (Huang, 2009). Moreover, it highlights the concept of User Interfaces for All in Human-Computer Interaction, emphasizing the need for computational environments that cater to a broad range of human abilities, skills, and preferences. It challenges the traditional approach by advocating for proactive design strategies to address the diverse needs of users (Stephanidis, 2001).

Finally, introducing the interactive service-based applications, the concept of service composition and different types of services, including conventional, software, and hybrid services. It highlighted the influence of Web2.0 technologies in enabling end users to participate in web development and emphasized the move towards the internet of services (Namoune, Wajid & Mehandjiev, 2009).

### 1.1 *Research motivation*

Interfaces are the main point of contact between users and technology in the modern digital age, impacting user experience, productivity, and general satisfaction (Bias & Mayhew, 2005). However, there are a lot of obstacles that come with designing and implementing interfaces, from usability problems to accessibility concerns. In order to obtain a solid grasp of the current problems, new trends, and creative solutions, it is imperative that the literature on interface-related topics be thoroughly examined (Schulz, 2018).

This study attempts to identify critical factors influencing interface effectiveness and usability across a range of domains, including software applications, websites, mobile devices, and interactive systems (Zahabi, Kaber & Swangnetr, 2015), by critically analyzing and synthesizing the abundance of research available. The goal of the research is to provide useful insights that can guide the design and development of more user-friendly and intuitive interfaces by identifying frequent errors and best practices.

Additionally, the study aims to further interface design theory and practice by addressing the gaps and limits in existing information. The ultimate objective is to make it easier to create interfaces that improve user engagement, productivity, and pleasure; this will raise the standard of human-computer interaction experiences in both personal and professional settings.

### 1.2 *Research methodology*

When undertaking a systematic exploration of interface-related literature, it is imperative to employ a structured methodology, which includes distinct steps such as search strategy formulation (Aromataris & Riitano, 2014), screening and selection of relevant studies (Lefebvre et al., 2019), and thorough data extraction and synthesis (Li, Higgins & Deeks, 2019), as illustrated in the Table 1 below.

Table 1. Research Methodology

Step	Description	Reference
<b>Search Strategy</b>	Identifying relevant databases and search engines such as IEEE Xplore, ACM Digital Library, PubMed, and Google Scholar. Developing comprehensive search strings using a combination of keywords and Boolean operators (e.g., "user interface design" AND "human-computer interaction"). Utilizing controlled vocabulary where applicable to improve search precision (e.g., MeSH terms for PubMed). Setting clear inclusion criteria based on publication date range, language, study design, and relevance to interface issues. Documenting the search strategy including the	Aromataris & Riitano, 2014

	databases searched, search strings used, and any filters or limits applied for transparency and reproducibility.	
<b>Screening and Selection</b>	Screening the search results based on titles and abstracts to identify potentially relevant studies. Applying predefined inclusion and exclusion criteria to assess the eligibility of each study. Retrieving the full texts of potentially relevant studies for further evaluation. Conducting a detailed assessment of each full-text article to confirm its alignment with the review's focus on interface issues. Resolving conflicts or discrepancies in study selection through discussion or consultation with a third reviewer.	Lefebvre et al., 2019
<b>Data Extraction</b>	Developing a structured data extraction form to systematically capture relevant information from selected studies. Pilot-testing the extraction form on a subset of articles and refine it as necessary to ensure completeness and consistency. Independently extracting data from each selected study using the finalized extraction form, recording details such as author(s), publication year, study design, sample characteristics, key findings, and theoretical frameworks. Verifying the accuracy and consistency of extracted data through cross-checking and resolving any discrepancies through consensus or reference to the original studies. Organizing the extracted data into a comprehensive dataset, grouping it by relevant categories or themes identified during the review process.	Li, Higgins & Deeks, 2019

## 2. Thematic analysis

### 2.1 *Software usability for users with less computer literacy*

According to Darejeh and Singh (2013), it is important to recognize cognitive changes in elderly users, such as memory and information processing issues, when designing user interfaces. Furthermore, the review by Belda-Medina and Kokošková (2023) underscores the necessity of creating intuitive interfaces for children that align with their preferences, such as employing visual elements and interactive features to enhance engagement. Additionally, Hasan (2020) emphasizes the significance of enhancing accessibility for users with physical or mental limitations by integrating features like screen reader compatibility, customizable options for font and color, and clear navigation paths to cater to diverse user needs and improve overall usability.

On the other hand, Darejeh and Singh (2013) assert that the principles for user interface design for users with less computer literacy should emphasize simplifying interactions by reducing feature complexity, ensuring interfaces are intuitive without requiring extensive exploration, and employing larger components for improved visibility. Moreover, Kalbach (2007) advocates for avoiding technical jargon and providing customization options for font, color, and size to enhance user experience. Finally, Tidwell (2010) suggests that incorporating descriptive texts aids understanding, particularly for elderly and visually impaired users, while incorporating engaging graphical objects like avatars or icons increases software appeal, especially for children and users with cognitive challenges.

### 2.2 *Challenges in HCI design for mobile devices*

Challenges in HCI design for mobile devices revolve around hardware limitations such as small screens and weight constraints, which hinder the effective presentation of information. These constraints force designers to find creative solutions to optimize user interactions within the limited space available on mobile interfaces (Huang, 2009). Additionally, software challenges like hierarchical menus and navigation issues arise due to the small screen sizes of mobile devices, making it challenging to organize and present information efficiently (Ziefle & Bay, 2006). Despite the limitations imposed by the devices' portability requirements, designing for portability forces

designers to innovate and build user-centered solutions that improve the usability and functionality of mobile interfaces (Kuniavsky, 2010).

On the other hand, as users need simple mobility, Kuniavsky (2010) contends that designing for portability is crucial for mobile devices. The constraints of small screens and limited resources present significant hurdles in effectively displaying information on these devices. Therefore, interaction design must focus on meeting user needs and ensuring usability to enable seamless navigation and interaction with content on mobile interfaces (Billinghurst & Starner, 1999). This user-centered approach is critical for developing intuitive, user-friendly interfaces that cater to the varied requirements of mobile device users, enhancing their overall experience and satisfaction with the technology (Lowdermilk, 2013).

### *2.3 User interfaces for all*

User Interfaces for All represents a groundbreaking concept within Human-Computer Interaction, advocating for the development of computational environments that accommodate a broad spectrum of human abilities, skills, requirements, and preferences (Stephanidis, 2001). This paradigm challenges the conventional one-size-fits-all approach by endorsing proactive design strategies that proactively anticipate and cater to the needs of diverse user populations. Such an approach underscores the significance of crafting interactive software that is accessible and usable by all users across various contexts, thereby emphasizing the necessity for interfaces to exhibit adaptable and adaptive behaviors to effectively accommodate different user groups (Fuglerud, 2014).

Nevertheless, HCI Challenges encapsulate the ever-evolving landscape of Human-Computer Interaction, especially in the context of the Information Society (Ho et al., 2009). These challenges revolve around the imperative to adapt to the escalating reliance on computer-mediated activities, transitioning from mere productivity tools to integrated environments accessible to all. Designing for a heterogeneous user base, encompassing individuals with disabilities or varying abilities, presents intricate complexities necessitating innovative solutions and methodologies to ensure the usability and accessibility of interactive systems for all users (Shneiderman, 2000). The ongoing discourse and research endeavors in HCI underscore the dynamic nature of the field, emphasizing the criticality of addressing emerging challenges to augment the effectiveness and inclusivity of interactive systems.

### *2.4 Interactive service-based applications*

The Interactive service-based applications introduce the concept of service composition and various service types, including traditional, software, and hybrid services. They emphasize the influence of Web2.0 technologies, enabling end users to engage in web development and transitioning towards the internet of services (Namoune, Wajid & Mehandjiev, 2009). The review investigated into users' mental frameworks regarding service composition, aiming to grasp their beliefs and expectations (Namoune, Wajid & Mehandjiev, 2009). It explored users' attitudes towards innovative service leveraging, identifying risks like privacy concerns and benefits such as increased efficiency (Pearson, 2013). Ultimately, the objective was to bridge the gap between users' mental models, associated risks, and benefits to enhance user-friendly service composition tools and practices (Desolda, Ardito & Matera, 2017).

The findings from the review revealed that users have diverse mental models regarding service composition, with varying beliefs and expectations when combining services (Kang, Dabbish, Fruchter & Kiesler, 2015). Users showed a willingness to innovate and leverage services creatively but expressed concerns about privacy and data security risks. Additionally, users

perceived benefits such as increased efficiency and customization when engaging in service composition (Trischler, Pervan, Kelly & Scott, 2018).

To address concerns regarding service composition, one proposed approach involves raising user awareness about associated benefits and risks (Kamari, Corrao & Kirkegaard, 2017). Another suggestion is to simplify the composition process with user-friendly tools and guided support, catering to users with varying technical skills (Lizcano, Alonso, Soriano, & Lopez, 2011). Finally, implementing quality standards and testing procedures can mitigate risks and enhance user confidence in utilizing such technologies effectively (Zhao, Loucopoulos, Kavakli & Letsholo, 2019).

### 3. Findings and results

The table 2 below presents a comprehensive analysis of key findings in various thematic areas within Human-Computer Interaction (HCI). It synthesizes significant insights gathered from recent literature, shedding light on important discoveries and trends in interface design, usability challenges, and interactive technologies.

Table 2. Findings in human-computer interaction thematic areas

Thematic Area	Findings	Reference
Software Usability for Users with Less Computer Literacy	<ul style="list-style-type: none"> <li>• Cognitive changes in elderly users, such as memory and information processing issues, should be recognized in interface design.</li> <li>• Design principles should focus on reducing feature complexity and avoiding technical jargon.</li> <li>• Providing customization options enhances user experience.</li> <li>• Descriptive texts aid understanding.</li> </ul>	Darejeh & Singh (2013); Kalbach (2007); Tidwell (2010)
Challenges in HCI Design for Mobile Devices	<ul style="list-style-type: none"> <li>• Hardware limitations like small screens and weight constraints hinder effective presentation of information.</li> <li>• Designing for portability necessitates innovative solutions to enhance usability despite constraints.</li> <li>• Mobile interfaces should focus on meeting user needs and ensuring usability.</li> </ul>	Huang (2009); Kuniavsky (2010); Billinghurst & Starner (1999)
User Interfaces for All	<ul style="list-style-type: none"> <li>• Computational environments should cater to a broad range of human abilities and preferences.</li> <li>• Proactive design strategies are essential to address the needs of diverse user populations.</li> </ul>	Stephanidis (2001)
HCI Challenges	<ul style="list-style-type: none"> <li>• The field of HCI faces challenges in adapting to the escalating reliance on computer-mediated activities.</li> <li>• Designing for a heterogeneous user base requires innovative solutions to ensure usability for all users.</li> </ul>	Ho et al. (2009); Shneiderman (2000)
Interactive Service-based Applications	<ul style="list-style-type: none"> <li>• Users have diverse mental models regarding service composition, with varying beliefs and expectations.</li> <li>• Users perceive benefits such as increased efficiency and customization in service composition.</li> </ul>	Namoune, Wajid & Mehandjiev (2009); Pearson (2013)
	<ul style="list-style-type: none"> <li>• Raising user awareness about associated benefits and risks is crucial.</li> <li>• Simplifying the composition process with user-friendly tools and guided support empowers users with varying technical skills.</li> <li>• Implementing quality standards and testing procedures can mitigate risks and enhance user confidence.</li> </ul>	Kamari, Corrao & Kirkegaard (2017); Lizcano, Alonso, Soriano & Lopez (2011); Zhao, Loucopoulos, Kavakli & Letsholo (2019)

#### 4. Contribution and future research

##### 4.1 *Contribution*

By combining important data from several theme areas, this study makes a substantial contribution to the field of Human-Computer Interaction (HCI) by providing insightful information on interface design principles, usability issues, and new trends. It enhances the understanding of interface-related issues and highlights areas for improvement in HCI theory and practice. The comprehensive examination of interface usability for users with limited computer literacy, challenges in HCI design for mobile devices, user interfaces for all, and interactive service-based applications provides a solid foundation for informing the development of more intuitive and user-friendly interactive systems. Additionally, the study's structured methodology sets a precedent for future research endeavors in HCI, emphasizing the importance of systematic approaches to examining interface-related literature and extracting actionable insights.

##### 4.2 *Future research*

Moving forward, future research in HCI could explore several promising avenues to build upon the findings presented in this study. Firstly, there is a need to investigate advanced interface design techniques that leverage emerging technologies such as augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) to enhance user experiences and accessibility. Secondly, researchers could focus on developing user-centered design methodologies that facilitate greater user involvement in the design process, ensuring that interfaces truly meet the needs and preferences of diverse user groups.

Cross-cultural interface adaptation represents another promising area for future exploration, with studies examining the cultural factors influencing interface usability and effectiveness, and strategies for adapting interfaces to different cultural contexts. Additionally, there is a growing need to address ethical considerations in interface design, particularly concerning issues such as privacy, data security, and algorithmic bias, to ensure that interfaces uphold ethical standards and respect users' rights and values. Longitudinal studies tracking users' interactions with interfaces over time could provide valuable insights into how usability, satisfaction, and engagement evolve, identifying opportunities for continuous improvement.

Finally, research focusing on accessibility and inclusive design practices can further advance the field by exploring best practices for designing interfaces that are accessible to users with disabilities, promoting inclusivity for all users.

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