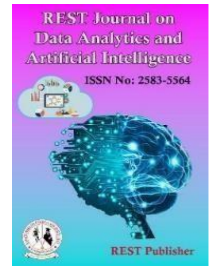
REST Journal on Data Analytics and Artificial Intelligence

Vol: 4(3), September 2025

REST Publisher; ISSN: 2583-5564

Website: http://restpublisher.com/journals/jdaai/

DOI: https://doi.org/10.46632/jdaai/4/3/15



Statistical Analysis of User Experience Factors in Computer Operating Systems an SPSS-Based Pilot Study

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Abstract: *This study investigates the factors that influence user experience in computer operating systems through comprehensive statistical analysis using given the critical role of operating systems in modern computing, the research aims to evaluate their performance from a user-centered viewpoint. A pilot study (N = 6) was conducted to measure five key parameters: ease of use, accessibility, user satisfaction, cost-effectiveness, and system reliability. The measurement tool demonstrated reliable internal consistency (Cronbach's α = .746). User satisfaction and system reliability scored highest (Mean = 4.00), followed by ease of use (3.83), cost-effectiveness (3.50), and accessibility (3.17). A strong positive correlation was found between ease of use and user satisfaction (r = .956**), and ease of use also significantly correlated with system reliability (r = .765).On the other hand, cost-effectiveness displayed weak or negative correlations with the other factors, suggesting it is a distinct dimension in users' perceptions. Further reliability analysis showed that removing the cost-effectiveness item raised Cronbach's alpha to .913, indicating its inconsistency with other factors. These findings underscore the interconnected nature of usability factors in operating systems while highlighting cost-effectiveness and accessibility as areas for improvement.*

Keywords: *Computer operating systems, User experience, SPSS statistical analysis, System reliability, Accessibility evaluation.*

1. INTRODUCTION

His emergence of modern computing technologies and their architectures has led to a clear trend toward the development of operating systems (OS) that manage the underlying technical frameworks enabling device components to interact. This highlights, without question, that an OS is the cornerstone of every computer system worldwide. [1] While a significant portion of operating system research focuses on UNIX variants, mainstream computing predominantly relies on personal computers derived from the IBM-PC architecture, which typically operate on Microsoft Windows. [2]This divergence between research environments and widely-used systems can limit the applicability of certain studies to industry needs. Nevertheless, ongoing OS research—supported by organizations like Intel, the Sloan Foundation, and the National Science Foundation—remains vital.[3] It offers critical insights into software development trends, though non-UNIX systems often receive less attention. This paper examines the reasons behind this research imbalance, explores the characteristics of systems research, and considers its implications for future innovation. It begins with an overview of computer science, highlights the need for established principles in OS design, and suggests a framework for structuring OS education. [4] The emergence of new processor architectures necessitates fundamental changes in both operating systems and applications, effectively turning all computers into parallel systems. Utilizing this parallel capability, once primarily a high-performance computing (HPC) challenge, is now a central concern for mainstream OS and language development.[5] This session encourages the control theory community to engage with modeling and analysis problems in computer systems, particularly the design of adaptive software that remains robust and efficient across diverse conditions.[6] Additionally, the paper evaluates CALOS—a web-based educational tool for operating systems courses and discusses findings from its pilot implementation regarding computer-assisted learning outcomes. [7] Research in reconfigurable computing operating systems varies mainly in how hardware modules are represented—as processes, threads, or kernel modules—and the extent of OS services allocated to them. For instance, BORPH employs UNIX processes, while Threads and Reconfigure use lightweight threading. Newer approaches like SPREAD merge multithreading with streaming models, and FUSE integrates hardware accelerators directly into the kernel.[8]Concurrently, this paper re-envisions hypermedia as a foundational computing paradigm, arguing for its expansion beyond conventional roles in human-computer interaction and information management. By embedding hypermedia into the core OS, we can create a unified system that seamlessly blends interaction, storage, programming, and control into a single conceptual framework.[9] Retention policies, which vary across standards, are crucial in defining how data is kept within computing systems, based on user needs and available resources. This paper reviews retention requirements for different standards, including ISO27001 and PCI DSS. Logging, as an essential feature of many operating systems, has become a critical component of kernels in modern systems.[10]In reconfigurable systems, the software responsible for linking and loading applications must manage more complex tasks compared to traditional systems. While some tasks overlap with those in application design tools, such as setting locations and routing, system software does not handle technical mapping in the same way traditional OSs don't perform compilation tasks.[11] Prior studies have demonstrated the effectiveness of rate-based resource allocation in supporting both soft and hard real-time applications on general-purpose operating systems. Building on this foundation, our research evaluates the comparative advantages of employing diverse rate-based strategies to address various resource allocation challenges within OS environments like FreeBSD UNIX. [12]Increasingly diverse computational environments, including clusters, supercomputers, and grid systems, host shared and parallel applications. Performance variability is inherent in these environments. To address this, we present a modular framework that enables applications to adapt to evolving computational needs and environmental conditions. Reconfiguration happens at the application component level, such as processes or actors, for flexibility across distributed applications. [13] Application components communicate their resource utilization—including processing, communication, data access, and memory usage—to middleware through a standardized profile API. Specialized monitors within this framework collect metrics such as CPU, memory, storage, and network bandwidth consumption. The IOS structure provides defined interfaces for these monitors, ensuring compatibility with diverse profiling methodologies. [14] Choosing an operating system for service and I/O nodes is often influenced by the need for access to source code. While major changes to the OS and I/O partitions are unlikely, modifications may be needed to facilitate interaction with the operating systems of compute nodes. [15]

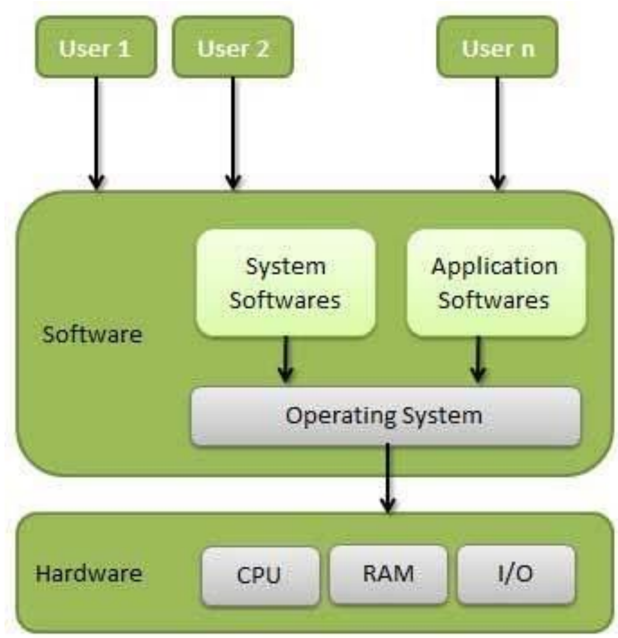

FIGURE 1. Operating system architecture

Figure 1**.** illustrates the operating system architecture, depicting its core role in managing interactions between users, application software, and hardware components like the CPU, RAM, and I/O devices. It acts as the essential intermediary that ensures efficient resource allocation and seamless communication across all system layers.

2. MATERIAL AND METHOD

Alternative Parameters

Participant ID: The Participant ID refers to the unique identifier such as an account number, login, user ID, or partner reference number provided by us, allowing access to the Sharing Plan Account Service.

Device Type: A "device type" describes a specific model or class of hardware, outlining its physical properties, capabilities, and functionality. For example, it might refer to a "Cisco router" or an "Android phone," each representing a category that can be applied to all devices of that model in a larger system or inventory.

Operating System: An operating system (OS) serves as the fundamental software layer that mediates between a computer's hardware and its user applications. It coordinates essential functions including memory allocation, process scheduling, file handling, and input/output operations. Common examples of operating systems are Microsoft Windows, macOS, Android, and Linux.

User Experience Level: The "user experience level" can refer to an organization's UX maturity, which assesses how well it integrates user-centered design. It can also describe the level of experience of an individual in a product, such as junior, mid-level, or senior UX designer, indicating their responsibility and expertise within the field.

Primary Use Case: A primary use case is the central goal or action initiated by a user (or an external entity) to interact with a system, fulfilling their core need. It serves as the primary interaction and forms the basis of use case diagrams, often playing a critical role in software and system requirement specifications.

Accessibility Feature Used: Accessibility features enable individuals with disabilities to interact with technology effectively. Tools like text-to-speech assist visually impaired users by converting written content into audio, while speech recognition allows those with mobility limitations to operate systems through voice commands.

Evaluation Parameters

Ease of Use: Ease of use describes how effortlessly and intuitively users can accomplish their objectives with a product, system, or service. It emphasizes usability and user-friendliness, enabling task completion with minimal difficulty or prior training. High ease of use leads to greater user satisfaction by reducing the need for complex instructions or lengthy learning curves.

Accessibility: Accessibility focuses on the ability for people, especially those with disabilities, to access and benefit from a system or service. It often involves assistive technologies but also applies broadly, improving overall usability and convenience for all users.

User Satisfaction: User satisfaction gauges how content users are with a product or service, indicating whether it meets or surpasses their expectations. This often fosters loyalty and encourages continued use. Common assessment methods include Net Promoter Score (NPS), surveys, and user ratings, which help pinpoint strengths and opportunities for enhancement.

Cost Efficiency: Cost efficiency is the ability to achieve desired results with minimal financial expenditure. It emphasizes getting the best value for money spent, ensuring that the outcome justifies the cost. A cost-effective product or solution delivers quality while keeping expenses reasonable.

System Reliability: System reliability is the measure of how consistently a system performs its intended function without failure. It is calculated based on the failure rate of individual components in the system, with the aim of reducing failure rates to ensure the system operates smoothly and reliably over time.

SPSS method:

This field of study focuses on techniques like multi-core processors, parallel programming methods, and distributed computing systems. Researchers are working on enhancing high-performance computing by identifying architectures that leverage parallelism to efficiently handle complex tasks. SPSS Statistics, a software developed by IBM, is used for multivariate analysis, business intelligence, and criminal investigation data management, among other advanced analytics tasks.[16] In evaluating statistical software for blind university students, our review prioritized Windows-compatible tools, as this is the dominant platform for this user group. We assessed packages including SPSS and Minitab, outlining expected software capabilities and core evaluation tasks. The study also addressed relevant file formats and accessibility challenges related to graphical output.[17]SPSS, a registered trademark of SPSS Inc., is proprietary software, and the materials related to it cannot be reproduced or distributed without permission from the trademark owners.[18]One of the goals of this book is to introduce how to use SPSS for data analysis. The text provides detailed instructions on conducting various statistical procedures in SPSS, with step-by-step guides, screenshots, and videos. [19] To evaluate student footwork ability and their movement on the basketball court, SPSS was used for statistical analysis. The study's results, which involved assessing the students' movement ability using basketball court parameters and game design, demonstrated the high reliability and validity of the footwork test method.[20]Additionally, to streamline the analysis process, nine indicators were selected, and a factor model was established using SPSS 10.0. The results showed that the factor model met the research needs and confirmed the effectiveness of the chosen method.[21]Developed by SPSS Corporation in the early 1980s, SPSS has become one of the most widely used statistical software packages in Australian research institutions and universities. Its popularity can be attributed to its simplicity, familiarity to applied mathematics consultants, and practicality for users.[22] Developed by SPSS Corporation in the early 1980s, the SPSS software package has evolved to its current version and is now one of the most widely used statistical applications in Australian research institutions, with availability across all universities in the country. [23] This chapter serves as a guide to the analytical procedures within SPSS's Complex Models module, introducing key techniques and technical terms. While the concepts are foundational, they are designed to build a base for deeper, more comprehensive understanding of complex modeling approaches. [24] While several commercial tools like SAS are available for data processing, user-friendly software such as SPSS remains popular. However, the rise of open-source platforms like R is reshaping the field. These tools offer researchers greater flexibility, enhanced analytical control, and access to a rapidly growing community of developers and resources. [25]The study outlined in this paper didn't involve specific fieldwork but instead followed a logical interpretation model based on available empirical data and secondary sources related to SPSS and data analysis. The primary data source for this study was the author's personal experiences with SPSS in social science research.[26]For data analysis, the collected data were coded and entered into an SPSS dataset, where descriptive statistics and paired samples t-tests were performed to identify differences. Satellite data were also used to assess the socioeconomic impact of small dams on local communities before and after their construction. [27]Beyond statistical analysis, SPSS also handles data management tasks, such as case selection, file reformatting, and data retrieval, as well as documentation through a metadata dictionary stored within the data file. The software's user-friendly graphical interface, complete with descriptive menus and dialog boxes, makes it accessible for those new to statistical analysis.[28]This report shares the author's 20+ years of experience using statistical packages, including over years as a statistical consultant at UCLA. As a consultant, the author has worked with thousands of researchers across a variety of statistical tools, including Stata, SAS, SPSS, Mplus, and others, switching between packages depending on the research needs of the day. [29] Additionally, SPSS randomization tests offer a robust alternative to conventional parametric methods like t-tests and ANOVA, particularly when assumptions of normality or random sampling are not met. The highlighted programs perform approximate randomization tests to evaluate hypotheses concerning mean equality, distribution similarity, and variable independence. [30]

3. RESULT AND DISCUSSION

TABLE 1. Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.746	.759	5

TABLE 1 Based on five items, the scale demonstrates acceptable reliability for research with a Cronbach's alpha of .746. This indicates sufficient internal consistency, confirming that the items collectively measure the intended underlying construct at a group level.

TABLE 2. Reliability Statistic individual

	Cronbach's Alpha if Item Deleted
Ease of Use	.474
Accessibility	.708
User Satisfaction	.570
Cost Effectiveness	.913
System Reliability	.652

TABLE 2 The analysis shows that removing the "Cost Effectiveness" item would drastically increase Cronbach's Alpha to .913, indicating it is inconsistent with the scale. Removing "Ease of Use" or "User Satisfaction" would also weaken reliability. "Accessibility" and "System Reliability" align best with the overall construct.

TABLE 3. Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean	Mean	Std. Deviation	Variance	Skewness		Kurtosis	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Ease of Use	6	3	2	5	23	3.83	.477	1.169	1.367	-.668	.845	-.446	1.741
Accessibility	6	2	2	4	19	3.17	.307	.753	.567	-.313	.845	-.104	1.741
User Satisfaction	6	2	3	5	24	4.00	.365	.894	.800	.000	.845	-1.875	1.741
Cost Effectiveness	6	3	2	5	21	3.50	.428	1.049	1.100	.000	.845	-.248	1.741
System Reliability	6	2	3	5	24	4.00	.365	.894	.800	.000	.845	-1.875	1.741

TABLE 3 Based on six responses, average ratings are positive. "User Satisfaction" and "System Reliability" score highest (Mean=4.00). "Accessibility" is rated lowest (Mean=3.17). Moderate standard deviations indicate some response variation. The negative skew for most items suggests a tendency toward favorable scores.

TABLE 4. Frequencies Statistics

Statistics						
		Ease of Use	Accessibility	User Satisfaction	Cost Effectiveness	System Reliability
N	Valid	6	6	6	6	6
	Missing	0	0	0	0	0
Mean		3.83	3.17	4.00	3.50	4.00
Median		4.00	3.00	4.00	3.50	4.00
Mode		4[a]	3	3[a]	3[a]	3[a]
Std. Deviation		1.169	.753	.894	1.049	.894
Percentiles	25	2.75	2.75	3.00	2.75	3.00
	50	4.00	3.00	4.00	3.50	4.00
	75	5.00	4.00	5.00	4.25	5.00

TABLE 4 The frequency statistics for six respondents show high mean scores for User Satisfaction and System Reliability (4.00). Ease of Use (3.83) and Cost Effectiveness (3.50) are moderate, while Accessibility is lowest (3.17). Multiple modes and standard deviations above 0.75 indicate some disagreement in responses across all factors.

Histogram

FIGURE 2.

Figure 2 Ease of Use has a mean rating of 3.83, indicating a generally positive perception. The median is 4.00, but a standard deviation of 1.169 and multiple modes show significant response variation. This suggests that while many find the system easy to use, experiences are not uniform.

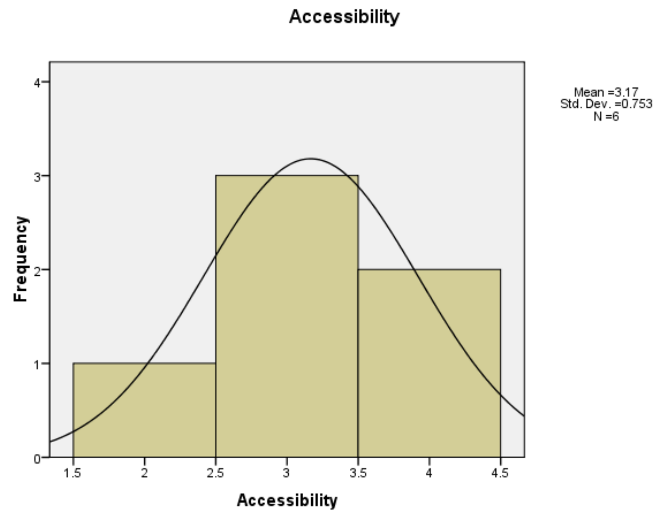

FIGURE 3

Figure 3 Accessibility received the lowest average rating (Mean=3.17) among the factors. The median and mode are both 3, indicating a central tendency toward a neutral or moderate assessment. This suggests that users perceive this as an area requiring potential improvement compared to other system features.

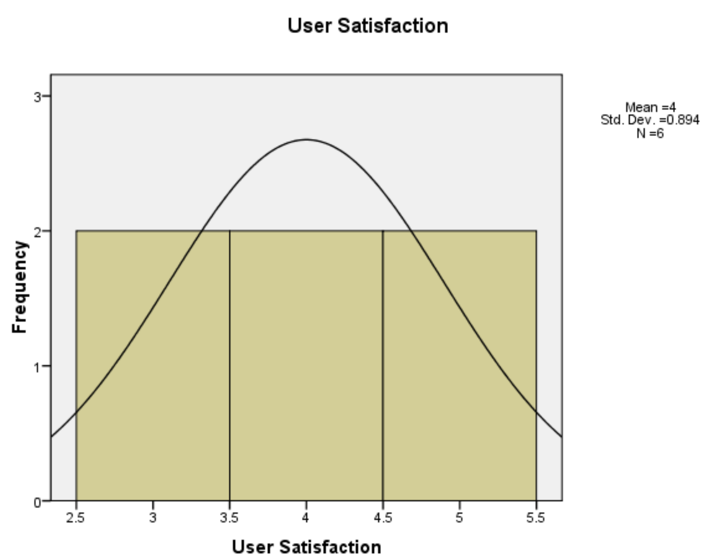

FIGURE 4

Figure 4 User Satisfaction has a high mean score of 4.00, matching System Reliability as the top-rated factor. The median is also 4.00, indicating generally positive feedback. However, a standard deviation of 0.894 and multiple modes suggest some variability in individual user experiences, with not all respondents equally satisfied.

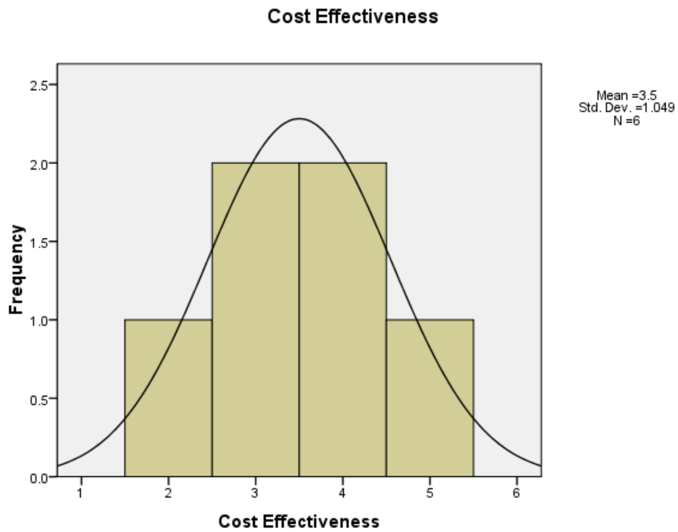

FIGURE 5

Figure 5 indicates a median cost effectiveness rating of 3.50. However, the high standard deviation of 1.049 and presence of multiple modes reveal considerable user disagreement. This significant divergence in opinions suggests that value-for-money is a polarizing aspect of the system among its users.

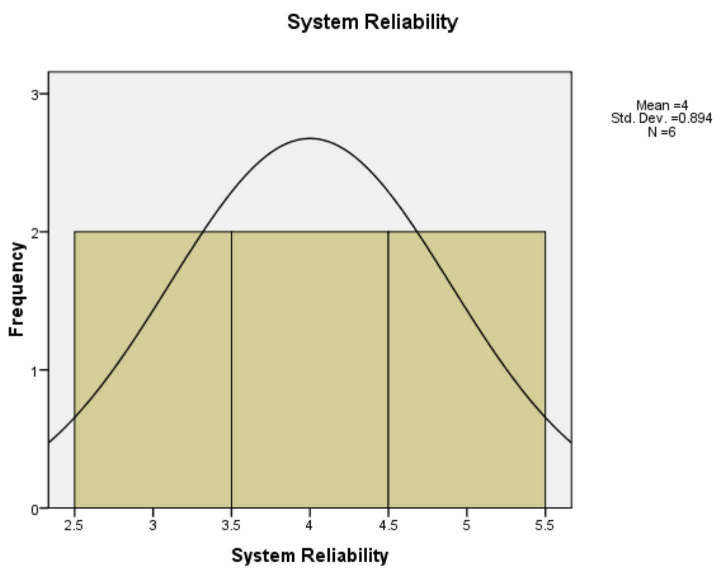

FIGURE 6

FIGURE 6 System Reliability is highly rated with a mean score of 4.00, matching User Satisfaction. The median is also 4.00, indicating consistent positive feedback. However, a standard deviation of 0.894 and multiple modes suggest some variability in user experiences, meaning not all perceive the system as equally dependable.

Correlations

TABLE 5. Correlations

	Ease of Use	Accessibility	User Satisfaction	Cost Effectiveness	System Reliability
Ease of Use	1	.720	.956**	.082	.765
Accessibility	.720	1	.594	-.380	.594
User Satisfaction	.956**	.594	1	.000	.750
Cost Effectiveness	.082	-.380	.000	1	-.213
System Reliability	.765	.594	.750	-.213	1
*. Correlation is significant at the 0.05 level (2-tailed).					

Table 5 The correlation analysis reveals a very strong, significant positive relationship between Ease of Use and User Satisfaction (r = .956**). Ease of Use also strongly correlates with System Reliability. Conversely, Cost Effectiveness shows weak, often negative correlations with all other factors, indicating it is an independent dimension of user perception.

4. CONCLUSION

This study, based on comprehensive statistical analysis using SPSS, offers valuable insights into the factors influencing user experience in computer operating systems. Through a pilot study involving six participants, the research evaluated five key parameters, uncovering important trends in user perceptions and preferences. The findings reveal that user satisfaction and system reliability are the most highly valued aspects of operating systems, both receiving a mean rating of 4.00. This suggests that users prioritize dependable performance and overall satisfaction more than other factors. This relationship suggests that systems perceived as easy to use lead to greater user satisfaction. The study also highlights areas that need improvement. Accessibility emerged as the lowest-rated factor (mean = 3.17), pointing to a significant opportunity for enhancing operating systems' inclusivity and usability for a wider range of users. Although cost-effectiveness received a moderate rating (mean = 3.50), it showed weak correlations with other factors, indicating it functions as a distinct aspect in user decision-making rather than being linked to other usability features. Item raised the Cronbach's alpha to .913 suggests that cost-effectiveness might require a separate evaluation structure. These results offer a deeper understanding of human-computer interaction in operating system design and provide practical recommendations for developers. The study emphasizes that prioritizing user satisfaction, system reliability, and ease of use should be central to OS development. Future research should address the study's limitations, using larger sample sizes and longitudinal studies to explore how these factors impact long-term user adoption and productivity. Furthermore, enhancing accessibility could significantly improve the user experience for diverse user groups.

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