

Review Article

Evolution of Enterprise Applications through Emerging Technologies

Gaurav Kumar *

Maryland, United States

*Correspondence: Gaurav Kumar (gka.gaurav@gmail.com)

Abstract: The extensive globalization of services and rapid technological advancements driven by IT have heightened the competitiveness of organizations in introducing innovative products and services. Among the noteworthy innovations is enterprise resource planning (ERP). An integral field in computer science, known as artificial intelligence (AI), is undergoing a transformative integration into various industries. Grasping the concept of artificial intelligence and its application in diverse business applications is crucial, given its broad and intricate nature. The primary focus of this paper is to delve into the realm of artificial intelligence and its utilization within enterprise resource planning. The study not only explores artificial intelligence but also delves into related concepts such as machine learning, deep learning, and neural networks in greater detail. Drawing upon existing literature, this research examines various books and online resources discussing the intersection of artificial intelligence and ERP. The findings reveal that the impact of AI is evident as businesses attain heightened levels of analytical efficiency across different ERP domains, thanks to remarkable advancements in AI, machine learning, and deep learning. Artificial intelligence is extensively employed in numerous ERP areas, with a particular emphasis on customer support, predictive analysis, operational planning, and sales projections.

Keywords: Enterprise Resource Planning, Manufacturing, Inventory, Artificial Intelligence, Big Data, Business Intelligence System

How to cite this paper:

Kumar, G. (2023). Evolution of Enterprise Applications through Emerging Technologies. *Universal Journal of Computer Sciences and Communications*, 2(1), 1–8. Retrieved from <https://www.scipublications.com/journal/index.php/ujcsc/article/view/828>

Received: October 12, 2023

Revised: November 17, 2023

Accepted: November 30, 2023

Published: December 3, 2023



Copyright: © 2023 by the author. Submitted for possible open-access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Swiftly evolving technologies have transformed the world, primarily through the integration of current artificial intelligence, designed ideally for the betterment of humanity. AI is actively employed to address a multitude of real-world challenges, showcasing its positive impact on society. Instances include its application in industrial machinery, intelligent assistants, autonomous vehicles, cancer detection, and intelligent Enterprise Resource Planning (ERP). Although present AI applications are often specialized in specific tasks, these AI-driven functions are reshaping numerous markets and industries. As ongoing research continues to advance AI, its influence is anticipated to expand further in the coming years.

Artificial intelligence is a concept closely associated with human intelligence, representing a computer's ability to mimic human cognitive functions and execute tasks in a manner akin to humans [1]. This term encompasses sophisticated software systems that replicate certain functions of the human brain, ranging from decision-making and voice recognition to creative tasks. For example, AI imparts a personalized touch to every interaction a robot has with people. The robot comprehends the user's inquiry, triggers a precise response, recognizes a different issue, and provides an appropriate answer. Various sectors, including marketing, research, and finance, extensively leverage AI, which encompasses a diverse array of subfields with varying ideas, approaches, and technologies [2].

This article specifically concentrates on artificial intelligence and its contributions to addressing issues within Enterprise Resource Planning (ERP). ERP is a program utilized for managing complex business processes such as finance, production, accounting, human resources, and supply chains. By consolidating essential business processes onto a unified platform, ERP enhances company productivity, profitability, and manageability. The integration of AI is poised to make ERP more flexible and user-friendly, enabling self-learning capabilities for future predictions [3]. Leading ERP vendors, such as SAP and Oracle, are actively developing additional AI applications that seamlessly integrate into ERP systems, potentially enhancing the accuracy of various metrics compared to human counterparts.

Presently, AI is widely utilized and continues to evolve, offering intelligent software that emulates human thought processes. This evolution benefits companies of all sizes, providing contemporary and intelligent solutions [4]. The term 'business' in this context encompasses various enterprises, including those offering services to other businesses. The primary objective of this thesis is to explore the impact of ERP on company profitability and examine how AI and ML influence ERP. This exploration is vital as AI instigates transformative changes across various industries, including the domain of ERP.

2. System of Enterprise Resource Planning (ERP)

In the 1990s, a revolutionary software known as Enterprise Resource Planning (ERP) emerged. This innovative software marked a significant departure from traditional IT systems. Irrespective of the industry, the ERP system was designed to integrate all essential components of a company. Essentially, ERP systems were envisioned as a means for businesses to achieve a state where every employee and customer could have visibility into the global activities of the entire company. ERP represents a systematic approach to continually manage and enhance a company's resource allocation. When utilized effectively, ERP systems enable companies to achieve remarkable outcomes in terms of growth, revenue generation, and the development of new products and services. The modular nature of ERP systems renders them flexible and capable of customization to align with the best business practices [5].

The components can either be integrated to form a comprehensive ERP system or function independently in real-time. ERP systems aim to integrate various systems across the entirety of an organization, encompassing its divisions. Consequently, the application of ERP systems in a company yields both advantages and disadvantages. Primarily, ERP systems can serve as a reliable source of information, enhancing information management, control, output, and accelerating decision-making processes. However, the adoption of ERP systems can be time-intensive for businesses, especially startups. Enterprise Resource Planning (ERP) systems incorporate features and modules that may pose challenges for businesses in terms of comprehension and utilization. In this context, ERP systems grapple with issues such as compatibility with evolving hardware and software, integration challenges, and the seamless flow of data between modules [6].

One of the major challenges faced by ERP systems is the rapidly evolving business landscape. The market's expansion leads to heightened client expectations, increased business demands, and greater competitive pressure. As a result, businesses are consistently under pressure to reduce overall costs and expedite specific tasks. To meet the evolving needs of businesses and facilitate faster adaptation to changes in the business environment, ERP providers continuously enhance and refine their ERP systems. While ERP systems were once considered valuable tools in the workplace due to their reporting capabilities, today's C-level leaders and decision-makers require more Business Intelligence (BI)-enabled tools. These tools assist them in making informed decisions by facilitating the analysis of vast amounts of data that ERP systems can gather [7].

3. Artificial Intelligence (AI) in ERP Applications

Artificial Intelligence (AI) learns algorithms designed to integrate intelligence into software, enabling the performance of specific tasks [8]. The ongoing advancements in digital technologies signify substantial progress in the field of artificial intelligence. When Enterprise Resource Planning (ERP) systems incorporate AI, they leverage extensive and diverse data sets to generate reports. This utilization can result in more efficient resource allocation, cost reduction, and the elimination of unnecessary complexities in business processes/models [9]. Major global corporations effectively employ AI to oversee geographically dispersed facilities, enabling comprehensive management of the entire production cycle, from manufacturing to sales. Procurement companies benefit from AI by efficiently tracking large volumes of goods. Real-time analysis of turnover and consumer habits simplifies the tracking of goods, facilitating the creation of tailored offers that align with consumer preferences [10].

4. Client Assistance in ERP

The objective of artificial intelligence is to replicate the functionality of the human brain within computer programs and delve deeply into the capabilities of the brain. For example, a chatbot represents just one among numerous digital assistance applications extensively utilized for diverse purposes, ranging from business and entertainment to commerce. Artificial intelligence is gaining considerable attention due to its ability to significantly save time in customer support. Its utilization of natural languages categorizes it as an interaction between human users and software.

Based on the findings, the integration of AI and chatbots into ERP systems is poised to assist managers in achieving results that are not only more effective but also more efficient. Notably, one of the outcomes is the automation of routine administrative and coordinating tasks, facilitating a more effective utilization of available time. Artificial intelligence contributes to freeing up managers' time, enabling them to divert their focus towards other aspects of administration. This allows managers to dedicate more time to tasks such as problem-solving, collaboration, strategic planning, innovation, personnel development, and engagement with stakeholders—activities that machines are incapable of independently performing [11]. The incorporation of AI and chatbots into ERP systems provides managers with this opportunity. Consequently, the integration of artificial intelligence and chatbots into enterprise resource planning (ERP) empowers managers with additional time, enhancing their productivity in administrative tasks and enabling a greater focus on decision-making. Another advantage of this integration lies in the enhancement of the ERP system, simplifying the control of the system's design and usability.

Conversely, an enterprise resource planning (ERP) system is a computer program designed to allow a company to have a comprehensive view of all aspects of its business simultaneously. While the ERP system can accumulate a wide range of data about the company, earlier versions lacked the capability to analyze this data effectively for more insightful decision-making support [12]. Consequently, there is a growing demand to integrate artificial intelligence into enterprise resource planning (ERP) systems, as this integration has the potential to enhance their functionality by improving data analysis and facilitating informed judgments, actions, and recommendations. This additional value contributes to an overall improvement in the products or services provided by ERP systems. Nevertheless, it is crucial to provide an assessment of the technology's limitations, potential areas for development, and suggestions for future research to ensure enhanced performance [13].

5. Sales and Distribution Automation

In contemporary times, artificial intelligence (AI) is experiencing widespread application in sales and marketing, particularly within the realm of ERP. An ERP system enhanced with AI possesses the capability to analyze market trends and consumer behaviour, autonomously making strategic decisions for market initiatives. Enterprise Resource Planning (ERP) systems are broadly categorized into two types: general AI and narrow AI. General artificial intelligence (AI) refers to a computer with the ability to learn and perform complex tasks akin to the human brain [14]. In contrast, narrow AI is employed for singular and straightforward tasks, often seen in sales automation. Sales management poses challenges for every company, with sales employees facing intricate and time-consuming responsibilities. AI, particularly in the form of narrow AI, proves to be advantageous in such scenarios. Predictive analytics, a crucial aspect for the sales department, can be significantly improved by integrating AI into the ERP system. This integration ensures swift and smooth analytics, identifying potential sales opportunities, automating price analyses, and optimizing return on investment. The integration of artificial intelligence is becoming commonplace in the operations of various large firms, such as Zalando. This trend is not limited to business-to-consumer (B2C) enterprises but also extends to business-to-business (B2B) companies that have already incorporated AI into their ERP systems [15].

6. Inventory Control and Warehouse Management

The term "inventory" encompasses a variety of items, ranging from raw materials to software. Inventory management involves the process of planning, organizing, overseeing, and maintaining an appropriate stock level to minimize costs while meeting customer demand. Inefficient inventory management can lead to significant additional expenses for manufacturers. To streamline order records and manage inventory effectively, manufacturers utilize AI-powered tools.

Machine learning plays a pivotal role in this context, capable of managing inventories based on demand and supply dynamics. Artificial intelligence (AI) analyses historical procurement data, relevant procurement analysis, and current consumption patterns through model deduction. This enables AI to provide manufacturers with optimal timing and quantities for raw material procurement, facilitating the maintenance of the ideal inventory needed for production. Efficient inventory management is essential for a company's operations and requires substantial manpower. Introducing AI in this context accelerates and enhances the precision of the process [16].

7. Shop Floor Manufacturing

By engaging in extensive data analysis, AI has the capacity not only to enhance the efficiency and precision of product design in manufacturing but also to significantly expedite the iterations, research, and development involved in the design process. This efficiency boost arises from AI's adept integration of large volumes of user data, accurate comprehension of customer preferences and demands, and provision of data support for business R&D efforts. The comprehensive production design process is completed with the incorporation of digital prototypes and virtual simulations within the product design enabling platform [17]. This is facilitated by the attributes of digital twins, encompassing simulation analysis, document production, industrial design, visual rendering, and more, all of which have the potential to enhance the efficiency with which designers create their designs.

Utilizing virtual models allows for the execution of simulation studies and tests with parameters that are both repeatable and modifiable. Verifying the performance of products across diverse external environments enhances the precision and reliability of research and development. This, in turn, streamlines the research and development

process, significantly reduces the costs associated with product development, and effectively aligns with the individualized needs of customers and the evolving market environment through experimentation. The application of Digital Twin technology has become prevalent in industries such as aircraft production, the development of new drugs, and other sectors characterized by extended design cycles and substantial challenges throughout the development process [18].

8. Inventory Monitoring and replenishment Automation

Employees often face the challenges of manual and time-consuming inventory tracking. The implementation of automation holds significant potential in addressing this issue. AI-powered inventory management has the capability to conduct real-time tracking while minimizing errors, thereby allowing staff members to redirect their focus towards other projects.

Various aspects of inventory management, including inventory verification and stocking, stand to benefit from the integration of artificial intelligence. The underlying algorithm guides machines to perform a range of tasks, and AI-based inventory management has gained widespread popularity. Robotic Process Automation (RPA) presents enormous potential that continues to expand, especially when coupled with cutting-edge technologies such as artificial intelligence (AI) and machine learning (ML). The synergy of these sophisticated and intelligent bots, when used together, enables them to replicate human interactions and find application across diverse industries [19].

Machine learning involves training robots to handle data more efficiently by simulating the learning process of rational individuals. On the other hand, when these bots incorporate artificial intelligence or AI services and methodologies, they can mimic human characteristics and make accurate decisions about the tasks at hand. The combination of ML and AI services empowers bots, chatbots, and advanced computers not only to comprehend issues but also to provide solutions such as application interconnectivity, predictive analysis, and big data for addressing challenges [20]. This amalgamation facilitates the credibility of AI robots to explore and extract information for categorization, association, optimization, grouping, pattern recognition, and more.

9. Intelligent Quality and Compliance with regulatory

The utilization of edge computing and AI technologies plays a crucial role in minimizing process errors in manufactured goods. The integration of artificial intelligence (AI) and machine learning with processing and manufacturing technologies brings about substantial transformations in manufacturing practices. For example, AI can identify minute flaws in machinery or products, offering designers the opportunity to address issues before they escalate into major mistakes [21]. The proximity of edge computing and AI facilitates on-site data processing, enabling immediate action based on insights. This not only reduces the likelihood of manufacturing defects but also enhances worker safety, implements production monitoring, saves businesses substantial costs, and significantly improves overall efficiency.

AI plays a pivotal role in enhancing the overall quality and performance of manufactured products. Numerous organizations engaged in manufacturing leverage AI-powered automation and robust tools to identify flaws in the manufacturing process or the key factors contributing to flaws in product design. Through the extensive use of AI for rigorous quality testing, manufacturers can expedite the time to market for high-quality batch-produced goods [22]. This enables companies to adapt their production processes to meet the increasing demand in the market.

10. Production planning and efficient Forecasting

Forecasting is a crucial process in business, particularly in the realm of supply chain management, significantly impacting both customer satisfaction and profit margins. To optimize these aspects, businesses must possess awareness regarding the quantities and quality of items in their stock. Artificial intelligence prediction models emerge as revolutionary tools for businesses within the commodity supply chain, helping in managing the risk associated with fluctuations in commodity prices and enhancing overall profitability [23].

In industries like industrial manufacturing, which are particularly vulnerable to shifts in commodity prices, AI technology's predictive capabilities become invaluable. The ability to forecast future price trends of raw materials equips these enterprises with a knowledge base, enabling the formulation of effective hedging strategies. For raw commodities susceptible to significant market price shifts, the utilization of hedging and futures trading becomes a potential means to mitigate the adverse impact on the company's earnings, especially with improved stability in hedging.

The implementation of this big data tool grants businesses access to precise price forecasts derived from a comprehensive analysis of market data. This data, collected, analysed, and interpreted by AI, ensures the prediction model's accuracy. Moreover, AI can conduct an analysis of past sales and stock levels without the risk of inaccuracy [24].

11. Financial and Controlling Management

ERP places significant importance on financial management, with frequent integration of AI in this domain. AI has the capability to execute financial tasks more rapidly and with greater accuracy. In the context of a centralized system like ERP, the creation, sending, and payment of invoices can be efficiently handled atomically. Moreover, ERP could autonomously conclude specific financial activities for a business on a monthly and annual basis [25]. The increasing utilization of machine learning allows AI to grasp human behavioural patterns and make decisions that surpass those made by humans. In contrast, manual accounting procedures are susceptible to typical human errors.

In contrast to human-led methods, AI offers a faster and more error-resistant approach to accounting. AI-driven ERP systems excel in processing invoices, paying bills, and accurately entering predictable data, surpassing the capabilities of human procedures. When AI is employed for tasks such as data entry, invoice payments, or invoice preparation, finance department personnel can redirect their focus to other financially lucrative aspects of the company. Furthermore, leaders in various industries can leverage AI to make informed marketing and sales decisions through predictive analyses.

The evolving sophistication of ERP is empowering diverse industries daily. ERP analysis and prediction play a crucial role in production and supply chain management. The accurate analysis and projections facilitated by ERP offer numerous benefits, and AI significantly enhances these processes. "AI analytics," a subfield of Business Intelligence (BI), employs machine learning techniques to uncover hidden insights in data and reveal previously unseen relationships. AI analytics has the capacity to automate many regular responsibilities of a data analyst, not with the goal of replacing analysts but rather to enhance existing abilities in terms of speed, data volume, and detailed tracking [26].

12. Conclusion

Artificial intelligence finds extensive applications in various aspects of ERP, positively impacting the overall financial performance. Its integration allows businesses to enhance their ERP systems through the incorporation of machine learning and Natural Language Processing (NLP). Undoubtedly, contemporary AI has a profound influence on individuals' lives, subtly manifesting in everyday activities through various applications.

AI is not only integrated into ERP programs but is also successfully employed across diverse business sectors. It is utilized for tracking consumer behaviour, analysing interactions on online shopping platforms, and generating automated feedback.

In summary, the innovation in AI holds significant importance and has profound implications for the ERP market. Although there is currently a limited selection of ERP software leveraging artificial intelligence, ongoing research in this field is substantial. The primary focus of current research includes predictive analysis, revenue projections, and gaining deeper insights into AI and its components. Future studies by the author will explore additional topics such as business intelligence and Natural Language Processing.

Reference

- [1] Lin, Rui. "Analysis on the Application of Artificial Intelligence in the Global Value Chain Upgrade of Manufacturing Enterprises." 2021 3rd International Conference on Artificial Intelligence and Advanced Manufacture. 2021.
- [2] Srinivasan, D., Ruey Long Cheu, and Chuan Wei Tan. "Development of an improved ERP system using GPS and AI techniques." Proceedings of the 2003 IEEE International Conference on Intelligent Transportation Systems. Vol. 1. IEEE, 2003.
- [3] Ribeiro, Jorge, et al. "Robotic process automation and artificial intelligence in industry 4.0—a literature review." *Procedia Computer Science* 181 (2021): 51-58.
- [4] Marinos, Themistocleous, Irani Zahir, and MO'Keefe Robert. "ERP and application integration. Exploratory survey." *Business Process Management Journal* 7.3 (2001): 195-204.
- [5] Deloitte. (2020). Industry 4.0 Is your ERP system ready for the digital era?
- [6] Appelbaum, D., Kogan, A., Vasarhelyi, M., & Yan, Z. (2017). Impact of business analytics and enterprise systems on managerial accounting. *International Journal of Accounting Information Systems*, 25, 29–44.
- [7] Vegard Kolbjørnsrud, Richard Amico, and Robert J. Thomas, "How Artificial Intelligence will Redefine Management," *Harvard Business Review*, vol. 2, no. 1, pp. 3-10.
- [8] Paschek, D., Luminosu, C. T., & Draghici, A. (2017). Automated business process management – in times of digital transformation using machine learning or artificial intelligence. *MATEC Web of Conferences*, 121.
- [9] Wortmann, Johan Casper. "Evolution of ERP systems." *Strategic Management of the Manufacturing Value Chain: Proceedings of the International Conference of the Manufacturing Value-Chain August '98, Troon, Scotland, UK.* Springer US, 1998.
- [10] Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business Horizons*, 62(1), 15–25.
- [11] M. Uddin, M. S. Alam, A. A. Mamun, T.-U.-Z. Khan, and A. Akter, "A study of the adoption and implementation of enterprise resource planning (ERP): identification of moderators and mediator," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 6, no. 1, p. 2, 2020.
- [12] F. A. Goni, A. G. Chofreh, M. Mukhtar, S. Sahran, and S. A. Shukor, "Segments and elements influenced on ERP system implementation," *Australian Journal of Basic and Applied Sciences*, vol. 6, no. 10, pp. 209–221, 2012.
- [13] V.V. Narendra Kumar, and T. Satish Kumar, "Smarter Artificial Intelligence with Deep Learning," *SSRG International Journal of Computer Science and Engineering*, vol. 5, no. 6, pp. 10-16, 2018.
- [14] Costache, S., Dib, D., Parlavantzis, N., & Morin, C. (2017). Resource management in cloud platform as a service systems: Analysis and opportunities. *Journal of Systems and Software*, 132, 98–118.
- [15] Nofal, M. I., & Yusof, Z. M. (2013). Integration of Business Intelligence and Enterprise Resource Planning within Organizations. *Procedia Technology*, 11(December 2013), 658–665.
- [16] Paliwal, M., Patel, M., Kandale, N., & Anute, N. (2021). Impact of artificial intelligence and machine learning on business operations, *Journal of Management Research and Analysis*, 8(2), 70-75.
- [17] Salah, Omar Hasan, Zawiyah Mohammad Yusof, and Hazura Mohamed. "The determinant factors for the adoption of CRM in the Palestinian SMEs: The moderating effect of firm size." *PloS one* 16.3 (2021): e0243355.
- [18] Tallón-Ballesteros, A. J. "The design of ERP intelligent sales management system." *Fuzzy Systems and Data Mining VI: Proceedings of FSDM 331.2020* (2020): 413.
- [19] Dhamija, P., & Bag, S. (2020). Role of artificial intelligence in operations environment: A review and bibliometric analysis. *The TQM Journal*, 32(4), 869–896.
- [20] Gupta, S., Kumar, S., Singh, S. K., Foropon, C., & Chandra, C. (2018). Role of cloud ERP on the performance of an organization. *The International Journal of Logistics Management*, 29(2), 659–675
- [21] Balapriya, S., & Srinivasan, N. (2022). Emerging Practices of Digital Commerce Using Artificial Intelligence Techniques in Online Merchandising Business Platforms, *International Journal of Mechanical Engineering*, 7(1), 6760-6767.
- [22] Zhengzhong Shi, and Gang Wang, "Integration of Big-data ERP and Business Analytics (BA)," *The Journal of High Technology Management Research*, vol. 29, no. 2, pp. 141-150, 2018.
- [23] Gupta, S., & Misra, S. C. (2016a). Compliance, network, security and the people related factors in cloud ERP implementation. *International Journal of Communication Systems*, 29(8), 1395–1419.

-
- [24] Cemal Aktürk, "Artificial Intelligence in Enterprise Resource Planning Systems: A Bibliometric Study," *Journal of International Logistics and Trade*, vol. 19, no. 2, pp. 69-82, 2021.
- [25] Nofal, M. I. & Yusof, Z. M. (2013) "Integration of Business Intelligence and Enterprise Resource Planning within Organizations", *Procedia Technology*, Vol. 11 (2013), pp. 658 – 665.
- [26] Shrutika Mishra, and A.R. Tripathi, "AI Business Model: An Integrative Business Approach," *Journal of Innovation and Entrepreneurship*, vol. 10, 2021.