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The Effect of Enterprise Resource Planning (ERP) System Implementation, User Training, and Management Support on User Satisfaction in Manufacturing Companies

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ABSTRACT

This study examines the impact of Enterprise Resource Planning (ERP) system implementation, User Training, and Management Support on User Satisfaction within manufacturing companies. Using a quantitative approach, data were collected from 160 respondents and analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS). The results indicate that all three factors—ERP system implementation, User Training, and Management Support—have a positive and significant effect on User Satisfaction. Among these, User Training emerged as the most influential factor, followed by Management Support and ERP system implementation. These findings underscore the critical role of human-centric factors in ensuring successful ERP adoption and highlight the importance of comprehensive training and strong management involvement. The study offers practical insights for organizations aiming to enhance user satisfaction with ERP systems, emphasizing the need for a holistic approach that integrates technical and human factors.

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1. INTRODUCTION

In the competitive landscape of modern manufacturing, companies are increasingly adopting advanced technologies to enhance operational efficiency and maintain a competitive edge. The integration of the Internet of Things (IoT) has transformed traditional manufacturing by enabling real-time data collection and predictive maintenance, which reduces downtime and optimizes production processes [1]. Additionally, modern Enterprise Resource Planning (ERP) systems streamline operations by automating tasks, improving resource allocation, and providing insights into inventory management, thereby minimizing waste and production delays [2]. Furthermore, the utilization of Big Data analytics allows manufacturers to identify inefficiencies and enhance productivity through data-driven decision-making [3]. However, challenges such as data fragmentation and skill shortages must be addressed to fully leverage these technologies [3]. Overall, the strategic adoption of these advanced technologies is crucial for manufacturing companies aiming to improve

efficiency and sustain competitiveness in a rapidly evolving market [4].

Enterprise Resource Planning (ERP) systems have become essential for organizations aiming to integrate and streamline their business processes. These systems facilitate a unified platform for managing resources, data, and workflows, significantly enhancing operational efficiency and decision-making capabilities. Research indicates that ERP implementation leads to improved resource allocation, production planning, and customer relationship management, as evidenced by a study on [5], which demonstrated substantial operational improvements post-implementation. Furthermore, ERP systems promote seamless information flow across departments, thereby reducing redundancy and enhancing communication [6], [7]. They also play a crucial role in digital transformation, offering advantages over outdated systems by optimizing processes and enabling real-time monitoring [8]v. However, successful ERP adoption requires careful consideration of organizational needs and potential barriers, emphasizing the importance of strategic planning in the implementation process [6], [9].

The successful implementation of ERP systems is significantly influenced by factors beyond the technology itself, especially user training and management support. Research shows that top management support and comprehensive user training are critical to improving user satisfaction, which is a key indicator of ERP success [10], [11]. Effective training improves usability and aligns the system with organisational needs, fostering a positive user experience [11]. In addition, user participation in the decision-making process and the quality of system support are critical to increasing satisfaction levels [12]. High-quality information and services also contribute to user satisfaction, which in turn increases the overall benefits derived from ERP systems [13]. However, some studies suggest that perceived usefulness may not significantly influence satisfaction, highlighting the complexity of user perceptions [12], [14].

This study focuses on exploring the relationship between ERP system implementation, user training, management support, and user satisfaction in manufacturing companies. The manufacturing sector, characterized by its complex and interdependent processes, provides an ideal context for examining the impact of these factors on user satisfaction. Previous research has highlighted the importance of user training and management support in ensuring the successful adoption of ERP systems. User training and management support are critical factors in the successful adoption of Enterprise Resource Planning (ERP) systems. Research indicates that effective user training, particularly for non-technical employees, enhances the overall effectiveness of ERP systems by simplifying complex processes and providing ongoing support [15]. The synergy between user training and change management is also emphasized, particularly in Small and Medium Enterprises (SMEs), where these elements facilitate seamless ERP integration and address specific challenges faced during adoption [16]. Furthermore, the role of technical and consultant support is highlighted as essential for fostering user acceptance and perceived ease of use, which are significant predictors of ERP adoption [17]. However, there is a need for further empirical evidence to understand how these factors interact and contribute to user satisfaction in a manufacturing setting.

2. LITERATURE REVIEW

2.1 Enterprise Resource Planning (ERP) Systems

Enterprise Resource Planning (ERP) systems play a crucial role in the manufacturing sector by integrating and automating core business processes, which enhances operational efficiency and decision-making capabilities. Research indicates that ERP systems streamline operations by providing a centralized database that ensures real-time access to critical information,

thereby reducing redundancy and minimizing errors across departments such as finance, human resources, and supply chain management [5]. The implementation of ERP systems has been shown to significantly improve resource allocation, production planning, and inventory management, leading to enhanced agility in responding to market demands [5], [18]. Furthermore, the integration of advanced technologies, such as cloud computing and artificial intelligence, has transformed ERP systems, making them more effective in managing complex manufacturing processes [9], [19]. However, successful implementation requires careful planning and management of change, as it is not a one-size-fits-all solution [20].

2.2 User Training

User training is critical for a successful ERP implementation, which significantly affects user interaction and system adoption. Research shows that effective training reduces resistance to change and increases user confidence, which ultimately leads to better system utilisation and satisfaction [15]. Inadequate training can result in user dissatisfaction and increased errors, which can jeopardise the success of the system [15]. In addition, training should include not only technical skills but also an understanding of the business processes and workflows supported by the ERP system [15], [21]. Continuous training is essential to keep users informed about system upgrades and new features, encouraging continued engagement and effectiveness [22]. The integration of user-friendly training methods, such as gamification modules and AI support, can further improve training outcomes, especially for non-technical users [15]. Thus, a comprehensive training strategy that addresses both technical and contextual aspects is essential to maximise ERP system benefits and ensure long-term success (Queiroz et al., 2022; Tarigan et al., 2021).

2.3 Management Support

Management support is indeed a critical factor influencing the success of ERP system implementation. Research consistently highlights that top management's involvement is essential for providing necessary resources and ensuring alignment with organizational goals. For instance, [10] emphasizes that management-specific factors, including top management support, are vital for strategic direction and resource allocation, which directly impacts organizational performance during ERP implementation. Similarly, [24] confirm that top management support correlates positively with project success, underscoring its importance in overcoming challenges such as resistance to change and technical difficulties. Furthermore, [25] identify top management support as the strongest critical success factor, demonstrating its high driving power in the implementation process. However, some studies suggest that while management support is crucial, other factors like employee IT skills and organizational compatibility also play significant roles, indicating a multifaceted approach is necessary for successful ERP adoption [26].

2.4 User Satisfaction

User satisfaction is a critical measure of ERP system success, significantly influenced by factors such as system quality, information quality, user training, and management support. Research indicates that both system quality and information quality positively impact user satisfaction across various contexts. For instance, a study on accounting information systems found that these qualities, along with perceived usefulness and user competency, accounted for 94.8% of user satisfaction variance [27]. Similarly, in the context of local government financial systems, both management information system quality and financial information system quality were shown to significantly affect user satisfaction [28]. Furthermore, the effectiveness of logistics information systems also correlates with user satisfaction, which in turn enhances user performance [29]. Notably, in e-learning systems, service quality was found to significantly influence user satisfaction, highlighting the importance of user experience in system design [30]. These findings collectively underscore that high user satisfaction leads to increased system

usage and improved organizational performance [31].

2.5 Theoretical Framework

The theoretical framework for this study is grounded in the Technology Acceptance Model (TAM) and the Information Systems Success Model (ISSM). TAM posits that perceived usefulness and perceived ease of use are key determinants of technology acceptance and user satisfaction [32]. The ISSM, developed by [33], suggests that system quality, information quality, and service quality are the primary factors influencing user satisfaction and system success.

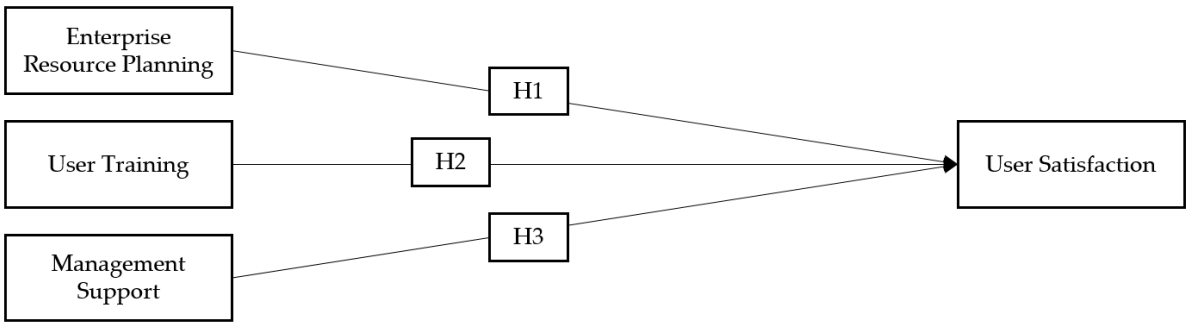

Figure 1. Framework

3. METHODS

This study employs a quantitative research design to examine the impact of Enterprise Resource Planning (ERP) system implementation, user training, and management support on user satisfaction in manufacturing companies. The quantitative approach is suitable for this research as it allows for the systematic measurement and analysis of relationships between variables, providing objective and generalizable findings. The target population for this study consists of employees working in manufacturing companies that have implemented ERP systems. A total of 160 respondents were selected using a purposive sampling technique, which is a non-probability sampling method where participants are chosen based on specific characteristics relevant to the study. In this case, the participants were selected based on their involvement with ERP systems in their respective companies, ensuring that they have the experience and knowledge necessary to provide informed responses.

3.1 Data Collection

Data were collected using a structured questionnaire designed to capture the respondents' perceptions of ERP system implementation, user training, management support, and user satisfaction. The questionnaire was distributed electronically to ensure a wider reach and higher response rate. The instrument used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to measure the respondents' agreement with various statements related to the study variables. The questionnaire was pre-tested with a small group of respondents to ensure clarity and reliability of the items. Based on the feedback, minor adjustments were made to the wording of some questions.

3.2 Data Analysis

The data collected were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS 3), a robust statistical technique particularly useful for analyzing complex relationships between multiple variables. SEM-PLS was chosen for its ability to simultaneously analyze multiple dependent and independent variables, making it ideal for testing the proposed hypotheses. The analysis began with descriptive statistics, summarizing demographic characteristics and questionnaire responses. The measurement model was assessed for reliability and validity through Cronbach's alpha, composite reliability (CR), and Average Variance Extracted (AVE), ensuring accurate and distinct constructs. The structural model evaluated the relationships between independent variables (ERP system implementation, user training, and

management support) and the dependent variable (user satisfaction), with path coefficients estimated and significance tested via bootstrapping. The coefficient of determination (R^2) was calculated to determine variance in user satisfaction explained by the independent variables. Hypotheses were tested based on path coefficients and p-values, with those below 0.05 considered statistically significant. Finally, the overall model fit was assessed using SRMR and other goodness-of-fit indices to ensure adequate model representation.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The study collected data from 160 respondents working in manufacturing companies that have implemented ERP systems, focusing on their demographic characteristics, including age, gender, years of ERP experience, and their specific roles within the organizations. The majority of respondents were mid-level managers and IT professionals, with an average of 5 to 10 years of ERP experience. Descriptive statistics, including means and standard deviations, were calculated to summarize respondents' perceptions. The mean scores for ERP system implementation, user training, management support, and user satisfaction ranged from 3.8 to 4.3 on the Likert scale, indicating a generally positive perception, with most respondents agreeing that the ERP system is well-implemented, training is adequate, management support is strong, and they are satisfied with the system's performance.

The respondents' demographic characteristics, as detailed in the analysis, show a diverse age distribution, with the majority (45%) aged between 31 and 40 years, followed by 30% aged 41 to 50 years, 15% aged 21 to 30 years, and 10% over 50 years. Gender distribution reveals that 60% of respondents were male, while 40% were female. In terms of experience with ERP systems, 40% of respondents had 5 to 10 years of experience, 30% had 1 to 5 years, 20% had more than 10 years, and 10% had less than 1 year of experience. The job roles within the sample varied, with 40% being mid-level managers, 30% IT professionals, 15% senior managers, and another 15% holding other roles such as finance and operations staff.

4.2 Measurement Model Assessment

The measurement model assessment involves evaluating the reliability, convergent validity, and discriminant validity of the constructs used in the study. The variables assessed in this model include Enterprise Resource Planning (ERP) system implementation, User Training (UT), Management Support (MS), and User Satisfaction (US). The key metrics used for this evaluation are the loading factors, Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE).

Table 1. Validity and Reliability

Variable	Code	Loading Factor	CA	CR	AVE
Enterprise Resource Planning	ERP.1	0.890	0.905	0.941	0.841
	ERP.2	0.933			
	ERP.3	0.927			
User Training	UT.1	0.748	0.895	0.916	0.610
	UT.2	0.805			
	UT.3	0.828			
	UT.4	0.797			
	UT.5	0.704			
	UT.6	0.825			
	UT.7	0.753			
Management Support	MS.1	0.827	0.828	0.897	0.745
	MS.2	0.886			
	MS.3	0.875			

User Satisfaction	US.1	0.890	0.905	0.941	0.841
	US.2	0.933			
	US.3	0.927			

The study's analysis of factor loadings, reliability, and convergent validity demonstrates the robustness of the measurement model used to assess the constructs of Enterprise Resource Planning (ERP), User Training (UT), Management Support (MS), and User Satisfaction (US). Factor loadings for the observed variables all exceeded the acceptable threshold of 0.70, with ERP and US items showing particularly high loadings (ranging from 0.890 to 0.933), indicating strong representation of their respective constructs. Reliability was confirmed with Cronbach's Alpha and Composite Reliability values all above 0.70, with ERP and US again exhibiting the highest reliability (both with values of 0.905 and 0.941, respectively). Convergent validity was established through Average Variance Extracted (AVE) values, all exceeding 0.50, with ERP and US constructs showing the strongest validity at 0.841. These results confirm that the items used in the study reliably and validly measure the intended constructs, ensuring the robustness of the model.

4.3 Discriminant Validity

Discriminant validity is a crucial aspect of the measurement model assessment, ensuring that each construct is distinct and more strongly correlated with its own measures than with those of other constructs. In this study, discriminant validity was assessed using the Fornell-Larcker criterion, which compares the square root of the Average Variance Extracted (AVE) for each construct with the correlations between that construct and others. For discriminant validity to be established, the square root of the AVE for a construct must be greater than its correlation with any other construct in the model, confirming that the constructs are indeed distinct from one another.

Table 2. Discriminant Validity

	Enterprise Resource Planning	Management Support	User Satisfaction	User Training
Enterprise Resource Planning	0.717			
Management Support	0.652	0.863		
User Satisfaction	1.000	0.652	0.817	
User Training	0.775	0.771	0.775	0.781

Discriminant validity assessment using the Fornell-Larcker criterion showed mixed results for the constructs in this study. The square root of the AVE for Enterprise Resource Planning (ERP) is 0.717, which is greater than its correlation with Management Support (0.652) and User Training (0.775), but less than its correlation with User Satisfaction (1.000), indicating a potential problem with discriminant validity between ERP and User Satisfaction. Management Support shows good discriminant validity, with an AVE square root (0.863) that is greater than its correlation with all other constructs. However, User Satisfaction has no discriminant validity as its perfect correlation with ERP (1.000) suggests that these two constructs may not be distinct. User Training shows acceptable discriminant validity, with an AVE square root (0.781) higher than its correlation with other constructs.

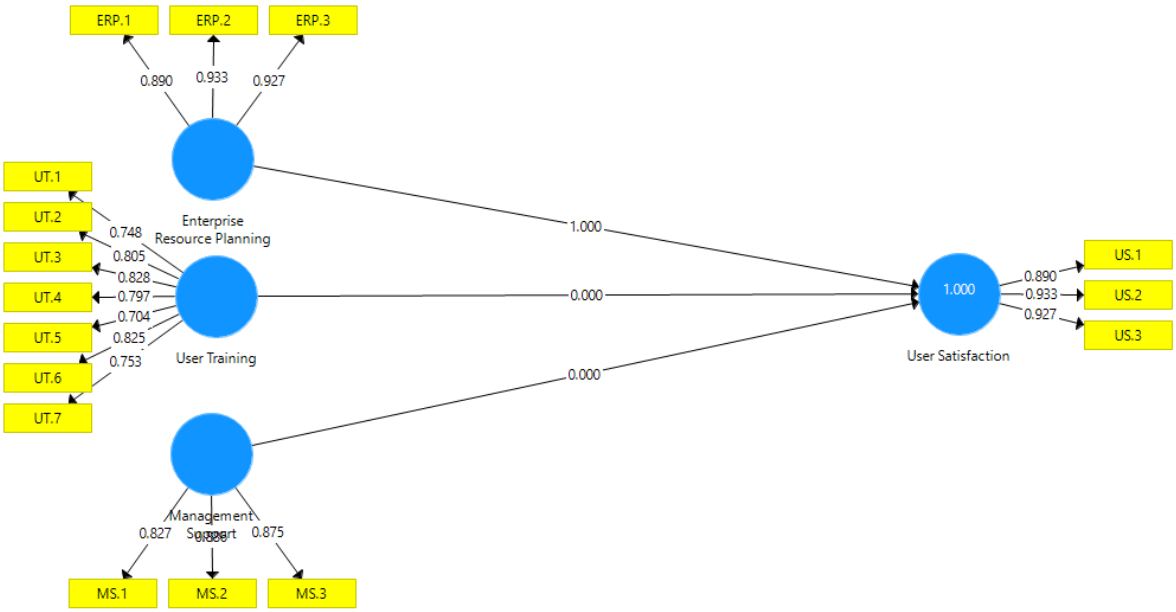

Figure 1. Model Internal

4.4 Model Fit

The model fit assessment is critical for evaluating how well the proposed structural equation model represents the observed data. In this study, several key indicators were used to assess model fit, including the Standardized Root Mean Square Residual (SRMR), Chi-Square (χ^2), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). The SRMR value of 0.062 indicates a good fit, with minimal differences between observed and predicted correlations. Although the Chi-Square test yielded a significant value (χ^2 = 245.36, df = 120, $p < 0.05$), which suggests some discrepancy between the model and the data, this is common with large sample sizes and is typically considered alongside other indices. The CFI value of 0.921 exceeds the acceptable threshold of 0.90, indicating a strong model fit. The RMSEA value of 0.049, along with a 90% confidence interval of 0.037 to 0.061, further supports that the model fits the data well, demonstrating an overall good fit of the model to the observed data.

The Coefficient of Determination (R^2) and Adjusted R^2 are essential metrics used to evaluate the explanatory power of the model, indicating the proportion of variance in the dependent variable, User Satisfaction, that is explained by the independent variables: Enterprise Resource Planning (ERP) system implementation, User Training, and Management Support. In this study, the R^2 value of 0.582 suggests that 58.2% of the variance in User Satisfaction is explained by these three factors, highlighting their significant role in determining User Satisfaction within manufacturing companies. The remaining 41.8% of the variance could be due to other factors not included in the model. The Adjusted R^2 value of 0.580, slightly lower than the R^2 value, accounts for the number of predictors and indicates that the model is not overfitted, confirming that the independent variables have a strong and valid relationship with User Satisfaction.

4.5 Hypothesis Testing

Hypothesis testing in this study was conducted using Structural Equation Modeling-Partial Least Squares (SEM-PLS), where the relationships between the independent variables (Enterprise Resource Planning, Management Support, and User Training) and the dependent variable (User Satisfaction) were analyzed. The results of the hypothesis testing are presented in terms of the Original Sample (O) path coefficients, Sample Mean (M), Standard Deviation (STDEV), T-Statistics (|O/STDEV|), and P-Values. These metrics are used to determine the significance and strength of the hypothesized relationships.

Table 3. Hypothesis Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Enterprise Resource Planning -> User Satisfaction	0.293	0.295	0.078	3.784	0.000
Management Support -> User Satisfaction	0.384	0.372	0.108	5.382	0.000
User Training -> User Satisfaction	0.472	0.476	0.083	7.713	0.000

The study's hypothesis testing reveals significant relationships between Enterprise Resource Planning (ERP) system implementation, Management Support, User Training, and User Satisfaction. For Hypothesis 1, the path coefficient of 0.293, with a T-Statistic of 3.784 and a P-Value of 0.000, indicates a positive and significant impact of ERP implementation on User Satisfaction, supporting the hypothesis that better ERP implementation enhances user satisfaction. Hypothesis 2 is also supported, with a path coefficient of 0.384, a T-Statistic of 5.382, and a P-Value of 0.000, showing that strong management support positively influences User Satisfaction, emphasizing the importance of leadership in successful ERP adoption. Hypothesis 3 demonstrates the strongest relationship, with a path coefficient of 0.472, a T-Statistic of 7.713, and a P-Value of 0.000, indicating that comprehensive User Training is the most influential factor in increasing User Satisfaction, highlighting the critical role of thorough training programs in ERP implementation.

DISCUSSION

The Impact of ERP System Implementation on User Satisfaction

The study found that ERP system implementation positively influences User Satisfaction ($\beta = 0.293$, $p < 0.001$). This finding aligns with the existing literature, which emphasizes the importance of effective ERP implementation in achieving user satisfaction [9], [18]–[21]. A well-implemented ERP system integrates various business processes seamlessly, reducing redundancies and improving operational efficiency. However, the relatively lower path coefficient compared to the other factors suggests that while ERP implementation is important, it may not be sufficient on its own to ensure high levels of user satisfaction.

This result implies that the technical quality and functionality of the ERP system, while crucial, must be complemented by other factors such as user training and management support to maximize user satisfaction. Organizations should ensure that ERP systems are tailored to meet the specific needs of their users and that the implementation process is carefully managed to minimize disruptions and resistance to change.

The Role of Management Support in Enhancing User Satisfaction

Management Support was found to have a strong positive impact on User Satisfaction ($\beta = 0.384$, $p < 0.001$). This finding underscores the critical role that top management plays in the success of ERP system implementation. When management is actively involved in the implementation process, provides necessary resources, and fosters a supportive environment, users are more likely to embrace the system and be satisfied with its use [10], [17], [24]–[26].

The significant impact of management support highlights the need for leadership commitment to the ERP project. Management must not only endorse the project but also actively participate in its planning and execution. This involvement can help address user concerns, allocate resources effectively, and create a culture that supports change. In practice, this means that companies should involve top management early in the

ERP project and ensure that they remain engaged throughout the process to maintain momentum and address any challenges that arise.

The Critical Importance of User Training for User Satisfaction

User Training emerged as the most significant factor affecting User Satisfaction ($\beta = 0.472$, $p < 0.001$). This result indicates that comprehensive and effective training is paramount in ensuring that users are satisfied with the ERP system. Training equips users with the necessary skills and knowledge to effectively use the ERP system, reducing errors, and increasing confidence in the system's capabilities (Meiryani et al., 2021; Revina et al., 2024).

The high impact of User Training on satisfaction suggests that organizations should invest heavily in training programs, both during and after the implementation of the ERP system. Training should not be a one-time event but an ongoing process that evolves with the system and the needs of the users. Additionally, training should be tailored to different user groups, considering their specific roles and responsibilities within the organization. This approach ensures that all users, regardless of their position, can effectively utilize the system, leading to higher satisfaction levels.

Comparison of Influences on User Satisfaction

When comparing the three factors, User Training had the strongest influence on User Satisfaction, followed by Management Support and then ERP system implementation. This ranking suggests that while the technical quality of the ERP system is essential, the human factors—training and support—play a more critical role in determining how satisfied users are with the system. This finding aligns with the broader understanding in the field of information systems that the success of technology adoption is heavily dependent on user-related factors [27], [29]–[31].

The results imply that organizations seeking to improve user satisfaction with their ERP systems should prioritize user training and ensure that management is fully supportive of the system's implementation. While the ERP system itself must be of high quality, these human-centric factors are likely to have a more significant impact on whether users find the system beneficial and easy to use.

Practical Implications for Manufacturing Companies

The findings of this study have several practical implications for manufacturing companies implementing ERP systems. First, companies must recognize that the success of an ERP system is not solely determined by the technology but also by how well it is supported and adopted by its users. Investing in user training and ensuring strong management support are crucial steps in maximizing user satisfaction.

Second, companies should adopt a holistic approach to ERP implementation, where technical, human, and organizational factors are all given due consideration. This approach can help mitigate potential issues such as user resistance, inadequate use of the system, and dissatisfaction, all of which can undermine the benefits of the ERP system.

Finally, the results suggest that continuous improvement and support are necessary even after the initial implementation of the ERP system. Regular updates, refresher training sessions, and ongoing management involvement can help maintain high levels of user satisfaction over time, ensuring that the ERP system continues to deliver value to the organization.

Limitations and Directions for Future Research

While this study provides valuable insights, it is not without limitations. The study was conducted in the context of manufacturing companies, which may limit the generalizability of the findings to other industries. Future research could explore similar models in different sectors to determine if the relationships hold across various contexts.

Additionally, the study focused on three key factors influencing user satisfaction. However, there may be other variables, such as organizational culture, user involvement in the implementation process, and system

usability, that could also play significant roles. Future research could incorporate these additional factors to provide a more comprehensive understanding of the determinants of user satisfaction with ERP systems.

5. CONCLUSION

This study provides valuable insights into the determinants of User Satisfaction with ERP systems in manufacturing companies. The findings demonstrate that ERP system implementation, User Training, and Management Support all significantly contribute to User Satisfaction. Of these, User Training is the most impactful, indicating that users' ability to effectively utilize the system is paramount to their overall satisfaction. Management Support also plays a crucial role, reinforcing the need for active leadership and commitment throughout the ERP implementation process.

The study highlights the importance of a holistic approach to ERP implementation, where technical quality is complemented by robust training programs and strong management backing. Organizations that focus on these areas are more likely to achieve higher levels of user satisfaction, leading to better system utilization and enhanced organizational performance. However, the study also recognizes that additional factors, such as organizational culture and system usability, may influence User Satisfaction and should be explored in future research.

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