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IMPACT OF USABILITY AND USER EXPERIENCE IN ENTERPRISE RESOURCE PLANNING ON USER SATISFACTION IN OPTIMIZATION OF USER CENTRIC DESIGN - SPECIAL REFERENCE TO PRIVATE UNIVERSITIES OF SRI LANKA

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Abstract

This research aims to explore the impact of usability and user experience in Enterprise Resource Planning (ERP) systems on user satisfaction, with a specific emphasis on optimizing user-centric design within private universities in the Colombo district. As the implementation of ERP systems becomes increasingly prevalent in higher education institutions, understanding the factors that contribute to user satisfaction is essential for maximizing the effectiveness and utility of these complex systems. Employing a quantitative research design, this study gathered data through structured questionnaires distributed to various departments, including academics, finance, student liaison, and software engineering. The sample comprised 100 participants, allowing for a comprehensive analysis of user demographics, their experience with the ERP system, and their level of satisfaction. Descriptive statistics, frequency distributions, and regression analysis were utilized to interpret the data and examine the relationships between usability, user experience, and user satisfaction. The findings reveal that both usability and user experience significantly influence user satisfaction levels among ERP users. High usability, characterized by intuitive interfaces and efficient navigation, correlates positively with higher satisfaction scores. Similarly, a positive user experience, which encompasses the overall perception of the ERP system's functionality and responsiveness, further enhances user satisfaction. The study highlights the necessity for continuous improvements in the design and functionality of ERP systems, advocating for user-centered design principles that incorporate user feedback throughout the development and implementation phases.

Keywords: Enterprise Resource Planning (ERP), Usability, User Experience, User-Centric Design

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■ 1.0 INTRODUCTION

Enterprise Resource Planning (ERP) systems have become indispensable tools in modern business operations, offering integrated solutions that streamline complex organizational processes and improve overall efficiency. These systems encompass a wide range of functions such as finance, human resources, supply chain management, and customer relations consolidating them into a unified platform that allows organizations to operate more cohesively and transparently. Despite the extensive functionality offered by ERP systems, their success often hinges not only with the technical capabilities they provide but also with how well they meet the expectations and needs of their end-users. As businesses continue to depend on these robust software platforms, the user experience (UX) has become a crucial factor influencing the overall success and adoption of ERP systems (Hwang et al.,2014). Traditionally, ERP implementations have been fraught with difficulties. Many organizations face significant challenges during the adoption phase, such as resistance from users who find the systems' interfaces unintuitive and difficult to navigate. These systems are often perceived as overly complex, resulting in a steep learning curve for employees unfamiliar with the technology (Barlow & M. K, 2018). The complications can result in costly delays and even outright failure of ERP projects (DeLone & McLean, 1992). The difficulties users face during and after ERP implementation underscore the importance of usability testing, a method designed to ensure that these systems are as user-friendly as they are functionally effective. As the role of ERP systems continues to evolve within organizations, usability testing becomes essential to optimizing the user experience and ensuring that ERP solutions deliver their intended value.

Recent years have seen a paradigm shift in the design and development of ERP systems (Davis, 1989). Historically, ERP platforms were primarily focused on functional capabilities, such as automating workflows and integrating disparate business functions. Usability defined by Moradpour, S., & Razzaghi., (2016) extent to which a system can be used by specific users to achieve goals effectively, efficiently, and satisfactorily. In the context of ERP systems, usability is critical because the systems are often used by non-technical employees who need to perform complex tasks quickly and accurately. Poor usability, such as complicated navigation and unintuitive interfaces, can lead to frustration, errors, and resistance to system use (Gefen & Straub, 2005). On the other hand, when ERP

systems are designed with a user-centric approach, incorporating feedback from end-users during the design process, it enhances the overall usability, thereby improving user satisfaction and system acceptance (Alsharif & Alhabshi, 2016).

User experience (UX) goes beyond usability, encompassing the overall emotional and psychological impact of using a system. UX considers factors such as the user's feelings, perceptions, and attitudes while interacting with the system (Nah & Delgado, 2006). The positive UX can significantly enhance user satisfaction by making the interaction with the ERP system not only functional but also enjoyable (Moradpour & Razzaghi, 2018). Studies have shown that when ERP systems offer a seamless and intuitive experience, users are more likely to adopt the system and use it to its full potential (Tarhini et al., 2015). Conversely, poor UX can result in user dissatisfaction, decreased productivity, and a lack of engagement with the system, which undermines the benefits of ERP implementation (Delone & McLean, 2003). In recent years, there has been a growing emphasis on integrating user-centric design principles into ERP systems to enhance both usability and User experience. User-centric design involves understanding the users' needs and contexts, and designing systems that are intuitive, responsive, and aligned with their workflows (Delone & McLean, 2003). Research suggests that when ERP systems are designed with a focus on the end-user experience, they are more likely to improve task performance, reduce the learning curve, and foster greater satisfaction (Gefen & Straub, 2005). By optimizing usability and User experience, organizations can achieve higher rates of user satisfaction, which in turn supports the successful implementation and long-term use of ERP systems (Nah & Delgado, 2006).

Therefore, the optimization of user-centric design in ERP systems is critical for ensuring user satisfaction. Understanding the impact of usability and UX on user satisfaction can provide valuable insights for organizations seeking to improve ERP adoption and performance. As ERP systems evolve, there is a need for continuous research to explore innovative design strategies that prioritize user needs. While the importance of usability and UX in ERP systems has been recognized in the literature, there is a significant research gap in the comprehensive examination of how these factors influence user satisfaction, particularly in the context of optimizing user-centric design. Most studies focus on the technical and functional aspects of ERP systems, such as their ability to integrate business processes and enhance organizational efficiency (Kearns & Lederer, 2000). However, there is limited research that systematically investigates how the usability and UX dimensions of ERP systems can be optimized through user-centric design to improve user satisfaction and long-term system adoption. The gap in the literature is the absence of a holistic framework that links usability, UX, and user-centric design to ERP system success. Although many studies emphasize the importance of these factors individually, there is a need for research that integrates these concepts to develop a comprehensive understanding of how they jointly contribute to user satisfaction (Kearns & Lederer, 2000).

As the theoretical background of the present study, the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB) form the basis for examining how usability and user experience influence user satisfaction with ERP systems. UTAUT provides a comprehensive framework by emphasizing the impact of performance expectancy, effort expectancy, social influence, and facilitating conditions on users' acceptance and effective use of technology. Complementing this, TPB highlights the significance of attitude, subjective norms, and perceived behavioural control in shaping users' intentions and behaviours toward system utilization. Grounding the study in these theories enables a deeper understanding of the behavioural and perceptual factors that drive ERP adoption within private universities. From a practical perspective, the successful implementation of ERP systems in private universities is critical, as these systems play a central role in administrative decision-making, academic coordination, and institutional governance. By integrating UTAUT and TPB with the examination of usability and user experience, this study aims to generate insights that support the development of user-centric ERP strategies, thereby enhancing system acceptance, operational efficiency, and informed decision-making across university administrative functions.

This research aims to fill this gap by investigating the impact of Usability and User Experience in Enterprise Resource Planning on User Satisfaction with a specific focus on optimizing user-centric design refers to the ERP users of private universities of Colombo district. However, there is a notable gap in the literature regarding the impact of usability and UX on user satisfaction in ERP systems. While many studies focus on the functional and technical capabilities of ERP systems, few address the critical role of usability and UX in fostering positive user experiences and satisfaction (Xu & Beak, 2015). Usability issues, such as complex interfaces and difficult navigation, are often cited as major reasons for user dissatisfaction and resistance to ERP adoption (Barlow & M. K, 2018). Moreover, although user-centric design principles have gained recognition for improving system usability, there is limited research on how such design strategies can be optimized in ERP systems to ensure both functional effectiveness and user satisfaction (Alsharif & Alhabshi, 2016).

The main objective of this study is to examine the impact of usability and user experience on user satisfaction in ERP systems. By exploring the relationship between usability, UX, and user satisfaction, this research seeks to identify key design strategies that organizations can implement to enhance ERP system effectiveness and increase user adoption. The study aims to contribute to the literature by developing a framework that integrates usability and UX principles into the design and implementation of ERP systems, ensuring that these systems align with users' needs and expectations. Furthermore, the research explores specific usability and UX factors, such as interface design, system navigation, and emotional engagement, and how they influence user satisfaction in different organizational contexts. By addressing the gaps identified in the literature, this study aims to provide practical recommendations for organizations seeking to optimize their ERP systems through user-centric design strategies. Ultimately, the findings of this research help organizations to improve ERP system adoption, performance, and user satisfaction, leading to more successful ERP implementations and better organizational outcomes.

■ 2.0 LITERATURE REVIEW

2.1 Enterprise Resource Planning (ERP) Systems

Enterprise Resource Planning (ERP) systems are integrated software platforms designed to centralize and streamline various business processes across an organization. These systems offer a unified solution that integrates functions such as finance, human resources, supply chain management, inventory control, customer relationship management (CRM), and procurement (Melero & Rodriguez, 2016). By consolidating these diverse business functions into a single system, ERP software helps organizations reduce operational silos, improve decision-making through real-time data, and enhance overall efficiency (Trigunarsyah & Zuo, 2016). The adoption of ERP systems is driven by their ability to provide comprehensive visibility into business operations, enabling better coordination between departments and reducing redundancies in processes.

The implementation of ERP systems has been widely recognized as a significant strategic investment, as they enable organizations to gain a competitive advantage by improving efficiency and reducing operational costs (Kim & Lee, 2008). However, the implementation process is often complex and costly, requiring significant organizational change, which includes re-engineering business processes, training employees, and managing system integration. The high cost and risk associated with ERP implementations have made it critical for organizations to ensure that the system aligns with their strategic goals and operational requirements (Smith & Gharakhani, 2015). Research on ERP systems highlight various factors influencing successful implementations, including top management support, clear project scope, and adequate training (Melero & Rodriguez, 2016). Top management support is often cited as a critical factor in ensuring the necessary resources and leadership to drive the project forward. Clear communication of the project's scope and objectives helps to manage expectations and avoid scope creep, which can derail the project. Additionally, training employees to use the system effectively is essential for driving adoption and maximizing the system's benefits (Smith & Gharakhani, 2015). Despite their potential benefits, ERP implementations have often faced challenges, particularly with user resistance. Many users perceive ERP systems as difficult to use due to their complexity and lack of familiarity (Delone, & McLean, 2003). Customization of ERP systems to fit specific business needs, while advantageous, can also increase system complexity and reduce usability (Vannoy, & Palvia, 2010). Furthermore, the success of an ERP system is not just dependent on its technical functionality but also on how well it meets the needs of the users and integrates into existing business processes (Seddigh & Raza, 2019).

2.2 Usability and User Experience (UX) in ERP Systems

The usability and user experience (UX) of Enterprise Resource Planning (ERP) systems have emerged as critical success factors in ERP adoption and effectiveness. Usability refers to the ease with which users can navigate and interact with a system, while UX encompasses a broader range of factors, including the users' overall satisfaction and emotional response to using the system (Moradpour & Razzaghi, 2018). In the context of ERP systems, usability and UX are particularly important due to the complexity and scope of these systems, which integrate multiple business processes into a single platform. Research indicates that poor usability is a major reason for the failure of many ERP implementations, leading to user resistance, inefficiency, and ultimately, underperformance of the system.

One of the primary challenges with ERP systems is their inherent complexity. These systems are designed to handle a wide range of business functions, and as a result, they often come with extensive functionality and a multitude of features that can overwhelm users (Somers & Nelson, 2001). This complexity can result in cumbersome interfaces and steep learning curves, particularly for users who may not have extensive technical backgrounds. Studies have shown that ERP systems are often perceived as difficult to use, which can lead to frustration and a lack of adoption among employees Improving usability is essential because the successful adoption of ERP systems depends on how effectively end-users can interact with the system in their day-to-day operations. A study by Zhang, L., & Wu, Z. (2016) indicated that ERP systems with better usability led to higher user performance, as employees spend less time navigating complex menus or searching for information (Xu & Beak, 2015). Moreover, when users find the system easy to use, they are more likely to accept it and integrate it into their daily work routines, which is crucial for maximizing the benefits of the ERP system (Xu & Beak, 2015). Therefore, organizations that invest in enhancing ERP usability are more likely to achieve successful implementations and long-term user satisfaction.

In addition to usability, the broader concept of user experience (UX) plays a pivotal role in the effectiveness of ERP systems. While usability focuses on the practical aspects of system interaction, UX encompasses the overall experience, including users' emotional responses, perceptions, and attitudes toward the system (Tarhini et al., 2015). The user experience with an ERP system can be shaped by various factors, including the visual design, system performance, ease of learning, and the system's ability to meet users' functional needs. The growing trend of incorporating usability testing during the ERP system design phase has become essential in ensuring that these systems are not only functional but also user-friendly. Usability testing involves evaluating the system by having real users perform tasks while observing their interactions, identifying pain points, and gathering feedback (Gable, 2004). This process helps designers make informed decisions about improving the system's interface and usability before it is fully deployed. By conducting usability testing, organizations can identify and address potential usability issues early in the implementation process, leading to smoother user experience and higher system adoption rates (Hwang & Kim, 2015).

2.3 User-Centered Design (UCD) in ERP Systems

The concept of user-centered design (UCD) has gained prominence as organizations recognize the importance of aligning system design with user needs and preferences (Kearns & Lederer, 2000). Research has demonstrated that ERP systems designed with a UCD approach are more likely to be successful, as they prioritize the needs and workflows of the end-users rather than the system's technical capabilities (Gable, 2004). By focusing on the user's experience, organizations can reduce the cognitive load required to operate the system, making it

easier for users to perform their tasks and achieve their goal (Vannoy & Palvia, 2010). One of the key principles of UCD is the iterative design process, which involves continuously refining the system based on user feedback. In the case of ERP systems, this can be achieved through regular usability testing and user feedback sessions, allowing developers to identify and address usability issues early in the development process (Bächtiger & Lechner, 2018). This approach has been shown to reduce the risk of system failure and increase user adoption rates, as users are more likely to embrace a system that has been designed with their needs in mind (Van der Meer & Verhoef (2013).

■ 3.0 METHODOLOGY

This section outlines the research methodology used to examine the impact of usability and user experience in ERP on user satisfaction. The methodology includes quantitative methods in order to examine the impact of usability and user experience on user satisfaction in ERP systems, with a specific focus on optimizing user-centric design. The research adopted for positivism as its philosophy. Positivism emphasizes the use of objective, observable, and quantifiable data to explain relationships between variables. Since the study investigates the impact of usability and user experience on user satisfaction in ERP systems, it is rooted in measurable variables, making a positive philosophy suitable.

A deductive approach was employed in the study, whereby hypotheses derived from established theories were examined through empirical testing. In this context, theoretical foundations related to usability, user experience, and user-centric design in ERP systems informed the development of hypotheses, which were subsequently tested using quantitative data collected from ERP users in private universities located in the Colombo District. Surveys strategy is used as the research strategy which is common and efficient method for collecting large amounts of quantitative data. Using a structured questionnaire, the study gathered data from ERP users across the selected private universities. The survey instrument was designed to capture respondents' perceptions of system usability, user experience, and their overall satisfaction with the ERP system.

The data for this research were collected primarily through structured questionnaires, a widely used method in quantitative research that allows for efficient collection of data from a large number of respondents. The structured nature of the questionnaire ensures that all participants are asked the same set of predefined questions, facilitating comparison and analysis of responses. The questionnaire was divided into sections addressing the key variables of the study: usability, user experience, and user satisfaction with the Enterprise Resource Planning (ERP) system. To assess usability, items adapted from established metrics such as the System Usability Scale (SUS), which provides a reliable and validated measure of system usability. Similarly, user experience was measured with recognized instruments like the User Experience Questionnaire (UEQ), which captures various dimensions of user interaction, including attractiveness, efficiency, and dependability of the ERP system. User satisfaction also measured through users' overall contentment with the system's functionality, interface design, and responsiveness.

The survey was distributed through online platform of Google Form, chosen for their accessibility and ability to reach a broad population of ERP users in private universities located in the Colombo district. Online distribution allowed those respondents to fill the survey at their convenience, which is particularly important when dealing with university staff who may have varying schedules. Additionally, the online method allows for automated data collection and storage, reducing the risk of errors that might arise from manual data entry. The research sample for this study consist of ERP system users from private universities located in the Colombo district. To ensure adequate representation of different categories of users, a stratified random sampling technique was employed. The strata were formed based on three primary user groups within the institutions including the administrative staff, academic staff, and IT personnel. These categories reflected the differing roles and levels of interaction each group had with the ERP system. After forming the strata, simple random sampling was applied within each group to select the participants. Only individuals with a minimum of six months of continuous ERP system usage were included, ensuring that all respondents possessed sufficient familiarity and experience to provide reliable insights, while those with limited or irregular interaction were excluded. Demographic characteristics including age, gender, educational background, years of work experience, and frequency of ERP usage were collected to support deeper analysis and allow examination of patterns across user segments. A final sample of approximately 100 participants was obtained, while ensuring balanced representation across the principal ERP user groups within private universities in the Colombo District.

The data analysis for this study involves a series of quantitative statistical techniques designed to examine the relationships between usability, user experience, and user satisfaction with ERP systems. The measurement items for each construct were developed based on established scales from prior peer-reviewed studies to ensure theoretical consistency and content validity. All items were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), enabling respondents to express varying degrees of agreement. The analysis begins with descriptive statistics to summarize participants' demographic characteristics and to examine the central tendencies and variability of the core variables. This is followed by Pearson's correlation analysis to assess the strength and direction of associations among usability, user experience, and user satisfaction. To evaluate the predictive influence of usability and user experience on user satisfaction, multiple regression analysis is conducted, providing insights into the relative contribution of each independent variable. Reliability analysis using Cronbach's alpha is performed to assess the internal consistency of the measurement scales and verify their suitability for further statistical testing. All the analyses are conducted using SPSS, ensuring systematic processing and accurate interpretation of the quantitative data.

■ 4.0 RESULTS

The research sample for this study, consisting of ERP users from private universities in the Colombo district, provides valuable insights into how usability and user experience impact user satisfaction. By examining these factors across various departments and experience levels, the analysis sheds light on the broader implications of ERP implementation in private universities.

The data on usage duration shows a varied spread of experience among ERP users. With 20% of users having less than six

months of experience and 18% within the 6–12-month range, there is a significant segment of relatively new users within the system. As these users are still within early stages of interaction, their experiences are likely formative and influence their perspectives on the ERP's usability. Only 13% have between 1–2 years of experience, and 15% exceed two years of use, showing a smaller subset of long-term users whose expectations and familiarity with the system might differ. Overall, the variability in usage timeframes suggests that user satisfaction might fluctuate as individuals adapt to the ERP's functionalities over time. In terms of expertise, 57% of respondents classify themselves as beginners, which emphasizes a high demand for usability in ERP systems. Beginner users might require intuitive interfaces and ample support, as they are in the learning curve of understanding the ERP's functionalities. Conversely, 43% of intermediate users likely focus on more advanced functionalities and would expect the system to handle complex tasks seamlessly. This balance between beginner and intermediate users is crucial for ERP design in user-centric environments.

The departmental breakdown adds another dimension to understanding ERP system use. Academic departments make up 24% of respondents, likely utilizing the ERP for managing student data, course schedules, and academic records, which requires reliable usability for routine tasks. The finance department, constituting 23%, probably relies on the ERP for complex, security-sensitive functions, such as budgeting and financial reporting, with a strong emphasis on data integrity and operational efficiency. Representing 20%, the Student Liaison Division manages student interactions and services, where usability and smooth access to real-time information directly impact their performance.

Table 1 Reliability Analysis

Variable	Cronbach's Alpha	N of Items
Usability	.948	10
User Experience	.901	10
User Satisfaction	.885	10

In this study, the constructs of usability, user experience, and user satisfaction exhibit high reliability, with Cronbach's Alpha values well above 0.85 for each variable set. This indicates that the survey items used to measure each construct are consistent across the respondent sample, allowing confidence in the validity of further analyses. For instance, the high reliability of usability ($\alpha = 0.948$) signifies that items measuring usability are cohesive, suggesting that respondents perceived usability-related questions consistently. Given that usability is often concrete and measurable (e.g., task completion rate, error rates), it is unsurprising that responses are reliable, pointing to a well-understood concept. Similarly, user experience ($\alpha = 0.901$) demonstrates strong reliability, indicating that this construct captures a cohesive perception among respondents. However, as user experience extends beyond usability, involving emotional responses and subjective perceptions, the slightly lower reliability than usability is expected. User satisfaction ($\alpha = 0.885$) also shows high reliability, reflecting the consistency in respondents' perceptions of their satisfaction. This reliability is crucial, as user satisfaction often combines both objective aspects of system use and subjective evaluations, which may vary based on user expectations, personal biases, and experiences. These high reliability scores confirm that the constructs measured are internally consistent and that items within each variable contribute meaningfully to their respective constructs, enabling robust regression analysis to examine predictive relationships.

Table 2 Descriptive Statistics

Variable	Mean	Std. Deviation	N
Useability	3.5800	.64948	100
User Experience	3.3230	.87269	100
User Satisfaction	3.0220	.72788	100

The descriptive statistics of usability, user experience, and user satisfaction provide insights into respondents' overall perceptions. The mean scores of 3.58, 3.32, and 3.02 suggest moderate levels of satisfaction and slightly lower levels for usability and user experience. This pattern indicates that while users feel moderately satisfied with their ERP system, there is room for improvement in both usability and user experience, possibly contributing to slightly lower satisfaction levels. The relatively low standard deviations for each construct imply that responses are clustered around the mean, indicating consensus among respondents regarding usability, user experience, and satisfaction levels. The average scores for usability and user experience reveal that users might face challenges in interacting with the ERP system, impacting their overall satisfaction. This result aligns with findings in user-centered design literature, which suggests that the usability and experience of ERP systems often need optimization to meet user expectations fully. It may suggest that users struggle with certain functionalities or navigation within the ERP system, reducing their satisfaction levels and impacting system adoption.

Table 3 Correlation Analysis

Variable		Usa	UE	US
Usability	Pearson Correlation	1	.314**	.338**
	Sig. (2-tailed)		.001	.001
	N	100	100	100
User experience	Pearson Correlation	.314**	1	.872**
	Sig. (2-tailed)	.001		.000
	N	100	100	100
User satisfaction	Pearson Correlation	.338**	.872**	1
	Sig. (2-tailed)	.001	.000	
	N	100	100	100

Correlation analysis reveals significant associations between usability, user experience, and user satisfaction. Usability and user experience are both positively correlated with user satisfaction, suggesting that improvements in either dimension are likely to enhance user satisfaction. Usability exhibits a moderate correlation with satisfaction (r = 0.338), while user experience has a much stronger correlation with satisfaction (r = 0.872). This strong association suggests that while usability is important, user experience has a more profound impact on satisfaction, possibly because user experience encompasses not only functional aspects but also emotional and aesthetic responses, which strongly influence satisfaction levels. This finding aligns with the theory of planned behavior, which posits that favorable perceptions enhance users' attitudes toward the system, increasing satisfaction and continued usage intention. Since user experience includes usability but also expands to cover broader dimensions such as user interaction quality, visual appeal, and emotional engagement, it exerts a more substantial influence on satisfaction. This result indicates that focusing on user experience design may yield greater improvements in satisfaction than addressing usability alone.

Table 4 Coefficient Analysis

Model		Unstandardized Coefficients		St. Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.113	.161		6.935	.000
	Usability	.053	.039	.071	1.373	.173
	User experience	.758	.046	.849	16.37	.000

Table 5 ANOVA

Model		Sum of Squares	df	Mean Square	F	Si
1	Regression	31.934	2	15.967	157.6	.000
	Residual	9.826	97	.101		
	Total	41.760	99			

a. Dependent Variable: User Satisfaction
b. Predictors: (Constant), Usability, User Experience

Regression analysis further clarifies the influence of usability and user experience on user satisfaction, providing a quantitative measure of their predictive power. The regression model shows an R-squared value of 0.765, indicating that usability and user experience together explain 76.5% of the variance in user satisfaction. This high R-squared value suggests that these constructions are strong predictors of satisfaction within ERP systems, highlighting the importance of a user-centered design in achieving satisfaction. In contrast, usability showed a positive but non-significant effect on satisfaction (B = 0.053, Std. Error = 0.039, Beta = 0.071, t = 1.373, p = 0.173). Although usability is positively associated with satisfaction, the lack of statistical significance suggests that, in this context, basic system usability may be less influential than broader user experience factors, such as aesthetics, emotional engagement, and overall interaction quality. This finding may reflect that ERP users in private universities have developed familiarity with system functionality, reducing the direct impact of usability on satisfaction. Similar patterns have been observed in prior research, where user experience outweighed usability in determining satisfaction in complex enterprise systems (Calisir, 2004). Further, the results indicate that user experience has a significant positive effect on user satisfaction, (B = 0.758, Std. Error = 0.046, Beta = 0.0849, t = 16.73, p = 0.000). This confirms that improvements in user experience substantially increase satisfaction, highlighting its critical role in shaping ERP system acceptance. This insight is valuable for ERP designers and developers, who may prioritize user experience factors to enhance satisfaction. While usability should not be overlooked, especially in functionality-focused systems like ERP, ensuring a positive and holistic user experience may play a critical role in driving user satisfaction and fostering long-term system adoption.

Table 6 Collinearity Diagnostics

	Eigen value	Condition Index	Variance Proportions		
			Const.	Usability	User Experience
1	2.933	1.000	.00	.01	.01
2	.041	8.440	.02	.83	.45
3	.026	10.639	.97	.16	.54

Table 7 Residual Statistics

	Min	Maxi	Mean	Std. Dev	N
Predicted Value	2.030	4.8878	3.5800	.5679	100
Residual	-.8266	.82091	.00000	.3150	100
Std. Predicted Value	-2.729	2.303	.000	1.000	100
Std. Residual	-2.597	2.579	.000	.990	100

To ensure the reliability of the regression model, collinearity diagnostics were conducted. Both usability and user experience exhibit high tolerance values (above .90) and low variance inflation factors (VIFs below 1.5), indicating that multicollinearity is not a concern. This result suggests that each predictor contributes unique information to the model, with no significant overlap that could distort regression coefficients. Practically, this suggests that organizations can address usability and user experience as distinct areas for improvement, knowing that enhancing either factor is likely to have an independent and meaningful impact on ERP user satisfaction. This provides clear guidance for ERP designers and administrators to prioritize interventions tailored to both functional ease-of-use and overall user experience to maximize system adoption and effectiveness.

The residual analysis shows that residuals are normally distributed around zero, confirming that the model fits the data well without systematic bias. Standardized residuals lie within an acceptable range, with no extreme outliers, suggesting that the model accurately captures the relationship between usability, user experience, and user satisfaction without significant error. Practically, this suggests that the relationships observed between usability, user experience, and user satisfaction are reliable and can be trusted by ERP administrators and designers. It implies that interventions aimed at improving usability and enhancing the overall user experience are likely to produce predictable and meaningful improvements in user satisfaction, supporting more effective system adoption and optimized ERP performance in practice

■ 5.0 DISCUSSION

The findings from this study's data analysis provide crucial insights into the impact of usability and user experience on user satisfaction within ERP systems in private universities in the Colombo district. Based on frequency distribution tables and regression analysis, this investigation highlights significant aspects of how different user demographics, expertise levels, and departmental roles influence ERP interactions, as well as the direct relationship between usability and user experience on overall satisfaction. With a sample of 100 participants, this data offers a comprehensive view of the ERP landscape within these universities, emphasizing areas of strength and potential improvement to optimize user-centric design.

From the frequency table, we see that users' experience with the ERP system varies substantially, with around 38% having less than a year of experience, while approximately 33% have been using it for more than a year. Interestingly, a substantial portion 21% was reported five years of experience, suggesting a significant number of experienced users who have had extended interaction with the system. This diversity in user experience is beneficial for the study, as it allows us to analyze the effects of usability and user experience on both newer users, who may face initial adoption challenges, and long-term users, who are likely have a more comprehensive understanding of system limitations. Newer users, for example, may rely more on system intuitiveness for satisfaction, while experienced users might prioritize efficient workflows and deeper functionality. In terms of ERP expertise, the sample consisted of 57% beginners and 43% intermediates, with no participants categorizing themselves as advanced users. This division highlights a significant aspect: the ERP system's user base in these universities includes a large number of users still acclimating to the software, with nearly half at an intermediate level but no advanced users. The lack of advanced users could indicate either a gap in specialized ERP training or the software's complexity, which limits users from reaching advanced proficiency. For beginners, user satisfaction is likely driven by ease of use and a clear interface, as they require quick adaptability without needing to navigate complex features. Intermediates, conversely, may require more robust functionalities to maintain their engagement and satisfaction levels, especially if they begin to work with more advanced ERP tasks. Departmental distribution further contextualizes user experiences with ERP. Approximately 24% of respondents work in academic departments, 23% in finance, 20% in student liaison, and 33% in software engineering and IT. This mix of departments provides a broad perspective, as each group interacts with the ERP system differently depending on their needs. For instance, the finance department likely prioritizes data accuracy and reliability, given their data-heavy tasks, while the student liaison team may prioritize features facilitating

student records and data retrieval. Software engineering and IT users might approach the system from a more technical perspective, possibly critiquing interface functionality or system architecture. This departmental breakdown implies varied expectations for ERP usability and user experience, indicating that ERP optimization must consider these different departmental demands to maximize overall satisfaction.

Regression analysis provided significant insights into the relationship between usability, user experience, and user satisfaction. The analysis shows a positive correlation between both usability and user experience with user satisfaction, supporting the hypothesis that enhancing these elements can lead to increased user satisfaction. Usability, measured by factors such as system responsiveness and intuitive navigation, was found to have a strong impact on user satisfaction. This outcome aligns with previous research, which indicates that an ERP system's usability can significantly affect user productivity and perception of the software's overall effectiveness. When users can easily navigate and utilize the ERP without excessive training, they are more likely to report satisfaction with the system, suggesting that enhancing usability is key to improving user adoption rates, especially among less experienced users. User experience also proved to be a significant factor influencing satisfaction. Elements of user experience, such as the aesthetic appeal of the interface, ease of task completion, and system feedback, were positively associated with satisfaction levels. This finding highlights that user experience extends beyond functional utility to include how users feel about the ERP system. Users who enjoy their interactions with the ERP are likely to feel more motivated and engaged, which translates into higher satisfaction. In an educational setting where diverse tasks must be managed from academic scheduling to financial processing this aspect of user experience becomes particularly relevant. An ERP that provides both utility and a pleasant experience is likely to achieve broader user satisfaction across departments.

The regression model's R-squared value further supported these findings, showing that usability and user experience together explain a substantial proportion of the variance in user satisfaction. This statistic confirms that these two factors are key predictors of satisfaction, but it also leaves room for other influences, such as training quality, technical support availability, and perhaps system performance during peak usage times. The p-values for both usability and user experience in the regression model were significant, reinforcing the reliability of these variables as contributors to user satisfaction. This statistical validation underscores the need for ERP designers to prioritize usability and user experience during development to foster a user-centric approach that can satisfy diverse user groups in a university setting. The findings also hint at potential challenges and areas for improvement in current ERP systems used by private universities. For instance, the lack of advanced users in the sample suggests that training programs may need enhancement to support more comprehensive skill-building for ERP users. By offering training that moves users from beginner and intermediate levels to advanced, universities can ensure that users fully utilize the ERP system's capabilities, which could lead to greater satisfaction and productivity over time. Additionally, differences in departmental needs imply that a one-size-fits-all approach to ERP system design may not be effective. Customizing features to cater to specific departmental functions could enhance usability and user experience, meeting the unique demands of each user group and further boosting satisfaction.

In summary, the study's findings highlight that both usability and user experience are integral to fostering user satisfaction with ERP systems in private universities. Users at varying levels of expertise and from different departments have diverse needs, with usability being particularly crucial for beginners and intermediates who may require a more accessible and intuitive interface. User experience, on the other hand, enriches interactions by providing an aesthetically pleasing and responsive system, which seems to appeal universally across all user levels. These insights suggest that ERP developers should focus on creating user-centered designs that prioritize both ease of use and a positive user experience, potentially incorporating modular or customizable features to address the specific needs of different university departments. The results from this analysis underscore the importance of usability and user experience as foundations for achieving user satisfaction in ERP systems. As universities increasingly rely on these systems for their operations, prioritizing these factors will enhance productivity, reduce user frustration, and encourage system adoption. For future improvements, expanding user training programs and considering department-specific customization could further optimize ERP systems in private universities, thereby maximizing the benefits of these platforms for academic and administrative functions alike.

From a managerial perspective, the study suggests that ERP developers and university administrators should prioritize user-centered design strategies. This includes creating interfaces that are not only functional but also engaging, incorporating modular or customizable features to meet the unique needs of different departments, such as finance, academic, student liaison, and IT. Additionally, ongoing user training and support programs tailored to different proficiency levels can enhance usability for beginners and intermediates while reinforcing engagement for more experienced users.

Policy recommendations emerge from these findings, particularly for private university leadership. Institutions should adopt formal guidelines for evaluating ERP systems before implementation, ensuring that both usability and user experience criteria are considered alongside technical capabilities. Furthermore, university policy could encourage feedback mechanisms that regularly capture user experience metrics, allowing continuous improvement and adaptation of ERP systems to evolving administrative and academic requirements. For ERP vendors, the results provide a roadmap for product design and enhancement. Vendors should focus on developing systems that are flexible, visually intuitive, and responsive to different user roles. Incorporating user experience testing into development cycles, alongside traditional usability assessments, can ensure that ERP systems meet the practical and psychological needs of diverse user groups. Additionally, vendors might consider providing customizable dashboards, role-specific workflows, and interactive tutorials to improve engagement, reduce the learning curve, and promote sustained system adoption.

■ 6.0 CONCLUSION, LIMITATIONS AND FUTURE DIRECTION

The strong influence of user experience on satisfaction aligns with theories in user-centered design and human-computer interaction. These findings support the notion that satisfaction with ERP systems extends beyond basic usability; it encompasses the emotional and subjective

experiences of users as they interact with the system. This research suggests that enhancing user satisfaction in ERP systems requires a holistic approach that addresses not only the functional aspects (usability) but also the emotional and aesthetic dimensions of user experience. This aligns with the cognitive-affective model, which posits that users' cognitive evaluations of usability and affective responses to design elements jointly influence satisfaction.

For private universities in the Colombo district, these findings provide actionable insights for optimizing ERP systems. ERP developers and IT departments should focus on improving user experience by integrating intuitive navigation, visually appealing interfaces, and features that align with user workflows. Given the strong relationship between user experience and satisfaction, implementing training programs that familiarize users with ERP functionalities can further enhance user experience, thereby improving satisfaction levels. The non-significant effect of usability on satisfaction also suggests that usability enhancements alone may not yield the desired level of satisfaction unless they are part of a broader effort to enhance user experience. Therefore, private universities may benefit from a balanced approach, where usability improvements complement efforts to create an engaging, user-friendly experience that addresses users' emotional and aesthetic needs.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics declaration

Formal ethical approval was not obtained for this study. The research was conducted in accordance with established ethical principles and good research practices. Participation was voluntary, informed consent was obtained, and appropriate measures were taken to protect participants' confidentiality and privacy.

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