

# Study of Pros and Cons of Today's Modern Operating System

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## Abstract

*This research paper delves into the intricate realm of modern computer systems, which serve as the backbone of our daily digital interactions. These systems play a crucial role in powering the devices we rely on, from smartphones and tablets to laptops and desktop computers. By examining the positives and challenges inherent in these systems, this paper aims to shed light on their profound impact on our digital lives. One key focus of this paper is to explore the complexities of widely used operating systems such as Windows, macOS, Linux, Android, and iOS. Each of these operating systems has its unique strengths and weaknesses, which influence their usability, security, and overall user experience. By comparing these systems, we aim to provide a comprehensive understanding of their respective merits and limitations. Through comparative analysis, we seek to uncover insights into how these operating systems shape the digital landscape and affect users' daily interactions with technology. By gaining a deeper understanding of these systems, we can better appreciate the challenges and opportunities they present, as well as their implications for the future of computing. Ultimately, this paper aims to contribute to the ongoing discourse surrounding modern computer systems and their impact on society.*

**Keywords:** Modern operating systems, computer systems, user interface, multitasking, security features, compatibility, regular updates, resource intensiveness, privacy concerns, system complexity, vulnerabilities, internet connectivity

## INTRODUCTION

In the fast-paced world of technology, modern operating systems have evolved from basic functionalities to essential components that serve as the computational brains of contemporary devices. Their fundamental role involves managing the intricate relationship between hardware and

software, facilitating a seamless user experience. As users interact with their devices, these operating systems act as intelligent mediators, simplifying complex hardware operations to ensure smooth functionality [1].

However, the significance of modern operating systems comes together with their inherent complexity. These systems must delicately balance sophisticated processes required for efficient resource management, security protocols, and compatibility with a user-friendly interface [2]. The complexity arises from the intricate tasks of allocating and managing resources, adapting to diverse hardware configurations, addressing security concerns, and keeping pace with emerging technologies. Striking the right balance between

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advanced features and user simplicity remains an ongoing challenge in the design and maintenance of modern operating systems. This delicate dance between complexity and user-friendliness underscores the crucial role these systems play in the ever-evolving landscape of digital technology [3].

#### **Advantages of Modern Operating Systems [4]**

- *User-friendly interface:* Modern systems boast visually appealing interfaces, making them accessible and user-friendly.
- *Multitasking capabilities:* They excel in handling numerous tasks concurrently, facilitating activities like simultaneous music playback and web browsing.
- *Security Features:* Incorporating robust tools, these systems safeguard devices against threats like viruses and hackers.
- *Compatibility with diverse devices:* Demonstrating versatility, these systems seamlessly integrate with a wide array of devices, from printers to innovative applications.
- *Regular updates:* Ensuring optimal performance, these systems undergo regular updates, addressing issues and enhancing overall functionality.

#### **Disadvantages of Modern Operating System [5]**

- *Hardware requirements:* Some systems demand robust hardware, potentially posing challenges for older devices.
- *Privacy concerns:* Privacy may be compromised as systems collect user data, necessitating a balance between functionality and safeguarding personal information.
- *Complexity:* The inherent complexity of these systems may present a learning curve, especially for newcomers to computing.
- *Security challenges:* Popularity makes these systems targets for malicious activities, requiring robust security measures.
- *Dependency on the Internet:* Certain functionalities may be contingent on Internet connectivity, posing limitations in offline scenarios.

#### **Pros of Modern Operating Systems**

##### ***Feature Richness***

- Modern operating systems offer a plethora of features and functionalities that cater to diverse user needs.
- Users can enjoy a wide range of applications, multimedia support, and connectivity options.
- **User-Friendly Interface:**
- Graphical User Interfaces (GUIs) make modern operating systems more accessible and user-friendly.
- Intuitive interfaces improve user experience and reduce the learning curve for new users.

##### **Multitasking and Multithreading**

- Modern operating systems efficiently handle multitasking, allowing users to run multiple applications simultaneously.
- Support for multithreading enhances the performance of modern processors.

##### **Hardware Abstraction**

- The abstraction of hardware details makes it easier for software developers to create applications without worrying about specific hardware configurations.

##### **Security Features**

- Modern operating systems integrate advanced security features such as firewalls, antivirus tools, and encryption to protect user data.
- Regular security updates help address vulnerabilities and improve overall system security.

### **Device Compatibility**

- Modern operating systems are designed to support a wide variety of hardware devices, ensuring compatibility with a diverse range of peripherals [6].

### **Networking Capabilities**

- Robust networking features enable seamless connectivity, facilitating communication and data exchange between devices on a network.
- Internet connectivity is integral, supporting web browsing, online services, and cloud computing.

### **Cons of Modern Operating Systems Resource Intensive**

- Modern operating systems often require significant computational resources, leading to higher hardware specifications for optimal performance.

### **Learning Curve**

- The complexity of modern operating systems can result in a steeper learning curve, especially for users transitioning from simpler systems [7].

### **Bloatware**

- Over time, modern operating systems may accumulate unnecessary features and applications, leading to bloatware that consumes storage and system resources.

### **Vulnerabilities and Bugs**

- Complexity increases the likelihood of software vulnerabilities and bugs, which can be exploited by malicious entities [8].

### **Dependency on Updates**

- Users may become dependent on frequent updates, and failure to install them can leave the system exposed to security risks.

### **Compatibility Issues**

#### ***Software compatibility***

Older software may not be compatible with the latest operating system versions.

- Users may experience crashes, errors, or loss of functionality when running outdated applications.

#### **Driver Compatibility**

- Incompatibility between device drivers and the operating system.
- Hardware devices, such as printers or graphics cards, may not function correctly or may not be recognized by the system.

### **Legacy Support**

- Limited support for legacy technologies or older file formats.
- Difficulty in accessing or working with files created using outdated technologies.

### **Virtualization Issues**

- Compatibility challenges when running virtualization software.
- Virtual machines may not perform optimally or may encounter stability issues.

### **Security Software Compatibility**

- Antivirus or security software may not be fully compatible with certain operating system updates.
- Security vulnerabilities may arise, or the security software may not function as intended.

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**Middleware and Framework Compatibility**

- Incompatibility with middleware or development frameworks.
- Developers may face challenges in creating applications that seamlessly integrate with the operating system.

**Web Browser Compatibility**

- Web browsers may not render pages correctly or may lack support for the latest web technologies.
- Users may experience issues when browsing the internet or accessing web-based applications.

**Cross-Platform Challenges**

- Differences in operating systems across various platforms (Windows, macOS, Linux).
- Applications developed for one platform may require modification to run smoothly on another.

**Updates and Patches**

- Compatibility issues may arise after installing system updates or patches.
- Users may encounter errors, crashes, or new bugs introduced by the updates.

**Custom Software Integration**

Difficulty integrating custom-built software with the operating system.

- Businesses or individuals relying on specialized software may face challenges in ensuring seamless integration.

**API Changes**

- Changes to Application Programming Interfaces (APIs) can impact software that relies on specific API versions.
- Software developers may need to update their applications to align with the latest API specifications.

**Customization Challenges**

- While modern operating systems offer a range of customization options, deep-level customization may be challenging for average users.

**COMPARATIVE ANALYSIS****User Interface [9]****Windows**

- Offers a familiar interface, suitable for a broad user base.
- Some users may find the interface less intuitive compared to macOS.

**macOS**

- Known for its sleek and visually appealing interface.
- Limited customization compared to Windows.

**Linux**

- Highly customizable, with various desktop environments available.
- Some distributions may have a steeper learning curve for beginners.

**SOFTWARE COMPATIBILITY [10]****Windows**

- Extensive software library, compatible with a wide range of applications and games.
- Some niche or specialized software may have better support on other platforms.

### **macOS**

- Strong support for creative and design applications.
- Limited gaming software compared to Windows.

### **Linux**

- Growing compatibility, especially for open-source software.
- Limited support for proprietary software and some commercial applications.

## **PERFORMANCE**

### **Windows**

- Generally well-optimized for a variety of hardware configurations.
- Can be resource intensive, especially with updates and background processes.

### **macOS**

- Optimized for Apple hardware, providing smooth performance.
- Limited to Apple devices, potentially limiting upgrade options.

### **Linux**

- Efficient performance on a wide range of hardware, especially for lightweight distributions.
- Driver support for certain hardware may be limited.

## **SECURITY**

### **Windows**

- Improved security features in recent versions.
- Historically more vulnerable to malware, but this has improved.

### **macOS**

- Generally considered more secure, partially due to a lower user base.
- Not immune to security threats; vulnerabilities can still exist.

### **Linux**

- Security through open-source collaboration and regular updates.
- Can be vulnerable in certain distributions, and user practices play a crucial role.

## **CUSTOMIZATION**

### **Windows**

- Offers a good level of customization, especially with third-party software.
- Some limitations compared to Linux.

### **macOS**

- Limited customization options compared to Windows and Linux.
- Users have less control over the look and feel of the system.

### **Linux**

- Highly customizable, with various desktop environments and themes.
- Customization may require more technical expertise.

## **COMMUNITY AND SUPPORT**

### **Windows**

- Extensive user community and vast support resources.
- Official support may come at a cost, especially for older versions.

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**macOS**

- Support from Apple, with a dedicated user community.
- Limited to Apple hardware; support outside official channels may be limited.

**Linux**

- Strong community support, especially in forums and online communities.
- Official support may vary depending on the distribution.

**Complexity Analysis***Kernel Complexity*

- The complexity of the core component is responsible for managing system resources and providing a bridge between hardware and software.
- Modern operating systems often have sophisticated kernels with features like multitasking, multithreading, and support for various device drivers, increasing complexity.

*File System Complexity*

- The organization and management of data on storage devices, including the implementation of file structures and access protocols.
- File systems in modern operating systems are complex, supporting advanced features like journaling, encryption, and network file systems, contributing to overall complexity.

*Device Management Complexity*

- The ability of the operating system to recognize, configure, and manage various hardware devices.
- Supporting a wide range of devices, each with unique specifications, requires a complex system for device detection, driver loading, and resource allocation.

*Memory Management Complexity*

- The efficient allocation and deallocation of system memory for running processes.
- Modern operating systems use complex memory management techniques, including virtual memory, paging, and memory protection mechanisms, to optimize resource utilization.

*Security Mechanisms Complexity*

- The implementation of security features and protocols to protect the system from unauthorized access, data breaches, and malicious software.
- Security complexities include user authentication, access control lists, encryption, and constant adaptation to address evolving threats.

*Networking Complexity*

- The ability of the operating system to manage network connections, protocols, and data transfer efficiently.
- Networking complexities involve support for various protocols, network configurations, firewalls, and security measures to ensure reliable communication.

*User Interface Complexity*

- The design and implementation of the GUI or command-line interface for user interaction.
- GUIs in modern operating systems are sophisticated, featuring graphical elements, accessibility options, and interactive components, increasing the overall system complexity.

*Update and Patch Management Complexity*

- The procedures for delivering and installing updates, patches, and security fixes to the operating system.

- Managing updates in a way that ensures system stability while addressing vulnerabilities can be complex, requiring coordination and testing.

### Future Trends and Recommendations

Predictions for future operating systems and recommendations for addressing current challenges, emphasizing collaboration between developers and users, and industry-wide standards to enhance security and privacy.

### CONCLUSION

In conclusion, modern operating systems stand as indispensable orchestrators in the intricate dance between hardware and software, evolving from basic functionalities to the cognitive core of contemporary devices. Their significance lies in providing users with a simplified and streamlined experience, serving as intelligent mediators that navigate complex operations behind the scenes. However, this significance comes with a challenge—the perpetual need to balance sophistication with user-friendliness. As we navigate the complexities of these systems, it becomes evident that their role is central to our digital experiences, shaping the landscape of technology and influencing how we interact with our devices daily. The delicate equilibrium between advanced features and simplicity underscores the ongoing evolution of modern operating systems, paving the way for a future where technology seamlessly integrates with our lives.

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