

Modern Approaches to Developing User Interfaces

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Abstract: In modern user interface development, key attention is paid to the integration of visual trends and usability principles, which significantly affects the perception and interaction of users with the product. Based on the principles of visual design, purposeful use of animation, accessibility, and adaptability, modern approaches strive to create intuitive and visually attractive interfaces. Important aspects are also security, the flexibility of interaction on various platforms and devices, as well as the ability to personalize and personalize the experience for each user. All these elements contribute to increasing user trust and satisfaction, making the interfaces not only functional but also comfortable for daily use.

Keywords: user interfaces, visualization, digitalization.

Introduction

In today's digital world, where visualization defines the first interaction users have with websites and brands, the importance of modern user interface design cannot be underestimated. A style that is in line with current visual preferences builds trust and increases the appeal of a website or app. Integrating the latest visual trends, adhering to usability standards, and utilizing best design practices contribute to creating an interface that not only looks modern but also provides an effective user experience.

While it may be difficult for end users to enumerate all the characteristics of modern interface design, they respond intuitively to its elements, often without even realizing that these aspects shape their perception. The primary objective of modern user interface design for websites and applications is to enhance trust and functionality while creating a comfortable space for users that reflects their style and aligns with user expectations [1].

The relevance of the topic is due to the rapid development of technology and the increasing number of mobile and web applications, which require developers to create intuitive, accessible, and aesthetically pleasing interfaces. The challenge lies in the need to find a balance between functionality and ease of use, given the diversity of devices and platforms, as well as meeting the needs of users with different levels of technical expertise. Novel techniques such as design systems, adaptive and responsive design, and the use of artificial intelligence and machine learning are addressing these challenges by providing high-quality user experiences.

1. General characterization of approaches to user interface design.

Consideration of current trends in user interface design often begins by analyzing platforms such as Microsoft's Modern Windows Presentation Foundation (WPF) (Figure 1). This platform, focused on vector visualization and independence of screen resolution, has become the basis for the development of interfaces that make optimal use of the capabilities of modern graphics technology.

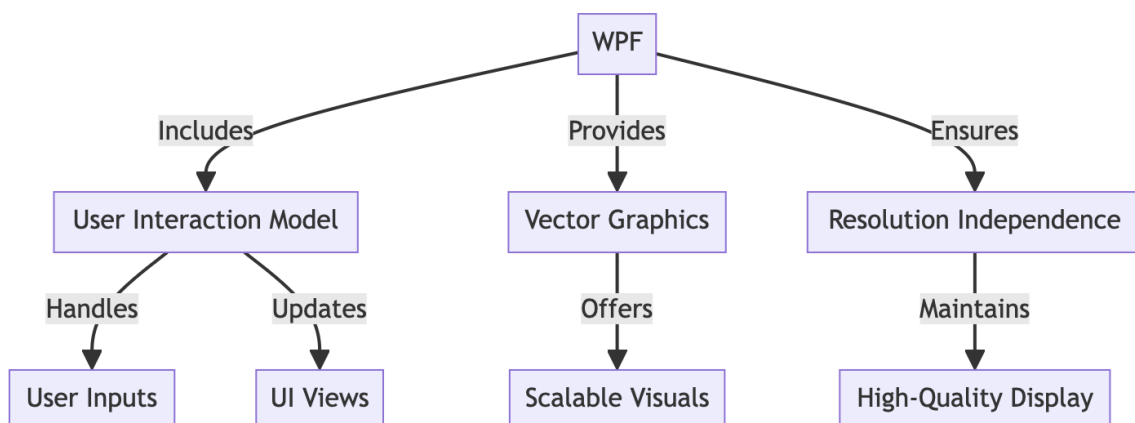


Figure 1 - Windows Presentation Foundation (WPF)

A key aspect of modern interface design is a thorough understanding of the target audience. Developers should strive to create a detailed user persona that includes age and gender characteristics, reasons for interacting with the product, desired outcomes, and timeframes for using the application. The design must be not only visually appealing but also functional, turning the user experience into a memorable interaction.

Contrary to popular misconception, interface design is not an art in the traditional sense, but rather a methodology that requires attention to detail and user needs. The attractiveness of an interface must be combined with its functionality, ease of use, and adaptability to the user's needs, and all elements must be purposefully designed.

Creating interface content that is easily scanned by the user's eyes is critical. This requires strategically placing key information in areas of greatest user attention, ensuring quick and efficient interactions without spending too much time searching for the data needed.

Given that users may be exposed to content through a variety of devices, it is important to create a unified design that functions consistently across all platforms. This requires taking into account the characteristics of different devices, including screen sizes and interaction methods.

Thus, modern user interface design requires an integrated approach that focuses on the user and their needs, as well as flexibility in the design process to adapt to a dynamically changing technological and cultural environment [2].

In turn, UI design principles play a crucial role in creating an effective and intuitive interaction between the user and the product. Here are a few key aspects to consider when designing user interfaces:

Clarity: A fundamental principle in interface design is clarity. It should allow the user to easily distinguish between interactive and static elements, and to anticipate the consequences of their actions. Clarity in design helps avoid confusion, minimize errors, and ensure that the necessary information is accurately conveyed. Before starting the design, ask questions about the ease of navigation and the obviousness of interface functions.

Familiarity: Familiarity in design helps improve the user experience by using recognized practices and elements that users already know from other interfaces. This includes placing navigation elements in expected locations and using commonly accepted symbols and icons. Recognizing and applying familiar design decisions not only reduces the learning curve but also promotes a faster and more comfortable interaction with the product.

Visual Hierarchy: Creating a clear visual hierarchy ensures that information is presented logically and understandably. This includes using contrasts, font sizes, and colors to highlight key information and organize content by importance. An effective visual hierarchy directs the user's attention to the most relevant elements and simplifies navigation.

User Control: Interface design should give users a sense of control over their actions. This means providing clear feedback to user actions, preventing unexpected changes to the interface, and minimizing data entry requirements. The interface should be predictable so that users feel confident and can achieve their goals effectively.

Accessibility: Ensuring that the interface is accessible to all users, including those with disabilities, is a critical aspect of the design. This includes adapting the design to accommodate different assistive device technologies, providing appropriate color contrast, and providing alternative text for images.

Flexibility: The design should be flexible to adapt to different usage conditions and user preferences. This includes providing customizable settings, accommodating different modes of interaction (e.g., keyboard, touch screen), and creating an interface that works equally well across devices and platforms [3].

2. A description of the user interface design process

User interfaces are access points where users interact with projects. User interfaces can be categorized into three main types:

- **Graphical User Interfaces (GUI):** users interact with visual representations on digital control panels. A computer desktop is a GUI.
- **Voice-activated interfaces (VUI):** users interact with them through voice. Most smart assistants, such as Siri on iPhones and Alexa on Amazon devices, are VUIs.
- **Gesture-based interfaces:** users interact with 3D design spaces through body movements, such as in virtual reality (VR) games (Table.1.) [4].

Table 1. Types of user interfaces

Interface Type	Characteristics	Examples of Use
Graphical User Interfaces (GUI)	Visual representations on digital control panels; include windows, icons, menus, and pointers.	Computer desktops, mobile applications, web applications
Voice User Interfaces (VUI)	Interaction through voice commands and responses; use speech recognition and synthesis technologies.	Smart assistants (Siri, Alexa), voice commands in cars
Gesture-Based Interfaces	Interaction through body movements and gestures; use motion sensors and cameras.	Virtual reality (VR) games, gesture controls in smart home devices

In turn, user interface design, often confused with UX design, is more concerned with the look and feel of the overall design. UI design is a craft in which the designer creates an important part of the user experience. UX design encompasses the entire spectrum of user experience. One analogy is to think of UX design as a car and UI design as a control console. To elaborate, UX design can be seen as the process of designing the entire car, ensuring that it is safe, comfortable, and efficient. This includes aspects such as the aerodynamics of the vehicle, the placement of the seats, the functionality of the engine, and overall user satisfaction when driving. In contrast, UI design focuses specifically on the control console – the dashboard, the arrangement of controls, buttons, and displays. It ensures that these elements are intuitive, visually appealing, and easy to interact with, providing a seamless and enjoyable user interaction with the vehicle's controls [4].

- 1. Understanding user needs and pain points.** UI design starts with a deep understanding of user needs and pain points. This process requires a broader perspective than just knowing user demographics. It's important to capture the true needs users may not realize they have, as well as the challenges faced when interacting with the product. Effective design begins when solutions that make using the interface intuitive and user-friendly are offered.
- 2. Empathy and data collection.** Empathy is a key element in this process, helping move from dry data to understanding the human experience. The use of interviews, surveys, and user tests can gather valuable data that will help shape all aspects of interface design.
- 3. Creation of user stories.** Once the information has been collected, it is useful to structure it through the creation of user stories, which are a tool for expressing users' main goals in the context of using the product. They help organize and prioritize interface features, ensuring that the design serves the users' needs and not the other way around.
- 4. Interface inventory process.** Next is the interface inventory process proposed by Brad Frost. This step involves a detailed examination and cataloging of all design elements that are necessary to achieve user goals. It identifies and eliminates design inconsistencies and optimizes the development process.
- 5. Identifying design patterns.** Identifying design patterns is the next step. This involves identifying and applying standard solutions to commonly encountered design problems, which promotes consistency and efficiency in design solutions.
- 6. Prototyping.** Prototyping concludes the design stages by providing a visual and functional preview of the future product. Prototypes allow designers and stakeholders to test concepts and make adjustments before final development. It is an important tool for ensuring that the final product will meet user expectations and needs.

Understanding and applying these steps not only improves the quality of user interface design but also ensures the creation of products that better respond to user needs and improve their interaction with technology [5].

3. Toolkit

Interface design consistency is a coherent distribution of elements focused on ensuring the usability of the user interface. This principle is important because it helps to reduce the cognitive load on users and increases the likelihood of active interaction with the website. One of the key characteristics of consistency is uniformity, which manifests itself in both the visual and functional aspects of the interface.

First, consistency implies uniformity in the visual presentation and behavior of the interface across different devices, which is ensured by using adaptive design. Second, maintaining uniformity in design elements such as color scheme, button size and placement, and conformity to common usage patterns contributes to a modern and comfortable user experience.

In modern interfaces, color gradients and shadows are used to create visual depth and support the user experience. Gradients provide an aesthetically pleasing visual effect that attracts attention and enriches the user experience. Shadows, although less visible, give interface elements a sense of volume, which encourages active interaction with them.

Targeted animation is an effective tool for enhancing user experience and conveying information. Animation can draw the user's attention to key interface elements, emphasize their importance, and help in understanding actions, which increases the effectiveness of interaction with the website (Fig.2.).

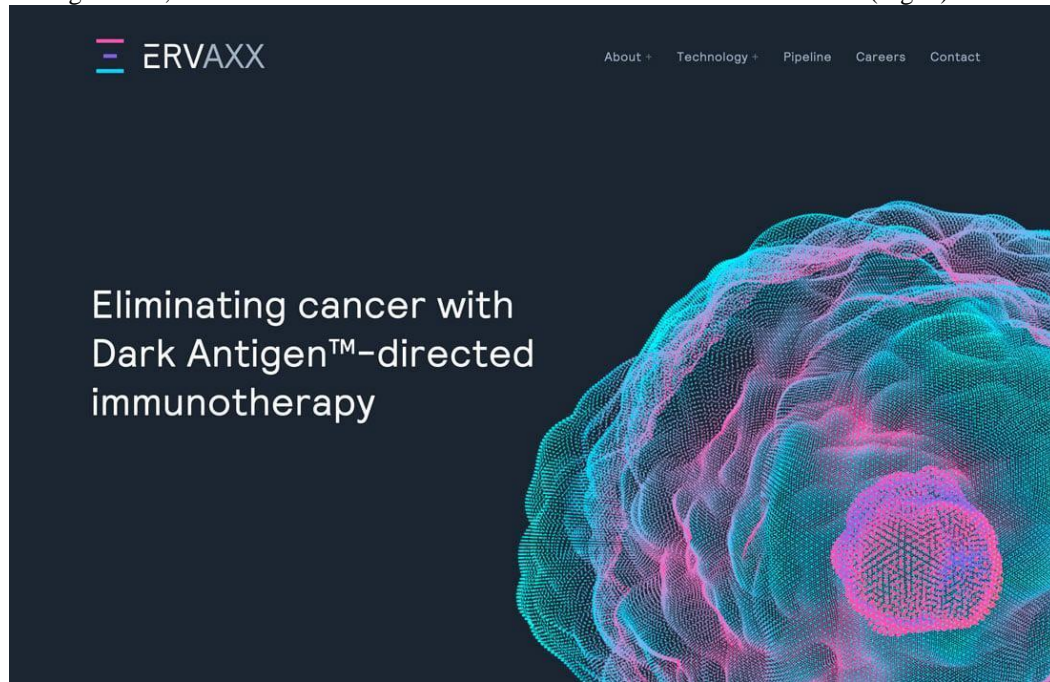


Fig.2. An example of using animation on a website [6].

Animation is now a common tool in web design, which emphasizes the need for its conscious and purposeful use. It is important to prevent the abuse of this technique, as the exorbitant use of animation can negatively affect the user experience and complicate the perception of information.

Modern interfaces resort to animation only when it is justified. The purposeful use of animation can facilitate a user's interaction with a website by providing visual cues for navigation, providing instructions, or serving as an element of a pleasing user experience.

For animation to not only beautify a website but also serve a specific function, the purpose of the animated element and its interaction with the overall design should be carefully considered. Only then will animation become an integral and justifiable part of the user interface, contributing to the improvement of user experience and efficiency of interaction with the site.

Providing easy-to-read font sizes is a fundamental aspect of web design that has a significant impact on the user's perception of information. Font sizes should be chosen with readability and content navigation in mind, providing an optimal visual experience for the user without unnecessary eye strain [6].

Table 2. Recommendations for choosing fonts in web design

Criterion	Recommendation	
Readability	Choose fonts with high readability levels, ensuring ease of perception on all devices	<ul style="list-style-type: none"> - Sans-serif fonts (e.g., Arial, Helvetica) - Adequate letter spacing (kerning)
Size	Minimum font size of 16px for body text, adjusting size based on the device	<ul style="list-style-type: none"> - Body text: 14-16px - Headings: 24px and above - Mobile devices: potentially larger sizes
Contrast	High contrast between text and background to enhance readability, especially for users with visual impairments	<ul style="list-style-type: none"> - Black text on white background - Use tools to check contrast (e.g., WebAIM)

Compatibility	Use web-safe fonts to ensure proper display across all platforms and browsers	- Arial, Verdana, Times New Roman - Implement fonts via @font-face for cross-browser support
Typeface	Select a typeface that matches the content's character and tone	- Geometric fonts for modern websites - Traditional fonts for formal or academic websites
Line Height	Ensure sufficient line height to improve readability	- Optimal line height: 1.5em-1.6em
Line Length	Optimal line length for comfortable reading	- Recommended line length: 50-75 characters
Text Alignment	Proper text alignment to enhance perception	- Left alignment for long text - Center alignment for short phrases or headings

Emphasizing the importance of font sizes, it should be noted that tiny, almost indistinguishable sizes can be one of the factors that determine the first impression of the user interface. Users prefer larger, easier-to-read fonts, and this preference has its basis in habit and comfort with text.

Text measurements in the basic 14 to 16-point range are well justified on websites, providing optimal readability and usability. Despite the initial impression of seeming large, this size provides a comfortable visual experience on both large screens and mobile devices, making it a standard in modern design. In addition, consider adjusting the line spacing for optimal results.

Seamless interaction in the interface represents a key aspect that ensures a continuous and harmonious user interaction with the website. By ensuring smooth and continuous transitions between different parts of the interface, optimal conditions for comfortable and efficient use of the website are created. Interaction with the website should be smooth both on one device and from one device to another.

Users want to have the same experience when they navigate from page to page. They also want the website to look and work the same on their desktops and phones.

User-friendly forms/entries. The era of cumbersome online forms that required filling out excessive amounts of information is a thing of the past. Modern interfaces favor short forms that ask for only the necessary information, considering the value of each user's time and attention. This desire for minimalism not only promotes usability but also reflects a concern for user comfort and respect for user needs.

Modern interfaces utilize smart forms and input fields designed to gather information efficiently. This means that only the information needed for a specific purpose is requested and if-then logic is applied to dynamically define form fields. Validation of the data entered is also an important aspect, especially on mobile devices where the likelihood of error is higher. Instant feedback about incorrectly filled-in data prevents user frustration and ensures a seamless user experience [6].

Conclusion

By exploring current approaches to user interface design, we see that the main focus is on creating an optimized, usable, and aesthetically pleasing user experience. Principles such as design uniformity, intuitive interaction, and deep integration of modern technologies help to achieve high levels of user interaction and satisfaction. The importance of tailoring the interface to individual user needs and preferences is a key factor in ensuring user engagement and loyalty. Thus, modern user interfaces do not just meet basic functional needs, but also create a deeply personalized and dynamically adaptable experience that remains relevant in the face of rapidly changing technological and cultural trends.

References

- [1]. What is modern user interface design? Concepts, tips, and examples. [Electronic resource] Access mode: <https://www.thetechplatform.com/post/what-is-modern-ui-design-concepts-tips-examples> (accessed 8.05.2024).
- [2]. Development of modern user applications. [Electronic resource] Access mode: <https://www.infosys.com/services/digital-interaction/documents/modern-ui-application-development.pdf#:~:text=Modern%20UI%20should%20live%20up,visually%20appealing%20with%20high%20usage> (publication date 8.05.2024).
- [3]. User Interface Design Principles – What are the design principles in 2024? [Electronic resource] Access mode: <https://careeremployer.com/web-development/ui-design-principles/> (accessed 8.05.2024).

- [4]. User Interface (UI) design. [Electronic resource] Access mode: <https://www.interaction-design.org/literature/topics/ui-design> (accessed 8.05.2024).
- [5]. User Interface Design (UI) — principles and recommendations. [Electronic resource] Access mode: <https://dev.to/miratam/a-guide-to-user-interface-ui-design-principles-and-best-practices-5ehi> (accessed 8.05.2024).
- [6]. What is modern user interface design? 10 tips and examples. [Electronic resource] Access mode: [https://designshack.net/articles/trends/modern-ui-design /](https://designshack.net/articles/trends/modern-ui-design/) (accessed 8.05.2024).