THE ROLE OF ARTIFICIAL INTELLIGENCE IN ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS

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This study examines the role and impact of artificial intelligence (AI)-based methods in Enterprise Resource Planning (ERP) systems. ERP systems are critical tools that integrate all business processes to optimize data management. In this context, the integration of AI algorithms into ERP processes offers businesses new opportunities to accelerate decision-making mechanisms, enhance process efficiency, and optimize costs. The study elaborates on the contributions of AI in areas such as predictive analytics and process automation, presenting a strategic framework for businesses. The findings demonstrate that AI-supported ERP systems are powerful tools that increase businesses' ability to adapt to dynamic market conditions.

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1 Introduction

Enterprise Resource Planning (ERP) systems are critical tools that integrate business processes to enhance efficiency and support decision-making processes. In today's rapidly changing business environment, companies must develop data-driven and dynamic structures to maintain their competitive advantage. In this context, the integration of artificial intelligence (AI) technologies into ERP systems offers significant opportunities for businesses to manage operations more effectively, optimize processes, and make strategic decisions (Haider, 2021).

For small and medium-sized enterprises (SMEs) in particular, which constitute the backbone of many economies, AI-enabled ERP capabilities offer a chance to accelerate digital transformation despite limited resources. SMEs are widely recognized as key drivers of innovation and employment; thus, their successful adoption of advanced technologies is vital for inclusive economic growth. By harnessing AI within ERP systems, these smaller firms can overcome some of the constraints in data analysis and decision-making that stem from their scale, thereby narrowing the competitive gap between themselves and larger corporations.

ERP systems unify all operations of a business under one umbrella by integrating various processes, ranging from accounting to supply chain management. However, traditional ERP systems are limited in analyzing large and complex data sets. Albased methods overcome these limitations, making ERP systems smarter and more autonomous (Hrischev & Shakev, 2022). For instance, predictive analytics enables forecasting future demand and sales trends, natural language processing enhances user experience, and process automation significantly reduces costs (Kunduru, 2023).

AI-powered ERP software provides numerous advantages, including integrated data management, optimized processes, real-time access, more informed decisionmaking, reduced operational costs, increased efficiency, high adaptability, superior customer satisfaction, and enhanced collaboration. The integration of AI and ERP systems facilitates businesses' adaptation to dynamic market conditions and plays a critical role in digital transformation processes (Sevim & Bülbül, 2017). Predictive analytics is one of the most critical advantages AI brings to ERP systems. It accelerates decision-making in processes like demand forecasting, supply chain optimization, and cost analysis, providing businesses with a competitive edge (Sevim & Bülbül, 2017). Additionally, AI algorithms enable more effective use of the data stored in ERP systems through big data analytics, thereby contributing to businesses achieving their strategic goals.

This study explores the role of AI technologies in ERP systems, the advantages offered by these technologies, and the challenges encountered. In particular, AI applications that enhance predictive analytics, process automation, and user experience will be examined in detail. Furthermore, the strategic contributions of AI-supported ERP systems to businesses and their future potential will be evaluated. In conclusion, the aim of this study is to highlight the innovations brought by AI-supported ERP systems and the strategic advantages they offer to businesses, contributing to the literature in this field.

2 Theoretical Background / Literature Review

The integration of ERP (Enterprise Resource Planning) systems and artificial intelligence (AI) has become a prominent research area in recent years, attracting attention at both academic and industrial levels. Most of these studies broadly examine the impacts of AI-supported ERP systems on businesses. However, the lack of in-depth sector-specific analyses and the limited number of practical studies are notable shortcomings. Sevim and Bulbul (2017) made a study focusing on the use of AI algorithms in the continuous auditing of ERP systems emphasized significant benefits such as the automation of auditing processes and cost reductions. However, sectoral differences and long-term effects were not addressed. Oguz and Agtas (2024) has a study investigating the effectiveness of AI-supported ERP systems in supply chain management discussing the contributions of predictive analytics to decision-making processes. However, it lacked practical implementation. Sarnic and Acar (2024) examined the potential benefits of integrating AI into ERP systems. It did not include more specific applications. There is a study made by (Bahssas et al., 2015) addressing innovative approaches in ERP systems and future AI trends presented a theoretical framework but often lacked application details. (Jin et al., 2022) has a study exploring the role of AI in the accounting module and the benefits of automation discussed improvements in financial processes but did not address applicability in different industries.

Although the existing literature provides valuable insights into AI-supported ERP systems, there are significant gaps. First of all, examining the impacts of AI-supported ERP systems across different industries is missing. Secondly, there are not many studies analyzing how small and medium-sized enterprises (SMEs) can benefit from AI technologies. Finally, investigating the long-term effects of ERP and AI integration and their contributions to digital transformation processes is not thoroughly mentioned.

This study not only aims to fill these gaps in literature but also explains how modern AI techniques, such as predictive analytics, natural language processing (NLP), and deep learning, can be used within ERP modules. Overall, this study highlights the potential of AI and ERP integration in the business world from both academic and industrial perspectives and sheds light on future research.

3 Methodology

The integration of artificial intelligence (AI) into Enterprise Resource Planning (ERP) systems has become a transformative element that elevates organizational efficiency and performance. This section discusses the role of AI in ERP systems and the applicable methods. Figure-1 illustrates various use cases and functions of AI integration in ERP systems.



Figure 1: ERP Tools

3.1 Use of Artificial Intelligence in Customer Services

AI-based applications such as chatbots, digital assistants, and automated response systems significantly contribute to improving customer satisfaction while reducing operational burdens. Specifically, natural language processing (NLP) technologies excel in understanding customer demands and offering appropriate solutions. For example, in the banking sector, AI-based assistants offer a wide range of services, from credit applications to customer account inquiries (KORUMAZ, 2023); (İşeri et al., 2021). The use of AI in customer services not only improves operational processes but also enables businesses to build stronger connections with their customers. These systems enhance customer satisfaction while providing businesses with a strategic competitive advantage (Hargreaves et al., 2018; Li & Xu, 2022).

3.2 Optimization in Production and Inventory Processes

AI technologies integrated into Enterprise Resource Planning (ERP) systems enable businesses to streamline their operations through real-time data analytics. Walmart improves product projections by utilizing advanced computer vision and machine learning technologies. In order to monitor the stock in real time and automatically alert Walmart and its suppliers when their products are sold out, they receive data from the robotic shelf scanner in addition to numerous other data signals. This allows them to replenish their stores more quickly (Mostafa, 2020). AI algorithms plan production processes, reducing raw material lead times and costs. In supply chain management, AI contributes to improving logistics processes (Turgut, 2023). Moreover, the predictive analytics capabilities of AI algorithms allow businesses to anticipate supply chain disruptions and take proactive measures (Yazılım, n.d.).

3.3 AI-Supported Automation in Financial Management

AI strengthens financial management processes by being utilized in credit risk analyses and investment decisions (Masraff, n.d.). Advanced data analytics and machine learning algorithms monitor and report unusual financial transactions in real time, simplifying audit processes. For example, AI-supported ERP systems can quickly identify fraud risks by analyzing large volumes of financial data and improve regulatory compliance (ÇETİN & TİRYAKİ, n.d.). AI-supported ERP systems are redefining the standards of efficiency and accuracy in financial management. These

technologies play a crucial role in helping businesses achieve their digital transformation goals, creating significant value for both large-scale enterprises and small to medium-sized businesses (Kestane & Kurnaz, 2019).

3.4 Use of Advanced Analytical Methods

Predictive analytics tools not only analyze existing data but also offer insights into future market trends, creating significant opportunities for businesses to gain a competitive advantage (Perçin & cansu Gök, 2013). In particular, advanced analytical methods enhance operational efficiency in supply chain and production management. AI is utilized to optimize logistics processes, predict delays, and evaluate supplier performance (Rezki & Mansouri, 2024). The integration of advanced analytical methods into ERP systems not only facilitates data analysis processes but also strengthens strategic decision-making. Big data analysis and predictive modeling significantly contribute to businesses gaining a competitive edge and achieving long-term success (SAP., n.d.).

3.5 Sales Automation and Forecasting

AI-supported ERP systems analyze customers' purchase histories and habits, making cross-sell and up-sell strategies more effective (Çelebi & Bulut, 2016). AI-supported ERP systems support businesses in making strategic decisions by predicting market trends. For instance, an automotive manufacturer could use AI algorithms to analyze regional sales trends and determine which markets to prioritize. Furthermore, machine learning applications such as price elasticity analysis allow businesses to optimize product pricing according to market dynamics (Ranganathan et al., 2024). In sales management, AI-supported ERP systems not only improve operational processes but also provide businesses with strategic advantages that enhance profitability. These technologies enable businesses to better evaluate future sales opportunities while increasing customer satisfaction (Düzelten, n.d.).

4 Results

The findings indicate that AI-driven ERP systems significantly enhance business efficiency by automating routine processes, improving decision-making, and optimizing resource allocation. AI-powered ERP software offers advantages such as

real-time data analysis, demand forecasting, and cost reductions, making enterprises more adaptable to market fluctuations.

ERP SOFTWARE	ADVANTAGES OF ERP SOFTWARE		
ORACLE CLOUD 86	Modern interface Wide range of features Scalability and flexibility Integration with Oracle products Security and compliance		
SAP S4 HANA	Scalability Real-time information Mobile access Streamlined workflows Less maintenance		
ACUMATICA Acumatica 85	 Flexible and customizable Scalable Mobile access and user-friendly Powerful features and integrations Strong community support 		
MS DYNAMICS 365	User-friendly interface Flexible customization Seamless integrations Powerful analysis tools Scalability		
ORACLA NETSUITE	Enhanced visibility Easy to use Real-time data Scalability and flexibility		
infor 86	Scalability and flexibility Security Global solution Supports core business processes Supports multiple business models User-friendly interface Access to innovation		

Table 1	: Analyst	Evaluations	of ERP	Software in	2024	(Hari,	2025)
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According to Table 1 and the report of Hari (2025), a comparison of leading AIdriven ERP solutions, including Oracle Cloud, SAP S/4 HANA, Acumatica, Microsoft Dynamics 365, Oracle NetSuite, and Infor, reveals that while these platforms provide powerful AI capabilities, their effectiveness varies based on cost, customization flexibility, and implementation complexity.

Oracle Cloud excels in machine learning and NLP applications but poses financial constraints for SMEs. SAP S/4 HANA is strong in predictive analytics but has high implementation costs. Acumatica supports automation but has limited community

support. Microsoft Dynamics 365 offers advanced anomaly detection but features a complex user interface. Oracle NetSuite specializes in big data analytics but presents cost-benefit concerns for mid-sized enterprises. Infor is effective in cost analysis but has scalability limitations for large enterprises.

Overall, AI-driven ERP systems enable businesses to improve operational efficiency and gain a competitive edge. However, their successful adoption depends on company size, industry-specific needs, and financial capabilities. While AI enhances ERP functionalities, businesses must evaluate software suitability based on strategic goals and resource availability (Hari, 2025).

5 Discussion

This study has explored the impact of AI-based ERP systems on business processes and their role in digital transformation. The integration of AI technologies into ERP systems provides significant advantages in areas such as efficiency improvement, cost optimization, process automation, and the enhancement of strategic decision support mechanisms. The effects of AI usage are particularly evident in ERP submodules such as customer service, finance, production and sales. The successful implementation of these technologies requires robust technical infrastructure, trained personnel, and appropriate management policies. Businesses must consider factors such as cost, time, and organizational change management during the transition to these technologies. For small and medium-sized enterprises (SMEs), these considerations are often particularly challenging given their constrained budgets and limited specialized personnel. Many leading AI-driven ERP platforms entail high implementation and maintenance costs, which can be prohibitive for smaller firms (Hari, 2025). Furthermore, SMEs may lack in-house expertise to manage complex AI integrations, and they have fewer resources to absorb the risks and disruptions associated with major technological changes. These obstacles can slow down SME adoption of AI-supported ERP systems despite the clear potential benefits. Therefore, developing cost-effective and scalable AI-ERP solutions tailored to the needs of SMEs is critical to accelerating their digital transformation processes. The findings of this study offer valuable insights by highlighting practical approaches that smaller enterprises can employ to harness AI within their ERP environments. By identifying key areas-such as using predictive analytics for demand forecasting or deploying process automation for routine tasks-where AI

integration yields immediate efficiency gains, this research provides a roadmap for SMEs to prioritize investments that deliver high impact. In doing so, even resourceconstrained businesses can leverage AI-driven ERP capabilities to streamline their operations and enhance their competitiveness. In addition to the SME-focused insights, there are broader considerations for the successful integration of AI and ERP systems. Investigating the effects of AI algorithms on data security, regulatory compliance, and regional differences remains a critical step toward ensuring the widespread applicability of AI–ERP solutions. For example, assessing the impact of regulations such as the European Union's General Data Protection Regulation (GDPR) on the functionality of AI algorithms is crucial to guarantee that AIempowered ERP systems remain effective and compliant across different jurisdictions. In conclusion, AI-supported ERP systems play a strategic role in optimizing business processes and providing a competitive advantage for businesses of all sizes.

6 Conclusions

AI-supported ERP solutions provide significant advantages in areas such as selecting the right resources in supply chain management, optimizing procurement processes, and rapidly resolving related issues. The integration of AI technologies such as machine learning and natural language processing (NLP) into ERP systems enhances customer services, analyzes consumer behavior, generates feedback, and supports sales forecasting, delivering substantial benefits. Additionally, AI-supported systems that provide real-time information enable businesses to quickly adapt to changing market conditions. This study has examined the organizational benefits of integrating AI into ERP systems in detail, aiming to contribute to literature. The research results indicate that AI-supported ERP systems hold great potential in areas such as error-free data management, simultaneous integration of all departments, and sales and demand forecasting. Future studies could conduct a comparative analysis of ERP solutions in terms of AI usage, and they can also conduct case analyses on the applications of AI-supported ERP systems across different industries.

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