





Minimalistic User Interface Design and Dark Mode Usage in Human-Computer Interaction

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Abstract: *When it comes to minimalist design and dark mode, these are two very current topics in today's design, development, and implementation of web and mobile applications. Often heard is the phrase "Less is more," which will be explained in detail through this paper, both from a theoretical perspective and with practical examples. Minimalist design has numerous advantages from various perspectives, but it also presents a significant challenge for designers because it requires highlighting everything important in the right way without excessive decoration and too many details. On the other hand, dark mode also presents a challenge, but from a technical standpoint, it has many advantages, as well as from the perspective of user experience. In comparison to lighter themes, it facilitates viewing the screen during the night and contributes to energy savings. In summary, today, minimalism and dark mode, in combination, when creating design software, improve the user interface (UI) and user experience, and enhance application performance in various fields.*

Keywords: *dark mode; human-computer interaction; user experience; user interface; minimalism*

1. INTRODUCTION

In today's world, life without mobile phones, laptops, tablets, and other similar devices is unimaginable. The field of information technology is constantly evolving. New principles are being created, applications are being developed, all aimed at making life easier, solving problems more quickly, and accessing information, which is considered to have the greatest value today.

Everything is being digitized, and it is necessary to keep pace with the times. In line with this, consideration must be given to different generations of people who will use them, various levels of education, as well as the diverse psychophysical abilities of people. In this regard, the implemented application must be accessible to as many people as possible in a simple way. This simplicity is achieved through the use of minimalist user interface design and dark mode.

Minimalist design is a concept in design that focuses on essential elements and a simple aesthetic, while dark mode provides a dark background that reduces eye strain and improves visibility, especially in low-light conditions, thus enhancing the user experience.

The aim of this paper is to illustrate what these two techniques represent, how they originated, what is gained by their implementation, but also the risks of achieving excessive complexity due to improper implementation of these techniques. As in everything, there are basic principles that should

be followed to ensure that the end product is satisfactory.

The rest of the paper is organized as follows. The second section describes minimalist design, along with its advantages compared to classic design and its implementation in UX/UI design. The third section describes dark mode, its application, and its benefits. The fourth section presents a practical example of implementing the principles described in the previous sections. Finally, in the fifth section, a conclusion is provided in which opinions on everything mentioned and implemented in the paper are outlined.

2. MINIMALIST DESIGN

Minimalist design is an aesthetic principle that focuses on simplicity and reduction. It is characterized by clean lines, minimal ornamentation, and functionality. Minimalism exists on the spectrum between emptiness and presence, with a focus on removing excess and retaining only the most essential elements.

Decades before minimalism became a trend in web design, it was a movement in visual arts in the post-World War II era. It emerged as a reaction to chaotic colors, movements, and the pronounced subjectivity often found in the works of abstract artists [1].

The perspective behind minimalist art was expressed by the motto of the renowned 20th-century architect Ludwig Mies van der Rohe: "Less

is more." This motto later became the spirit and unofficial mantra of minimalism in web design: fewer elements on the page result in less cognitive load for users [1].

By the end of the twentieth century, minimalism began to shape as a distinct trend in the field of human-computer interaction [2].

The emergence of Responsive Web Design (RWD) in 2010 prompted the broader users to appreciate a minimalist approach. To effectively utilize RWD techniques, organizations must carefully prioritize their content—distracting from primary content that can be overlooked on desktops becomes a significant issue on mobile devices [1, 2, 3, 4].

Starting from the mid-2000s, echoes of the minimalist art movement began to appear in web interfaces: smaller amounts of content and limited color palettes. Google is often considered a pioneer of minimalist web interfaces. Google has prioritized simplicity and rigor in its interfaces since its beta offering in the 1990s.

2.1. Minimalist design advantages

In 1995, Jakob Nielsen included minimalist design in his 10 usability heuristics. His use of the term was in line with Tufte's and Carroll's sense of minimalism, as he advocated for the elimination of irrelevant information from interfaces. The advantages of minimalist design according to Nielsen are [5]:

- *Simple Navigation*: Navigation remains consistent in terms of where it appears and how it appears on the website, facilitating users in quickly finding relevant information. If there are multiple sections, they should be categorized to maintain order and cleanliness. Additionally, if there is a dropdown menu for navigation, ensure that all links are clickable. Finally, if you have a search box embedded in your website, make sure it always provides relevant and fast results.
- *Usability*: Easier navigation is the basic pillar of improved usability. Minimalist design is trending as it focuses on enhancing and nurturing user experience. Product design should be user-oriented, employing limited colors and experimenting with fonts to create a minimalist design.
- *Assistance in Content Focus*: While writing content, it is essential to ensure that everything is in order and represents a visual hierarchy. Using the largest font size for headlines, the second-largest font size for subheadings, and the smallest font size for content can help in writing content for minimalist design.
- *Pleasant Atmosphere*: Adopting a minimalist approach and eliminating unnecessary elements ensures survival ahead of the competition and a user-friendly interface.
- *Faster Loading Times*: Minimalist design helps pages load faster because they have fewer but

important elements for users. Modern users are impatient and won't hesitate to go to another page if your page takes time to load.

- *Responsive Design*: If there are fewer essential elements on the screen, it is easier to adapt the page to different screen sizes. By embracing minimalist design principles, responsive design can effectively simplify the user interface and eliminate excess elements that may disrupt optimal browsing experience on smaller screens or mobile devices, Fig. 1.

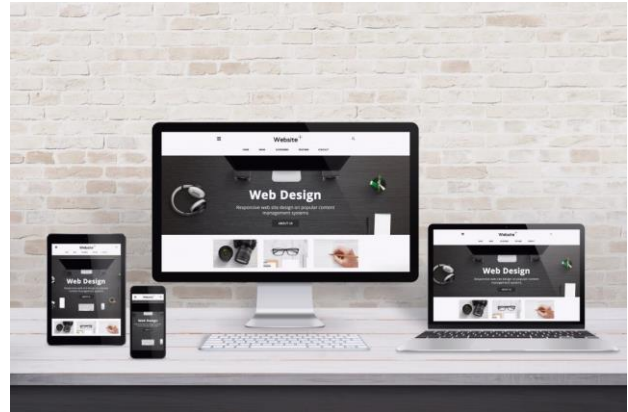


Figure 1. Minimalism and responsive design [6]

2.2. Minimalism in UX/UI design

UI refers to screens, buttons, switches, icons, and other visual elements with which you interact when using a website, application, or other electronic device. User Experience (UX) refers to the overall interaction you have with a product, including how you feel about the interaction. Although the user interface can certainly affect UX, these two are different, as are the roles of designers.

The minimalist user interface should be created with these three main principles in mind [3] – [5]:

- *Promotion of main content*: Many popular mobile applications achieve a minimalist design by following the principles of removing unnecessary images and distracting colors. Eliminating all additional components helps users focus on the actual functionality of the application or web page.
- *Strengthening the existing hierarchy*: White (or negative) space is the pillar of any minimalist design. What is left out of the design is equally important as what is inserted. Utilizing white space and size in a minimalist interface allows for maintaining a structured and clear page while adhering to the hierarchy of design components.
- *Less is more*: When there are fewer design elements, they may need to collide in size and width to provide equal emphasis. Less is more, and the goal is to create a significant impact with fewer design elements. It's essential to consider details, as they carry more weight in the overall design.

In the world of digital design, minimalism is becoming an increasingly common approach. This strategy seeks to remove any unnecessary content from a website or application, with the ultimate goal of facilitating access to the most important components and providing users with an enhanced overall experience.

The concepts of minimalism that experts often mention are [3]:

- *Simple*
- *Clear*
- *Expressive*
- *Well-composed and proportional*
- *High functionality of elements*
- *Use of white and negative space* (space between components on the screen).

When it comes to UX and UI design, alluringly simple and clear "flat" websites or mobile applications are becoming more attractive, which, with a reduced number of clicks, accelerated interaction, or simplified user paths, quickly lead users to the desired goal or information about services or products.

Maintaining clear message conveyance and creating a recognizable brand while creatively using graphic elements such as colors, typography, and simple shapes is important.

3. DARK MODE

Dark mode represents a preference for using a dark color palette in software and device interfaces. This mode provides screen lighting that is easier on the eyes and less straining, especially in low-light conditions [7].

Dark mode is a user interface in low-light conditions that uses dark colors—usually black or shades of gray—as the primary background color. This is a departure from the default white user interface that designers have used for decades. In response to our increased screen time, programmers have discovered that interfaces with dark themes help reduce eye strain, especially in conditions of low lighting or at night. Less eye strain means less headaches and a better working experience.

Below are some best practices for creating dark mode applications [8]:

- *Not too dark*: Avoid pure black. It's hard for the eyes to look at a high-contrast screen. Good colors for dark mode are shades of gray combined with unsaturated colors.
- *Contrast*: Backgrounds in dark mode must be dark enough to display white text.
- *Desaturation of colors*: Stay away from completely saturated colors on a dark background. Instead, use unsaturated colors like pastels and muted colors—shades that have added gray and white.

- *Never use shadows*: In a light theme, everything is smooth because the white background and black shadow match perfectly. A black background and a black shadow won't have much contrast. Two common mistakes are trying to make the shadow more intense than the background or trying to place a shadow lighter than the object.

In the Fig. 2, the difference between light and dark mode in the Windows 11 operating system is shown.

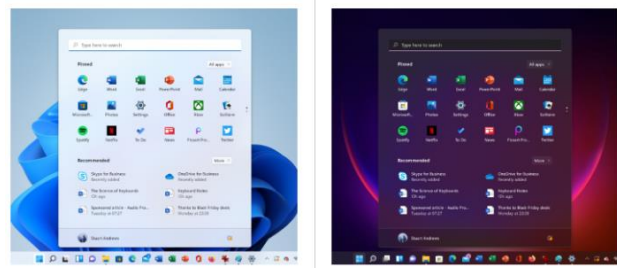


Figure 2. Difference between light and dark mode in the Windows 11 operating system

3.1. Dark mode advantages

Dark mode has several key characteristics and advantages [9]:

- *Reduces eye strain*: Using dark mode in user interface design helps improve overall content readability.
- *Increased visibility in low-light settings*: Another advantage of dark mode design is increased visibility, especially in low-light settings. In dark mode, we can see text and other items displayed on the screen more clearly.
- *Significantly saves battery*: Using the dark theme option on devices (whether it's a laptop or a mobile phone) significantly helps extend battery life. This is especially true for OLED screens because they can turn off black pixels when not in use.
- *Helps improve focus*: Another useful effect of dark mode in web page design is when you want to highlight a certain type of content. For example, brands like Spotify [10], Fig. 3, and Netflix want to draw attention to colorful and vivid album covers and video thumbnails. Dark mode makes these thumbnails pop in a specific way that light mode cannot achieve.

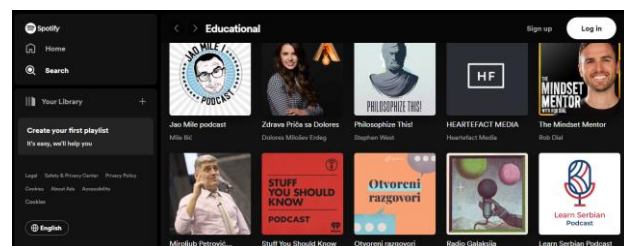


Figure 3. Spotify in dark mode

4. PRACTICAL REALIZATION

The application was created in Figma and is related to adding and tracking advertisements. Figma is a collaborative UI design tool based on the browser that allows users to work together to create vivid and interactive prototypes [11]. Through the application, minimalism is implemented in UI design along with examples of the first few pages in dark mode.

Fig. 4 depicts the login page where the user is required to log in. Basic information about the application is presented: its name and logo. Additionally, there are empty fields on the page that the user needs to fill in to access the application.

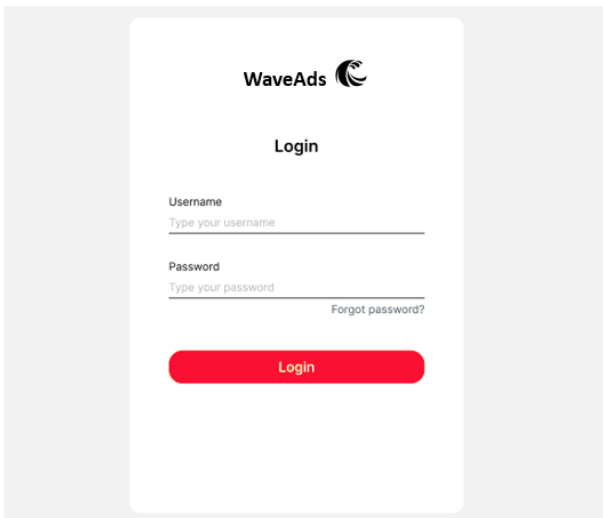


Figure 4. Login page

In Fig. 5, the homepage is displayed, featuring a header, sidebar, and the most popular and recently posted advertisements in the main section of the page.

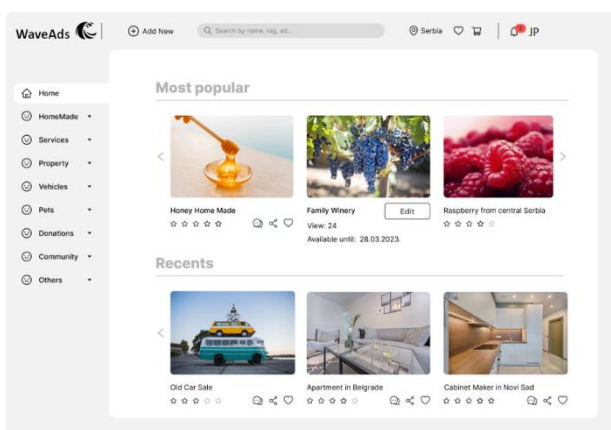


Figure 5. Homepage – light mode

Fig. 6 represents the previous homepage in dark mode.

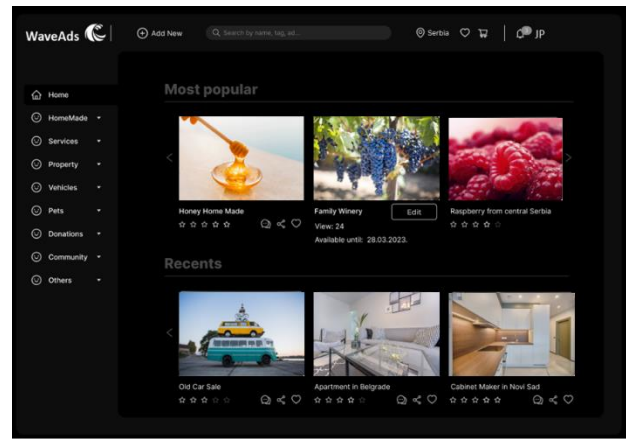


Figure 6. Homepage – dark mode

By clicking on one of the advertisements, a detailed view of that advertisement opens up, as shown in Fig. 7. Within this page, it is possible to see multiple images, the title, price, and comments, and the user also has the option to order the product by clicking on the "Order now" button.

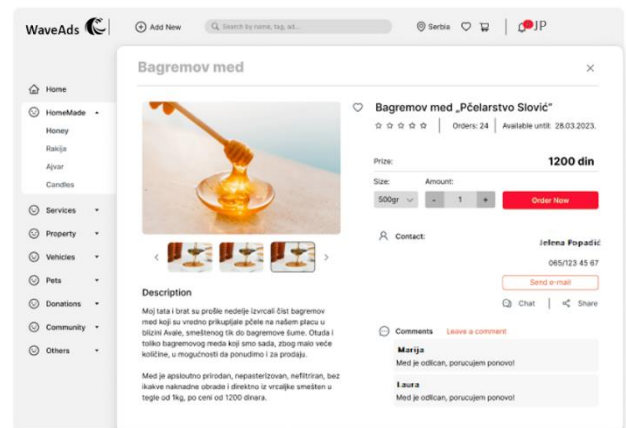


Figure 7. Display of individual advertisement - light mode

The previously shown page in Fig. 8 is presented in dark mode. Applications are increasingly equipped with the dark mode. It is noted that many computer enthusiasts have the impression that dark mode is somehow better than the traditional light mode [12].

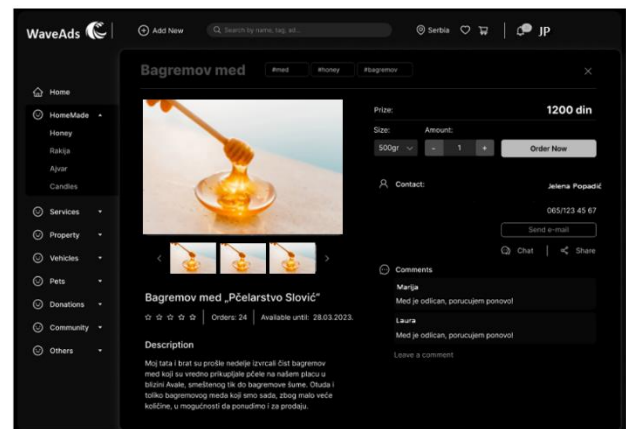


Figure 8. Display of individual advertisement - dark mode

5. CONCLUSION

"Keep it simple," "The less is more," or "Simplicity is the ultimate sophistication" are just some of the phrases that suggest a long-standing pursuit of minimalism and stylization in design.

Themes like minimalism and dark mode have emerged as significant trends in web design, offering clear benefits and improving the user experience. By combining the principles of minimalism and dark mode, web designers have the opportunity to create visually captivating web pages that are easy to navigate and pleasant to view.

However, it's important to remember not to blindly apply these design choices. Each website should be evaluated individually, taking into account factors such as brand identity, target audience, and overall goals of user experience. Like with any design trend, it's crucial to establish a balance between aesthetics and functionality.

Emphasizing minimalism shouldn't compromise the accessibility or usability of the website, and dark mode shouldn't hinder the readability or clarity of the content. It's essential to ensure that these design choices align with the purpose and goals of the website while providing users with a visually appealing experience.

In conclusion, themes like minimalism and dark mode in web design have brought about a change in the way websites are designed and experienced. By carefully embracing these trends, designers can create visually stunning web pages that cater to the preferences and needs of modern users.

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