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INTERFACE DESIGN BASED ON COGNITIVE LOAD THEORY

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Abstract

Purpose of the Article. This study aims to substantiate the principles of interface design based on cognitive load theory, with a focus on balancing the reduction of excessive perceptual complexity and providing users with control capabilities in situations of uncertainty or conflicting outcomes. **Research Methods.** The methodological foundation is cognitive load theory, which distinguishes between intrinsic, extraneous, and germane load. The study employs comparative analysis of scientific publications, international accessibility standards (particularly WCAG 2.2), and modern software solutions oriented toward inclusive and adaptive design. **Scientific Novelty.** For the first time, practices for reducing cognitive load in web application interfaces are systematized from the perspective of combining extraneous load minimiza-

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ДИЗАЙН ІНТЕРФЕЙСУ НА ОСНОВІ ТЕОРІЇ КОГНІТИВНОГО НАВАНТАЖЕННЯ

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Анотація

Мета статті. Дослідження має на меті обґрунтувати принципи дизайну інтерфейсу на основі теорії когнітивного навантаження, з акцентом на баланс між зниженням надмірної перцептивної складності та наданням користувачам можливостей контролю у ситуаціях невизначеності чи суперечливих результатів. **Методи дослідження.** Методологічну основу становить теорія когнітивного навантаження, яка розрізняє внутрішнє, зовнішнє та релевантне навантаження. У роботі використано порівняльний аналіз наукових публікацій, міжнародних стандартів доступності (зокрема WCAG 2.2) та сучасних програмних рішень, орієнтованих на інклюзивний і адаптивний дизайн. **Наукова новизна.** Вперше систематизовано практики зменшення когнітивного навантаження в ін-

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tion with the integration of user control tools. Recommendations are proposed for designers and developers regarding the implementation of inclusive interface adaptation mechanisms, including tools based on artificial intelligence. **Conclusions.** Influence on intrinsic cognitive load is primarily achievable through the optimization of system messages, button texts, and hints, whereas user-generated content remains beyond the designer's control. Excessive cognitive load can be reduced by adhering to standards for font size, line spacing, contrast, and clear visual structure. At the same time, parameters such as font choice or color scheme yield contradictory results and largely depend on users' individual cognitive characteristics and prior experience. The optimal approach involves implementing personalization and adaptability mechanisms, allowing each user to set a comfortable level of complexity and find a balance between simplicity and functionality.

Keywords:
cognitive load, interface design, user experience (UX), cognitive load theory, inclusive design, artificial intelligence.

терфейсах вебзастосунків з позиції поєднання мінімізації зовнішнього навантаження з інтеграцією інструментів користувацького контролю. Запропоновано рекомендації для дизайнерів і розробників щодо впровадження механізмів інклюзивної адаптації інтерфейсів, зокрема засобів на основі штучного інтелекту. **Висновки.** Вплив на внутрішнє когнітивне навантаження передусім досягається через оптимізацію системних повідомлень, текстів кнопок і підказок, тоді як користувацький контент залишається поза контролем дизайнера. Надмірне когнітивне навантаження можна зменшити дотриманням стандартів розміру шрифтів, міжрядкового інтервалу, контрасту та чіткої візуальної структури. Водночас параметри, як-от вибір шрифту чи колірна схема, дають суперечливі результати й значною мірою залежать від індивідуальних когнітивних особливостей і попереднього досвіду користувачів. Оптимальним підходом є впровадження механізмів персоналізації та адаптивності, що дозволяють кожному користувачеві встановити комфортний рівень складності й знайти баланс між простотою та функціональністю.

Ключові слова:
когнітивне навантаження, дизайн інтерфейсу, користувацький досвід (UX), теорія когнітивного навантаження, інклюзивний дизайн, штучний інтелект.

Introduction 1

In today's digitalized environment, the interfaces of computer programs, applications, and web platforms play a crucial role in enabling effective user interaction with information. However, the oversaturation of screen space with text blocks, navigation tools, and interactive elements often leads to excessive cognitive load, which can negatively affect performance and data perception quality. According to cognitive load theory, excessive complexity reduces the effectiveness of learning and decision-making. At the same time, overly simplified interfaces deprive users of essential control tools, creating a fundamental functional dilemma: how to strike a balance between usability and functionality for diverse user groups – both novices and experienced users. The relevance of this issue lies in the need to explore design principles that simultaneously reduce cognitive load and provide control mechanisms in situations of uncertainty or conflicting outcomes.

2 Research Objective

The objective of this study is to identify and describe effective design solutions for interfaces that reduce users' cognitive load while simultaneously enabling them to manage the interaction process in cases where the effects of these solutions are ambiguous.

3 The methodology and analysis of sources

The analysis of interface design approaches aimed at facilitating information perception is grounded in cognitive load theory, developed within the fields of pedagogy and instructional design by G. Miller (1956), J. Leppink, and A. van den Heuvel (2015), and R. Duvivier (Leppink & Duvivier, 2016).

According to this theory, cognitive load is divided into three types. Intrinsic cognitive load is inherent to the task or subject itself – for example, when a person interprets the meaning of words in a text. The second type, extraneous cognitive load, arises from the way information is presented and directly relates to design. Poor visual hierarchy, inappropriate font choices, incorrect line spacing, or insufficient text contrast contribute to unnecessary cognitive strain. The third type, germane cognitive load, emerges during the process of storing information in long-term memory, when text is transformed into knowledge (Jordan et al., 2019).

According to cognitive load theory, the primary resource for acquiring new knowledge is working memory – a system that temporarily holds and manipulates information (Sweller, 2011). It has extremely limited capacity and, in typically healthy individuals, can retain about seven elements simultaneously for approximately 20 seconds. All three types of cognitive load simultaneously compete for the limited resources of human working memory. Therefore, an excess of one type of load affects the others, significantly reducing the user's available cognitive capacity. For example, when reading a complex scientific text that requires intense concentration to decode words and their meanings, a reader may "read" the page but retain no memory of its content (Mayer & Moreno, 2003).

High cognitive load impairs people's ability to comprehend written information or learn effectively. Its impact is especially pronounced in individuals with dyslexia (Norton et al., 2015). The process of recognizing the visual form of letters and words, which occurs automatically in typical readers, requires significant cognitive effort in dyslexic individuals. As a result, the visual characteristics of text have a noticeable impact on word recognition ability (Munzer et al., 2020).

To assess how effectively interface or textual design facilitates reading, quantitative metrics are used. The simplest indicator is reading speed (time taken to read a given text), where increased speed reflects reduced cognitive effort required for text decoding. However, deeper insights are provided by eye-tracking methods – recording and analyzing eye movements during reading or interface interaction. Eye-tracking technology monitors gaze trajectories and

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allows researchers to evaluate specific difficulties in content perception based on several parameters:

- number and duration of fixations, when the gaze lingers on a specific word;
- saccade characteristics, referring to eye movements between fixations (Toki, 2024).

Digital platforms are increasingly adopting AI-based solutions to support reading, aligning with the principles of the zero interface approach – a concept that enables users to interact with computer systems without relying on visual interfaces. This idea was specifically examined in the article "Graphical and zero-based approaches in hybrid interfaces of mobile applications" (Pavliuk & Salyha, 2025). One prominent example of such interface implementation is text-to-speech (TTS) technology, which converts written content into spoken language. These tools allow users to listen to text instead of reading, thereby enhancing comprehension and reducing cognitive load during reading tasks (*AI and accessibility*, 2024). However, in the context of this study on cognitive load in interface design, the transformation of text into audio is excluded from analysis, as the research focuses exclusively on visual interaction mechanisms.

4 Research Findings

The challenge of balancing cognitive load is particularly acute in interface design. It is often addressed through a compromise between minimalist page layouts with extensive text and functional interfaces that require numerous detailed elements. Excessive simplification can lead to what is known as "hidden cognitive load," where users expend mental effort searching for functions that have been concealed for the sake of visual simplicity. One of the critics of minimalist interfaces is Advait Sarkar, who argues that an overemphasis on simplicity and usability may limit the potential of software. Therefore, effective design should be functionally minimalist, where simplicity is achieved by removing unnecessary elements – not by hiding essential ones (Sarkar, 2023).

Interfaces of computer programs – especially those designed for professional use – typically contain an excessive number of available functions. Personalization of the workspace allows users to configure the arrangement of windows and panels for more convenient operation. Users can reorder, pin, unpin, hide, and add panels, as well as collapse them into icons to optimize space (Fig. 1). Additionally, they can adjust the user interface scale and create custom workspaces by saving the current panel layout and menu settings for quick future access. This flexibility enables individuals to tailor the interface to their specific needs and working style.

At the same time, there is a significant difference in how interfaces are used by professional versus casual users. Professionals tend to expand both their workspace and technical capabilities – for more efficient work, they may connect multiple additional displays, increase screen size, and scale the interface to accommodate the maximum number of necessary functions.In contrast, casual users typically require only basic functionality. This creates divergent interaction models – ranging from highly functional, multitasking-oriented setups to simplified ones that support basic needs.

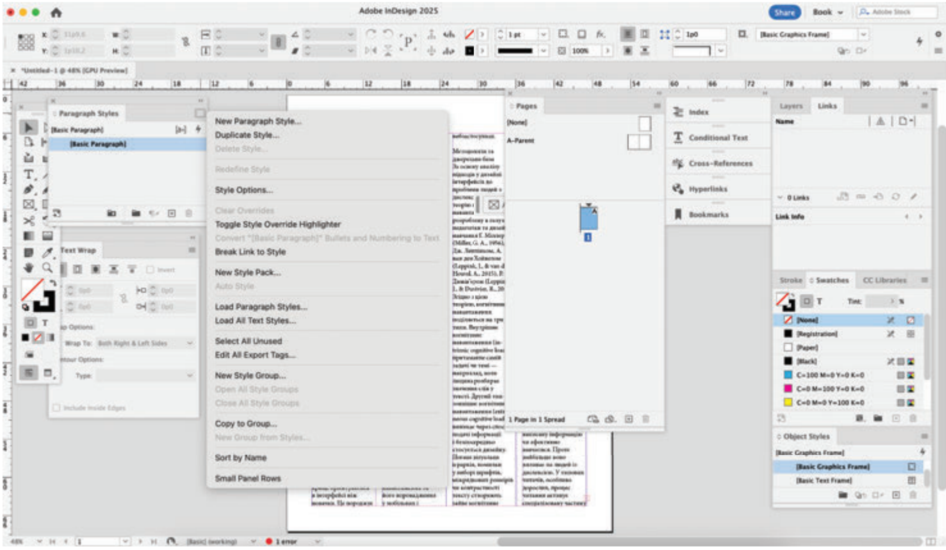

Fig. 1. Adobe InDesign 2025 interface showing open panels and contextual menu.

Рис. 1. Інтерфейс Adobe InDesign 2025 із відкритими панелями та контекстним меню.

A similar approach is used in web applications that allow users to open and close functional parts of their interface. A common pattern is the collapsible navigation panel, which serves as a tool for reducing cognitive load by decreasing the number of visible elements on the page. Removing the sidebar also helps expand the main working area of the interface. It can be minimized into a thin bar with icons that continue to function as a menu – though without text – as seen in Gmail. Alternatively, navigation can be hidden entirely, as in the interfaces of AI chat platforms such as Copilot, ChatGPT, Gemini, Claude, and others. In such cases, whenever users need to switch to another section, they must first open the panel (Fig. 2). Progressive disclosure supports presenting users only with the information needed at the current stage of interaction. This approach reduces working memory overload and promotes better content comprehension (Rosenfeld et al., 2015). Instead of displaying all complex functionality at once, the interface can hide secondary or rarely used options in additional screens or expandable elements.

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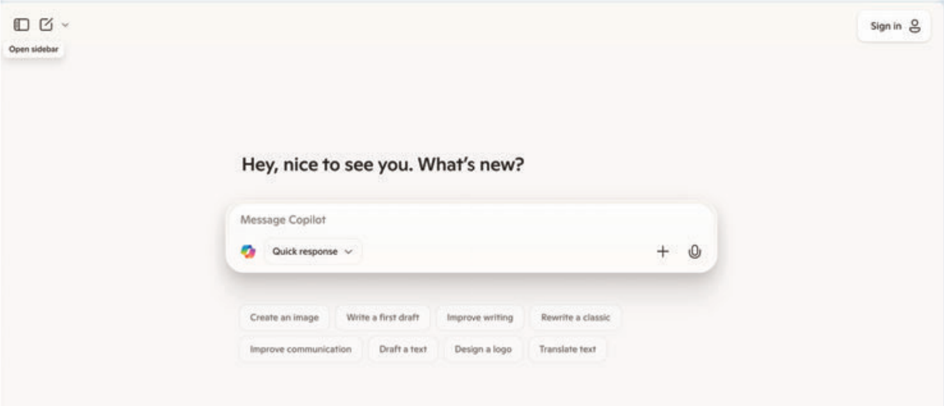

Fig. 2. Copilot interface with collapsed navigation panel. Screenshot taken on September 29, 2025.

Рис. 2. Інтерфейс Copilot із згорнутою панеллю навігації. Знімок екрана зроблено 29 вересня 2025 р.

Reducing intrinsic cognitive load in interfaces often requires intervention in the content itself, which is not always within the designer's domain. Website texts are typically authored by content writers. However, applications contain many other types of textual information. In particular, system texts – such as error messages, tooltips, and hints – play a crucial role in the interface. The optimization of such text is handled by specialists known as UX writers (Portmann, 2022).

Text processing often involves simplifying vocabulary to enhance accessibility. Complex terminology demands additional effort to decode messages, so it is advisable to use commonly understood language. Complex sentences significantly hinder text comprehension, as they increase cognitive load by forcing the reader to hold multiple semantic threads in working memory simultaneously (Graesser et al., 2011). In contrast, simple sentences containing approximately 7–14 words are considered optimal for quick and easy understanding. For instance, studies show that when the average sentence length is around 14 words, readers comprehend over 90% of the content, whereas increasing the length to about 43 words drops comprehension below 10% (*Readability*, 2022). Therefore, when creating UX and interface texts, it is recommended to use short, structured sentences, avoid complex constructions, and strive for clarity of expression.

Efforts to optimize intrinsic cognitive load should be focused where interface developers can actually influence this factor. However, in many applications, designers only define the general style of textual messages, while the content itself is generated by users and can vary widely. For example, in social networks and messaging platforms, users publish their own texts and engage in conversations. The complexity of these messages lies beyond the control of designers.

The development of artificial intelligence, particularly large language models, enables users to automatically adapt text to their needs. For example, in Notion.so, users can highlight text and "ask" to simplify the language, shorten it, or extract key points. They can also apply custom text instructions or ask questions about the selected content. In the Opera browser, a built-in AI assistant allows users to generate a concise version of any webpage, ask questions about its content, and more (see Fig. 3). Currently, such features are available only upon user request, but it is likely that tools for automatic content adaptation will soon emerge – translating text into more accessible language, avoiding complex terminology and long sentences, etc.

These technologies are already being implemented by leading companies. For instance, Microsoft has integrated the GPT-4 language model into its Bing search engine and Edge browser, allowing users to receive summarized information directly in search results. Google is testing its own approach – Search Generative Experience – where AI-generated answers appear above the list of results, providing users with a quick overview of key facts from various sources.

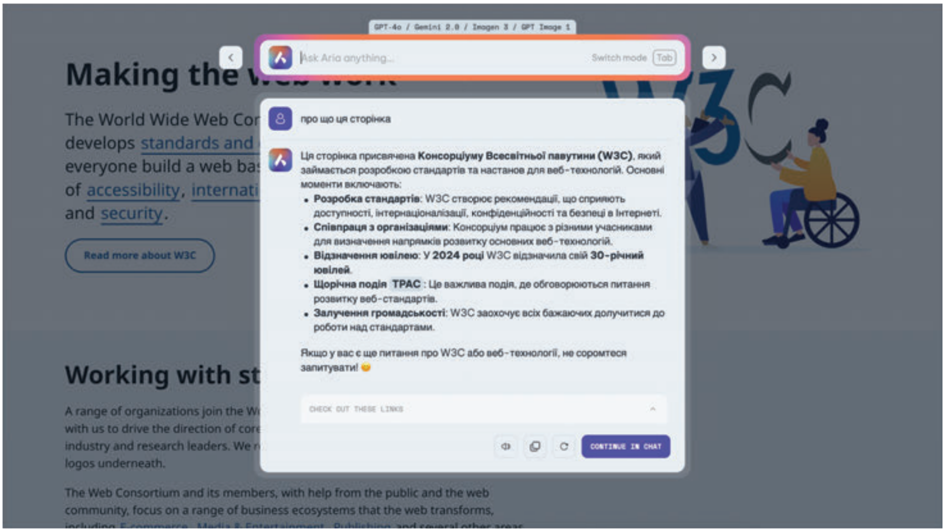

Fig. 3. Opera browser interface (version: 122.0.5643.51) with the Aria AI assistant generating a summary of an article. Screenshot taken on September 25, 2025.

Рис. 3. Інтерфейс браузера Opera (версія: 122.0.5643.51) з помічником Aria AI, який генерує резюме статті. Знімок екрана зроблено 25 вересня 2025 р.

By using large language models, users may no longer need to visit websites containing information – they can instead rely on the optimized response text provided by AI. This condensed synthesis

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of information from multiple sources, delivered in a single message, is particularly convenient due to its low intrinsic cognitive load. Rather than reading several articles on a topic – written in complex, unoptimized language – users receive a compact and personalized text tailored to their needs.

Researchers have documented the emergence of this new user behavior pattern, primarily evidenced by a sharp decline in organic traffic to many websites (Fishkin, 2024). According to recent data, nearly 60% of Google search queries now end without the user clicking through to any external website – so-called zero-click searches. Analysts predict that traditional search traffic may decline by another 25% in the coming years, as more users turn to AI chatbots and virtual assistants for answers instead of conventional search engines (Goodwin, 2024).

The next stage in interface design can be seen as the integration of artificial intelligence for adaptability and personalization. While most current tools for text simplification or information summarization are manually activated by users, a promising direction is the creation of interfaces that dynamically adjust to the user's level of expertise, cognitive characteristics, and current tasks. In such a model, AI acts as a mediator between the complex structure of a digital product and the individual needs of the user. The generation of user-oriented content – whether personalized or customized – reduces cognitive load and effectively meets the individual needs of consumers (Hrozna, 2017). The system can automatically regulate the density of information presentation, select an appropriate level of terminology, offer alternative formats (text, audio, visualizations), and adapt the interface to the user's available device – from a small smartphone screen to multi-monitor professional setups.

Thus, the integration of AI becomes a logical extension of cognitive load theory, enabling not only the reduction of unnecessary cognitive burden but also the individual balancing of simplicity and control in human–system interaction. This approach resonates with the concept of the "smart book," which integrates artificial intelligence tools into publishing products, making educational materials personalized and accessible to diverse categories of users (Sytnyk, 2025).

Reducing extraneous cognitive load in interfaces depends significantly on the choice and styling of the font used to convey textual information. The Nielsen Norman Group, a leading UX research organization, has conducted extensive studies on screen readability. They outline several key principles that enhance text legibility:

1) use a large default font size and allow users to increase it. Small text is inconvenient for everyone, especially individuals with visual impairments;

2) ensure high text contrast, providing a clear distinction between text and background colors. A plain, solid background is preferable, as patterns can interfere with letter recognition;

3) choose a simple typeface, avoiding decorative or script fonts (Nielsen, 2015).

Many researchers have found that sans-serif fonts tend to outperform serif fonts in readability tests. For example, studies assessing error detection in text have demonstrated this advantage (Dogusoy et al., 2016). However, more recent research does not confirm a definitive preference. According to experts at the Nielsen Norman Group, the advent of high-resolution displays (e.g., Retina screens) has made both serif and sans-serif fonts equally viable for on-screen reading (Nielsen, 2015). This is further supported by other studies measuring reading speed, which show no significant difference between the two font types (Arditi & Cho, 2005).

An important factor in reducing extraneous cognitive load is the use of uppercase and lowercase letters, particularly the presence of ascenders and descenders in lowercase characters. These typographic features enhance letter recognition by providing distinctive visual cues. Research confirms that increasing the length of ascender and descender elements significantly improves letter identification (Cooreman & Beier, 2024). Therefore, alphabets with a higher proportion of such features tend to facilitate easier reading. Typographic analysis shows that modern English fonts feature ascenders in 8 letters and descenders in 5, totaling 13 out of 26 (50%). Ukrainian fonts have 12 such letters out of 33 (36%), with one letter (ф) containing both. While the absolute numbers are similar, the relative frequency is lower in Ukrainian. Moreover, several of these characters (ц, ф, щ, ї, ґ) occur infrequently in typical usage, further diminishing their contribution to overall text legibility.

Studies on increased tracking show that it enhances letter recognition. Individuals with dyslexia, in particular, are sensitive to the crowding effect, where adjacent letters interfere with recognition. Wider spacing significantly reduces this interference. The effect has been confirmed in both Italian (a language with transparent orthography) and French (with more complex orthography), indicating the cross-linguistic applicability of this approach (Zorzi et al., 2012). Another study found that increased letter spacing improved reading speed by 13% in children with dyslexia and by 5% in typical readers (Stagg & Kiss, 2021).

These text formatting recommendations, validated through empirical testing, have been incorporated into web design standards known as the W3C Web Content Accessibility Guidelines (World Wide Web Consortium, 2024). As early as the first version in 2018, the guidelines included quantitative thresholds for minimum spacing to enhance text recognition. Implementing these guidelines sig-

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nificantly enhances text perception for all readers. Unfortunately, content accessibility standards are largely advisory, which means that designers of digital products often overlook them in practice. These requirements specify:

- line height: at least 1.5 times the font size;
- paragraph spacing: at least 2 times the font size;
- letter spacing (tracking): at least 0.12 times the font size;
- word spacing: at least 0.16 times the font size (World Wide Web Consortium, 2018).

Some approaches to reducing cognitive load do not yield consistent improvements in text perception – particularly in the area of font selection. Researchers have found that familiar, conventional typefaces often perform better than specialized fonts, even for individuals with dyslexia (Alexeeva et al., 2022). This suggests that text perception is influenced not only by the intrinsic properties of a font but also by the reader's familiarity with it. Since designers cannot ensure that users have prior experience with any specific typeface, it is essential to provide flexible interface settings that allow individuals to choose the font thev find easiest to read.

Fig. 4. Comparison of typefaces: Roboto, OpenDyslexic, and Inclusion UKR.

Рис. 4. Порівняння шрифтів: Roboto, OpenDyslexic та Inclusion UKR.

Designers have made repeated efforts to develop typefaces aimed at reducing cognitive load in letter recognition. For individuals with dyslexia, several specialized fonts have been created, including Dyslexie, Inclusion UKR, and OpenDyslexic, among others. OpenDyslexic has gained particular popularity since its release in 2011 by Abelardo Gonzalez, a developer with dyslexia, as a free and openly accessible alternative to costly commercial fonts. It is now widely used across various applications. These fonts are designed to facilitate letter recognition through specific typographic features:

1) heavier lower portions of letters to provide a visual "anchor";
2) modified shapes for visually similar characters (e.g., d and b);

3) extended ascenders and descenders;
4) increased tracking (inter-letter spacing);
5) enhanced emphasis on capital letters (Laddusaw & Brett, 2019).

Eye-tracking studies indicate that the use of OpenDyslexic offers certain advantages, as readers tend to make more frequent and shorter fixations, reducing erratic eye movements. This suggests a decrease in cognitive load during visual recognition, as the brain requires less effort to decode text. Additionally, many users subjectively report that such fonts feel "easier to read" and help reduce eye strain (Franzen et al., 2020). However, other studies have found no improvement in reading speed or accuracy when using OpenDyslexic (Wery & Diliberto, 2017).

Testing of the Ukrainian font Inclusion UKR revealed significant improvements in reading and text recognition among younger schoolchildren with special educational needs, but a decline in performance among typically developing children (Babych & Liubenko, 2021). Given the controversial results and reader-dependent effectiveness of these fonts, it is advisable to offer customizable font settings within the interface, allowing users to select the typeface that best suits their individual reading needs.

Color also affects text recognition. In particular, overly high contrast – such as black text on a white background – can make reading less comfortable (Isla & Bruce, 2005). Research has shown that warm background colors, such as peach, orange, and yellow, significantly improve readability for individuals with dyslexia compared to cooler tones like blue or green (Jakovljević et al., 2021). These findings align with recommendations from the British Dyslexia Association, which suggests using a cream-colored background to reduce excessive contrast (Rello & Bigham, 2017). For example, popular AI chat interfaces like Copilot and Claude use cream backgrounds by default (see Fig.2 and Fig.5).

Most modern applications offer two main color settings: light mode and dark mode. Initially, dark mode was primarily used by developers who spend long hours in front of screens. Over time, it gained popularity among general users. In 2019, Apple and Android introduced system-wide dark modes, leading to widespread adoption (Sethi & Ziat, 2023). Technology companies claim that dark mode saves battery life, reduces eye strain, and enhances productivity. Additionally, many users subjectively prefer dark mode over the traditional light mode. However, testing shows that dark mode increases cognitive load and impairs the perception of textual information (Gazit et al., 2025).

Some web applications offer interface customization options, including features designed for users with dyslexia. The popular site claude.ai, which hosts large language models developed by An-

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thropic, includes a chat setting that enables the use of the OpenDyslexic font. Currently, this font is applied only to the text within chat messages, without altering the broader interface layout. Moreover, the font appears to support Latin script only, while Cyrillic characters remain unaffected, limiting its accessibility for users reading in languages such as Ukrainian.

Fig. 5. Interface of claude.ai. Screenshot taken on September 21, 2025, using Opera browser (version 120.0.5543.161).

Рис. 5. Інтерфейс claude.ai. Знімок екрана зроблено 21 вересня 2025 р. за допомогою браузера Opera (версія 120.0.5543.161).

For users seeking greater control over fonts and other visual characteristics of websites, a range of browser extensions is available to help adapt any page to individual needs. One example is the OpenDyslexic Font extension for Chrome, which overrides any font specified by the web developer and replaces it with OpenDyslexic. A more comprehensive tool is the Helperbird: Accessibility & Productivity App, also available for Chrome. It allows users to customize not only fonts and text/background colors but also column layout. Many websites feature wide blocks of text that are difficult to read, as cognitive load increases toward the end of each line. Helperbird enables users to reformat pages into multiple columns, making reading more manageable. Additional features include an automatic reading ruler that helps users focus on a single line at a time, and the option to frame individual paragraphs for clearer separation. While such interventions significantly alter the original layout intended by designers, they effectively reduce text crowding, thereby lowering cognitive load and improving readability.

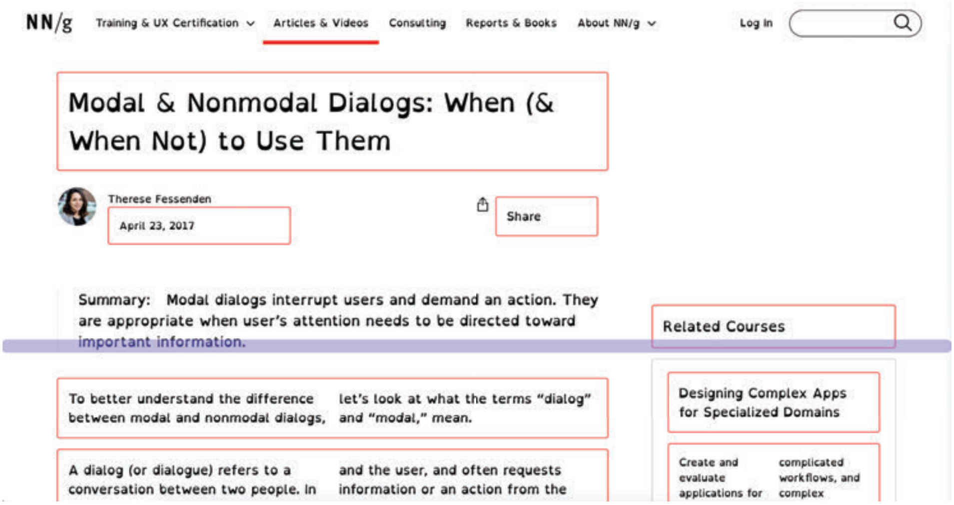

Fig. 6. Page from https://www.nngroup.com/ with the Helperbird extension (Version 2025.8.24) enabled, showing column layout, modified font, and a reading guide line. Screenshot taken on September 22, 2025, using Chrome browser (Version 135.0.7049.85).

Рис. 6. Сторінка з https://www.nngroup.com/ з увімкненим розширенням Helperbird (версія 2025.8.24), що показує макет стовпців, змінений шрифт і лінію для читання. Знімок екрана зроблено 22 вересня 2025 р. за допомогою браузера Chrome (версія 135.0.7049.85).

Corporate messengers are essential tools for professional communication, used by all employees within an organization. These platforms primarily rely on text-based interaction, making the reduction of external cognitive load a key factor in improving user experience. Developers are increasingly attentive to this issue and provide tools for interface customization. The popular desktop messenger Slack allows users to adjust font settings, including the option to select OpenDyslexic – available in the paid version. By default, Slack's interface displays a large amount of information on screen, which can significantly increase cognitive load. However, users can activate the Simplified Layout Mode, which streamlines the design and minimizes distracting elements. This transforms the desktop interface into a cleaner layout resembling a mobile app (see Fig.7).

Similarly, the desktop version of the messenger Element enables users to customize both the font size and typeface, including fonts installed from third-party developers. This flexibility supports more accessible and user-centered communication environments (see Fig.8).

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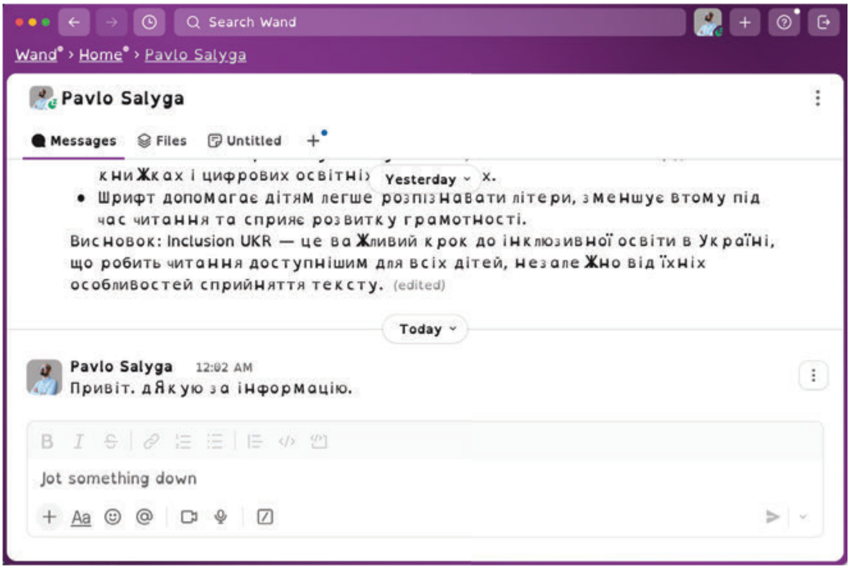

Fig. 7. Slack application (Version 4.45.69) with OpenDyslexic font enabled and Simplified Layout Mode activated. Screenshot taken on September 22, 2025, using MacOS Sequoia (Version 15.4).

Рис. 7. Додаток Slack (версія 4.45.69) з увімкненим шрифтом OpenDyslexic та активованим режимом спрощеного макетування. Знімок екрана зроблено 22 вересня 2025 р. за допомогою MacOS Sequoia (версія 15.4).

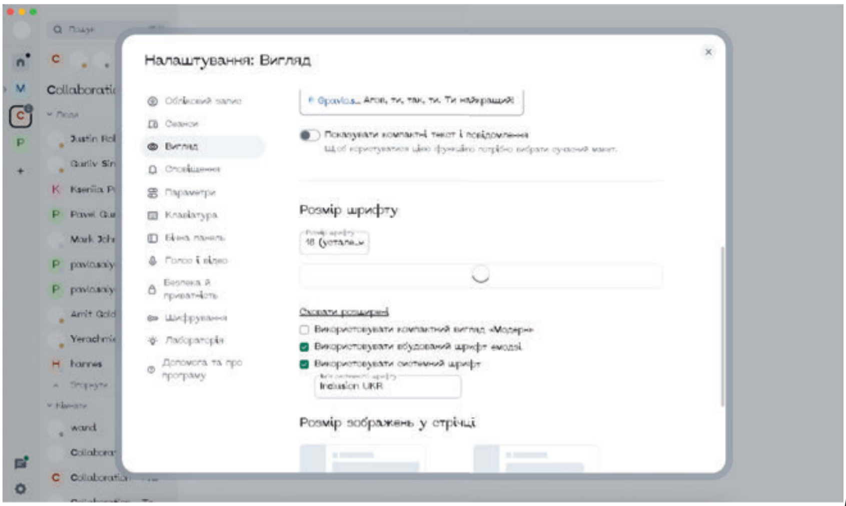

Fig. 8. Element application (Version 1.11.94) with the Inclusion UKR font enabled. Screenshot taken on September 22, 2025, using MacOS Sequoia (Version 15.4).

Рис. 8. Застосування елемента (версія 1.11.94) з увімкненим шрифтом Inclusion UKR. Знімок екрана зроблено 22 вересня 2025 р. за допомогою MacOS Sequoia (версія 15.4).

5 Scientific Novelty and Practical Significance of the Study

This article presents the first overview of the practical implementation of tools aimed at reducing both intrinsic and extraneous cognitive load in the interfaces of web applications and computer programs. It provides guidance for interface designers and developers on how to integrate international accessibility standards and implement personalization features that accommodate users with varying cognitive load requirements, making these solutions widely applicable.

The practical significance of the study lies in its potential to enhance the inclusivity of digital products, reduce the risk of working memory overload, and establish a balance between interface simplification and the preservation of functional control.

6 Conclusions

The study demonstrates that designers can influence text perception in interfaces by regulating intrinsic and extraneous cognitive load. Intrinsic load is associated with the content of the message, while extraneous load relates to the manner of its presentation.

Reducing intrinsic cognitive load is only partially feasible. Designers and UX writers can optimize message texts, button labels, and other static interface elements; however, content generated by users or external contributors remains beyond their control. In this context, artificial intelligence tools play a crucial role by enabling users to simplify language, shorten texts, and generate concise summaries. The growing popularity of chat interfaces based on large language models reflects a broader trend toward minimizing intrinsic cognitive load through automated processing of large volumes of information.

Regarding extraneous cognitive load, research confirms the effectiveness of specific design patterns. Factors such as font size, line spacing, paragraph spacing, and letter spacing are reflected in accessibility standards and have proven beneficial for improving text perception. In contrast, other parameters – such as font choice, color themes, and element density – yield controversial results and depend heavily on users' aesthetic preferences and prior experience. For instance, fonts specifically designed for individuals with dyslexia may enhance readability for one group but hinder it for typical readers accustomed to conventional typography.

The number of interface elements should reflect the user's experience and needs. A simplified interface is more appropriate for beginners, while advanced users often seek access to extended functionality. This creates a design dilemma: excessive minimization improves usability for one group but reduces efficiency for another. The optimal approach is to give users control over their cognitive load by allowing them to adjust design settings and selectively hide or reveal additional features as needed.

A number of open questions have also been identified. Much of the existing empirical research has focused on measuring reading speed and comprehension of continuous texts, without accounting for the specific nature of interaction with modern digital interfaces. In real-world scenarios, users engage with short textual frag-

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ments – such as tooltips, messages, and button labels – within environments characterized by high levels of visual noise. Under such conditions, the risk of extraneous cognitive load increases due to the combination of text, icons, banners, and navigation elements.

Moreover, most studies have been conducted in short experimental sessions, whereas the long-term use of applications, which allows for habit formation and interface adaptation, remains insufficiently explored. A promising direction involves conducting experiments with realistic, visually dense interfaces, and investigating the impact of prolonged usage on the dynamics of cognitive load. This would yield practically relevant insights for designers and developers regarding typographic choices, information architecture, and personalization tools that genuinely enhance accessibility and user experience for both typical and neurodivergent users.

In conclusion, the findings of this study suggest that the future of interface design lies in the integration of cognitive psychology principles with artificial intelligence tools. This approach enables the creation of systems that dynamically adapt to user needs, striking a balance between simplicity and functionality. Further research should focus on evaluating the effectiveness of personalized interfaces over extended periods of use, and on developing standards that ensure the inclusivity of digital products.

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