

EXPLORING GRAPHICAL USER INTERFACES (GUIs) AND THEIR EVOLUTION

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Анотація

Ця стаття простежує еволюцію графічного інтерфейсу користувача (GUI) – від текстових команд до інтуїтивно зрозумілих візуальних систем. Вона охоплює основоположну парадигму WIMP, комерційну конкуренцію між Apple та Microsoft, а також перехід від скевоморфного(підхід у UI/UX дизайні, який робить цифрові об'єкти схожими на їхні аналоги з реального світу) до плоского дизайну. Текст завершується дослідженням того, як смартфони та просторові обчислення зробили технології доступними для всіх завдяки людиноцентричному та інклюзивному дизайну.

Ключові слова: графічний інтерфейс користувача (GUI), WIMP (Windows, Icons, Menus, Pointers), дослідницький центр Херох PARC, метафори робочого столу, доступність, просторові обчислення, орієнтований на користувача дизайн.

Abstract

This article traces the evolution of the Graphical User Interface (GUI) from text-based commands to intuitive, visual systems. It covers the foundational WIMP paradigm, the commercial competition between Apple and Microsoft, and the transition from skeuomorphic to flat design. The text concludes by exploring how smartphones and spatial computing have democratized technology through user-centric, accessible design.

Keywords: Graphical User Interface (GUI), WIMP, Xerox PARC, desktop metaphor, accessibility, spatial computing, user-centred design.

The development of the Graphical User Interface (GUI) [6] is one of the most important changes in modern history. It turned computers from difficult tools for experts into easy-to-use devices for everyone's daily life. Basically, a GUI uses pictures and icons to help people use electronic devices. In the past, people had to type long, complex text commands (called CLI). Now, we interact with visual signs instead. The main idea of a modern GUI is called WIMP. This stands for Windows, Icons, Menus, and Pointers. This system is the basis for almost everything we do on computers and smartphones today [1].

Before the GUI revolution, the computing landscape was defined by the Pre-GUI Era, dominated by Command Line Interfaces. In this period, interaction was a high-barrier activity; users were required to type specific, rigid text commands into a console to execute tasks. This "syntax-heavy" environment demanded significant technical knowledge and the memorization of complex command structures. The limitations of CLI created a digital divide, as only those with specialized training could harness the power of a computer. This necessity for a more accessible, human-centric approach sparked the theoretical foundations that would eventually move computing from abstract text to visual representations of real-world tasks.

The first major breakthrough occurred in the 1970s at Xerox PARC. In 1973, the Xerox Alto was introduced, recognized as the first computer to utilize a functional GUI. It was a revolutionary machine that started the use of bitmapped displays, the mouse, and the foundational concept of "windows." More importantly, Xerox PARC researchers developed the "Desktop Metaphor," where digital functions were mapped to physical office objects like folders and trash cans. This era also introduced the concept of "What You See Is What You Get", ensuring that the document on the screen would look identical when printed, a feat that fundamentally changed digital publishing [5].

The 1980s and 90s marked the era of monetizable and the "Desktop Wars". Apple made the first major move with the Apple Lisa in 1983, though its high price point kept it out of the hands of the general public. However, the 1984 launch of the Apple Macintosh became a historical turning point, offering an affordable and user-friendly interface that brought graphical computing to the masses. Microsoft responded in 1985 with Windows 1.0, then a graphical overlay for MS-DOS. The competition intensified until the release of Windows 95, which introduced the iconic "Start" menu and taskbar, establishing a navigation standard that remains a "golden standard" of desktop computing decades later [2].

In the early 2000s, computer design changed. It stopped being just about how things work and started focusing on how they look and feel. Apple's Mac OS X (2001) introduced the "Aqua" style. It used beautiful effects like shadows and transparent windows. During this time, designers used Skeuomorphism. This means digital apps looked like real objects. For example, a notes app looked like a real yellow notepad. This helped people feel more comfortable with new technology. As people became better at using computers, the style changed to Flat Design. This is a simple look with clean lines and bright colours, like Google's Material Design. It focuses on being fast and clear rather than looking like real-life objects. Then, in 2007, the iPhone changed everything again. It replaced the mouse with touch gestures, so people could use their fingers directly on the screen.

Today, we are entering a new era called Spatial Computing. We are moving away from simple screens to Natural User Interfaces (NUI). These use voice control (like Siri), hand movements, and touch vibrations. Technology is now moving into 3D space with Augmented Reality (AR) and Virtual Reality (VR). In the future, AI will create "liquid" interfaces. These will change automatically to fit exactly what the user needs at that moment, making the technology almost invisible [3].

The success of a GUI is deeply rooted in psychology and accessibility [4]. Effective design relies on principles like visibility, clarity, and immediate feedback, ensuring the user always understands the result of their actions. While GUIs require a lot of system resources (such as RAM and CPU) than text-based interfaces, the trade-off is a massive gain in speed and inclusivity. By lowering the cognitive load required to operate a machine, GUIs have transformed the computer from a technical engine into a universal platform for creativity, communication, and human connection.

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