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AI & Large Language Models for Enterprise Decision Intelligence in ERP, Supply Chain & Manufacturing Ecosystems

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Abstract
The application of AI and large language models is fast becoming a revolutionary tool for decision intelligence in ERP (enterprise resource planning), supply chain, and manufacturing ecosystems. In this paper, there will be an examination of the technical background, market dynamics, and empirical evidence on the use of LLMs in these interconnected fields. Through a systematic literature review combined with a quantitative analysis of market data, this paper uses findings from reputable scholarly databases such as Scopus, Web of Science, and arXiv, as well as from credible market reports in the industry. This results in unmistakable market traction, as the size of the enterprise AI market has been projected to exceed 114 billion dollars in 2026, and even beyond to reach 270 billion dollars in 2031. There is empirical evidence that the proper use of LLMs improves demand forecasting, planning latency, and coordination in the supply chain. The use of hybrid models that integrate language models together with digital twins shows some promising potential in relation to decision support in manufacturing, where more resources are used. Still, there are some drawbacks in the sphere discussed, including the absence of theoretical background, insufficient verification in various industries, as well as governance and security concerns related to data. Specifically, the authors focus on the gap between the optimistic prospects concerning commercial markets and the empirical background of these technologies. In conclusion, the authors point out that despite the fact that large language models can really transform the industry of enterprise decision intelligence, further independent studies are required.

Keywords: Artificial Intelligence (AI), Large Language Models (LLMs), Enterprise Resource Planning (ERP), Supply Chain Management, Manufacturing Systems, Decision Intelligence, Demand Forecasting, Digital Twins, Predictive Analytics, Enterprise AI, Supply Chain Optimisation, Business Intelligence, Industrial Automation, Intelligent Decision Support, Smart Manufacturing.

Introduction

ERP systems and supply chain management generate a massive volume of structured and unstructured operational data on an everyday basis. Modern analytics solutions find it difficult to turn the collected data into business intelligence. Large language models provide transformer architectures capable of understanding context in complex data sets. Such models enable natural language querying, demand forecasting, anomaly detection, and automatic procurement decisions. Artificial intelligence is implemented in manufacturing value chains as part of production scheduling, predictive maintenance, and quality assurance procedures. International organizations are shifting from experimenting with generative AI solutions to their full implementation (Ångström et al., 2023). The global enterprise AI market size amounted to USD 114.87 billion in 2026 and will increase to USD 273.08 billion in 2031. The global AI for ERP market is estimated at USD 7.33 billion in 2026 and is anticipated to expand to nearly USD 58.7 billion in 2035. The cloud deployment segment held the largest share of AI ERP adopters in 2025.

The machine learning technology segment was one of the leading segments among all the others related to AI-powered ERP solutions. The market for enterprise large language models is expected to grow from USD 5.91 billion in 2026 to USD 48.25 billion by 2034. Big companies such as Deutsche Telekom have been using AI technology for live network operations with more than fifty thousand internal users (Perepelitsyn, 2023). Companies like Microsoft, Google Cloud, and AWS continue working on enterprise large language models that include not only reasoning capabilities but also data protection and workflow automation. Decision intelligence platforms use predictive analytics and generative reasoning to streamline supply chain processes. Improvements in forecasting accuracy, inventory management,nt and reaction time have been noticed as a result of the application of AI solutions (Aderibigbe et al., 2023). However, many challenges are still faced in terms of data governance, model explainability, integration, and staffing preparation . It is a significant technological transformation from enterprise software to generative intelligence. In order to comprehend this changing landscape, it is crucial to evaluate technical architectures and adoption trends.

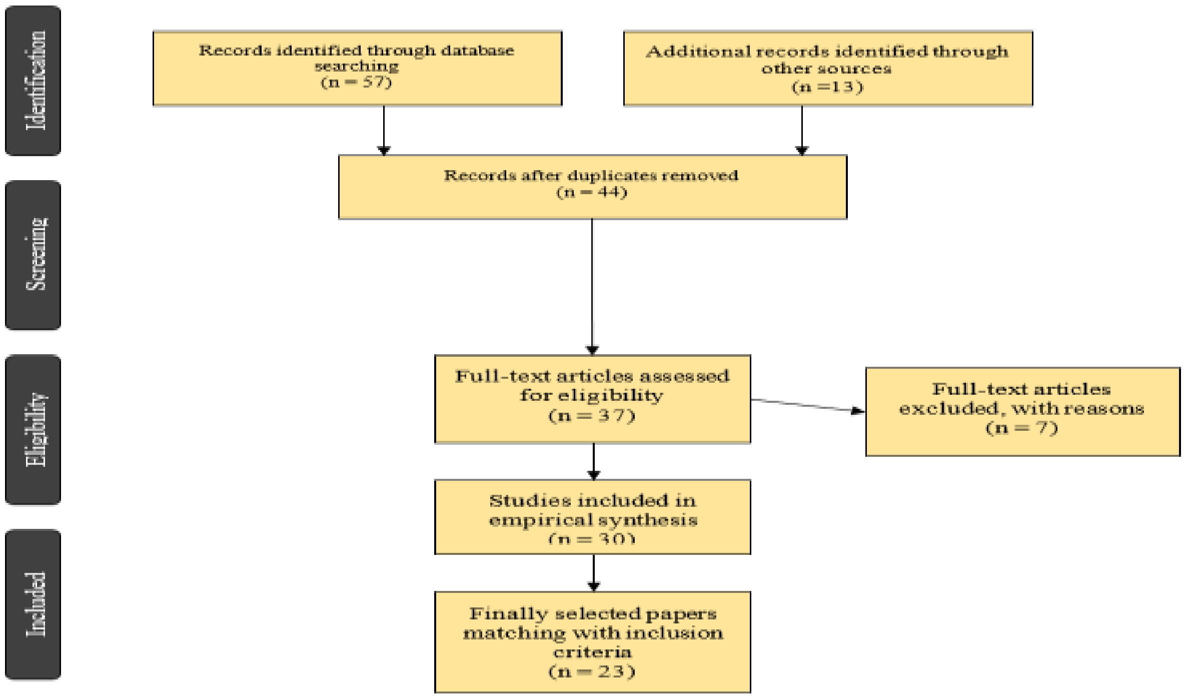
Related Work

Recent research in the academic field has also been considering the use of large language models as decision support systems for enterprise decision-making in the domain of logistics and operations management. Effective implementation of LLMs in SCM planning has shown benefits like accurate forecasts, faster planning processes, and improved collaboration. Simchi-Levi et al. provided groundbreaking work in 2025 that considers ways to use language models to address problems related to sourcing strategies, planning, and execution in SCM. Modern supply chains are complicated, dynamic, and heterogeneous in data, and this makes decision-making in such an environment problematic with traditional decision support tools; thus, large language models become an option due to their ability for semantic reasoning (Aghaei et al., 2025). A systematic literature review has been conducted on both Scopus and Web of Science databases regarding the capabilities of LLMs in the context of five key processes of the SCOR model.

Such hybrid techniques leverage LLMs to learn structure in text so that the signals can be used for predictions by predictive models later on, and it is evident that prediction accuracy will improve by leveraging the combination of statistics or graphs. Other researchers have leveraged LLMs to interpret natural language queries and to conduct reasoning in the context of digital twins of closed-loop supply chain designs of resource-intensive industries, such as steel production. In addition, simulation was employed to evaluate the capability of LLMs to act as a behavioral proxy in logistics science through the equivalence test to human beings. All of these recent findings demonstrate the growing scientific community interest in using LLMs for decision intelligence, but these attempts seem largely exploratory without theoretical integration of capabilities with enterprise performance (Wu et al., 2025).

Method

The research uses systematic literature review and market data analysis methods in order to examine the use of artificial intelligence in the enterprise resource planning and supply chain ecosystems (Paul & Barari, 2022). The relevant literature articles about large language models, enterprise resource planning, and supply chain decision intelligence have been identified using keyword searches in Scopus, Web of Science, and arXiv. Articles from peer-reviewed journals and conferences from 2020 to 2026 have been selected. The research works have been screened according to the following themes: enterprise decision-making, prediction accuracy, and automation of operations (Samokhvalov, 2024). Market statistics data were validated by several independent research companies. The thematic synthesis approach has been used in order to categorize findings into three types: technology architecture, application domains, and business outcomes.



Results

Accelerating Market Growth in Enterprise AI Adoption

There has been a quick move of global companies from AI pilots to implementations. This has been supported by findings from independent researchers (Liao et al., 2024). The market size of enterprise AI was at 114.87 billion US dollars in 2026 and was expected to reach 273.08 billion US dollars in 2031 at an 18.91% CAGR between 2026 and 2031. Another research company estimates the market size to be 30.18 billion US dollars in 2025 and will grow to 570.36 billion US dollars in 2035 at a 34.20% CAGR.

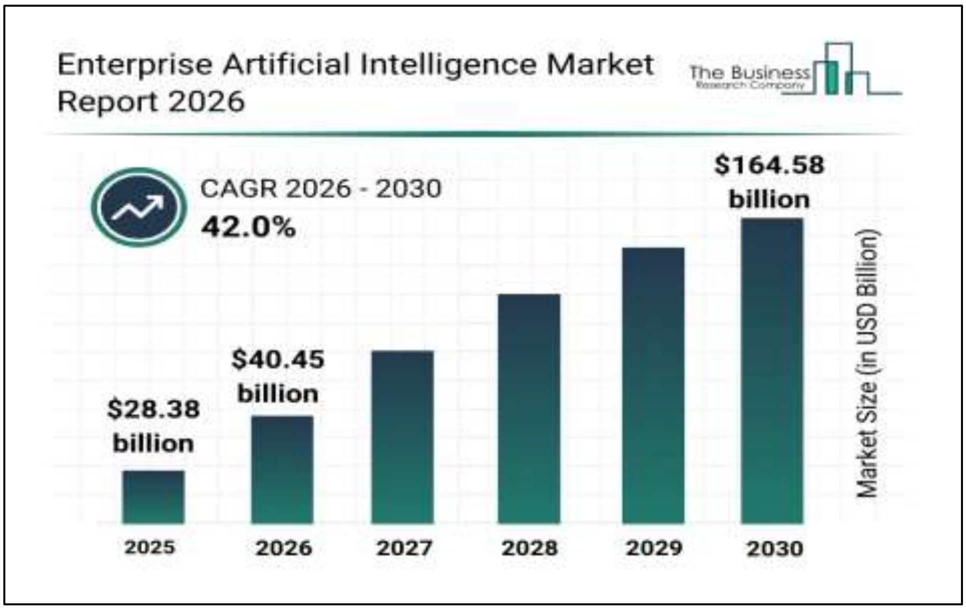


Figure 1: Enterprise Artificial Intelligence Market Report 2026

(Source: The Business Research Company. 2026)

Growth will be driven by computing hardware and cloud computing technology. Growth in the market due to hardware accelerators will outpace growth in the market because of the deployment of GPUs and TPUs for language models (Peng et al., 2023). Evidence from real-world deployment shows that this finding is very accurate. One example of this trend is Deutsche Telekom, which has moved from pilot to production usage through OpenAI. The company has used AI for more than 50,000 people in live call handling and network management systems.

AI Integration Driving ERP Transformation

There are some exciting perspectives for using AI with ERP systems as well. The size of the AI in ERP market in 2025 is forecasted at USD 5.82 billion and will rise to USD 58.7 billion by 2035 at a CAGR of 26.00%. There are a number of reasons why there is a need for growth – namely, intelligent automation and enhanced enterprise decision-making.

Figure 2: Global AI in ERP Transformation

(Source: Appinventiv, 2025)

As far as the geographic segments of the market go, North America accounted for the biggest market share (39%), while Asia Pacific is forecasted to have the highest CAGR. If we look at the deployment of ERP systems, then we can observe that the preference is related to enterprises as well (Polívka, 2023). Thus, the most significant part of all deployments is cloud-based SaaS deployment (it is equal to 82%). In terms of technologies, the most popular technology segment is machine learning, which accounts for 63% of all deployments. Finally, NLP is forecasted to have the highest CAGR between 2026 and 2035 in the ERP technology segment (Jha, Jha & Islam, 2025).

LLMs Enhancing Supply Chain Forecasting and Planning

Academic research has proven that the adoption of large language models brings a range of practical benefits for the performance of supply chain planning activities. According to the research, large language models make demand forecasting more accurate, shorten the time needed for planning, and enhance cross-functional collaboration if adopted within the processes of supply chain management planning (Lu, Garcia & Lee, 2024). The list of strategic benefits is not limited to operational ones. From the strategic point of view, such models help organizations predict structural risks and develop alternative scenarios thanks to improved forecasting and scenario-making capabilities.

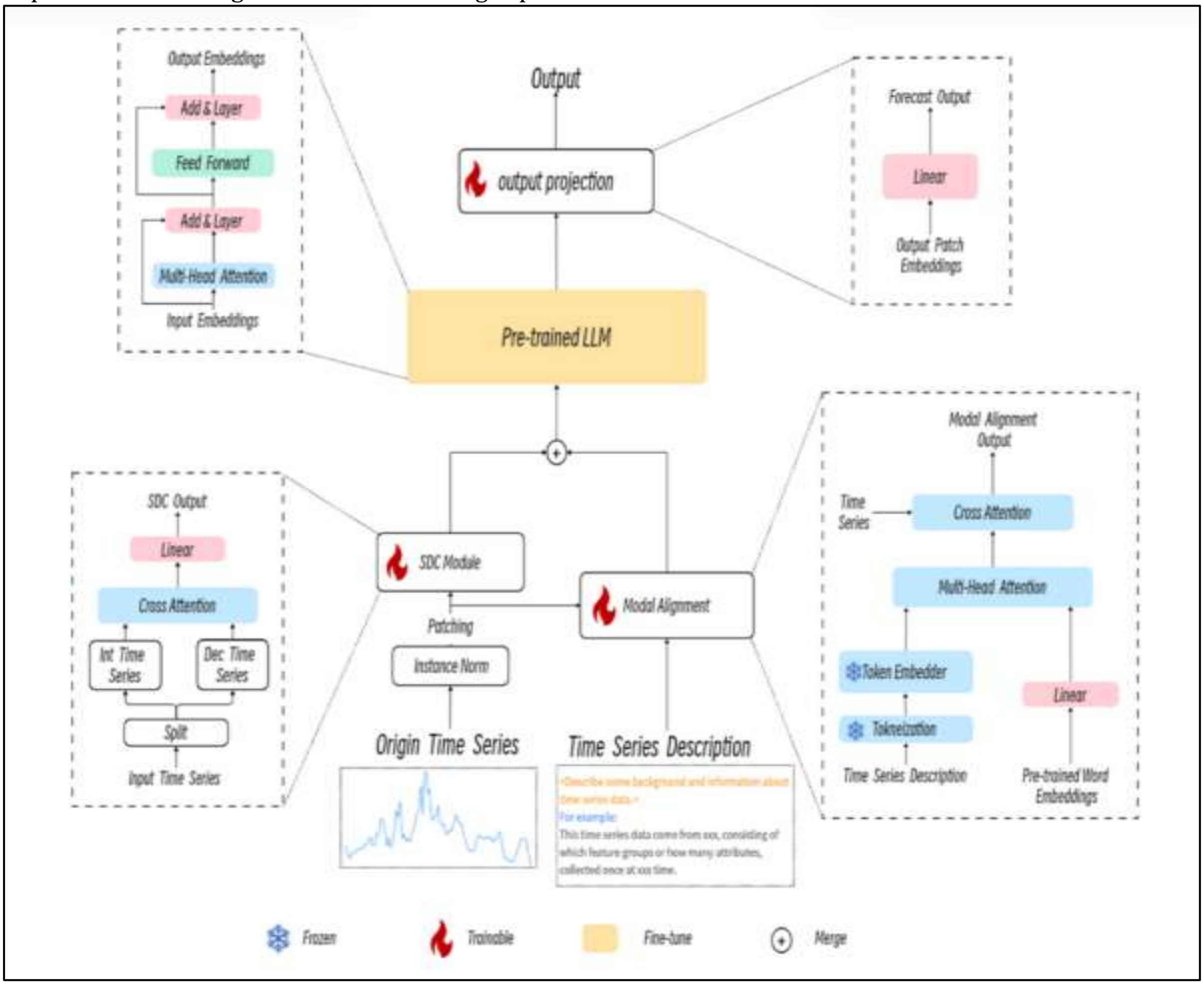


Figure 3: LLM time series forecasting method based on integer-decimal decomposition

(Source: Wang, Dong & Zhao, 2025)

Fundamental research carried out by scientists from Microsoft and MIT is devoted to the key problems of planning. The supply chain management domain faces a wide variety of decision-making problems that require solutions in the fields of sourcing, planning, and execution. Hybrid approaches, which combine language models and prediction systems, have turned out to be especially successful. In the hybrid approach, LLMs are used to detect signals in the text data that are further processed with the help of downstream prediction models (Wu et al., 2025).

Hybrid AI-Digital Twin Models in Manufacturing Decision Support

Hybrid methods are becoming increasingly popular in manufacturing ecosystems where both language models and digital twin simulations are utilized. Such a combination is needed to resolve complex problems requiring interpretation and synchronization in a physical sense. Studying closed-loop supply chains, researchers found that although decision models transfer operational processes into analytics, there were some challenges in natural language understanding and data-driven reasoning for decision-making (Wan et al., 2025). To overcome the challenge, researchers proposed an intelligent digital twin-based framework.

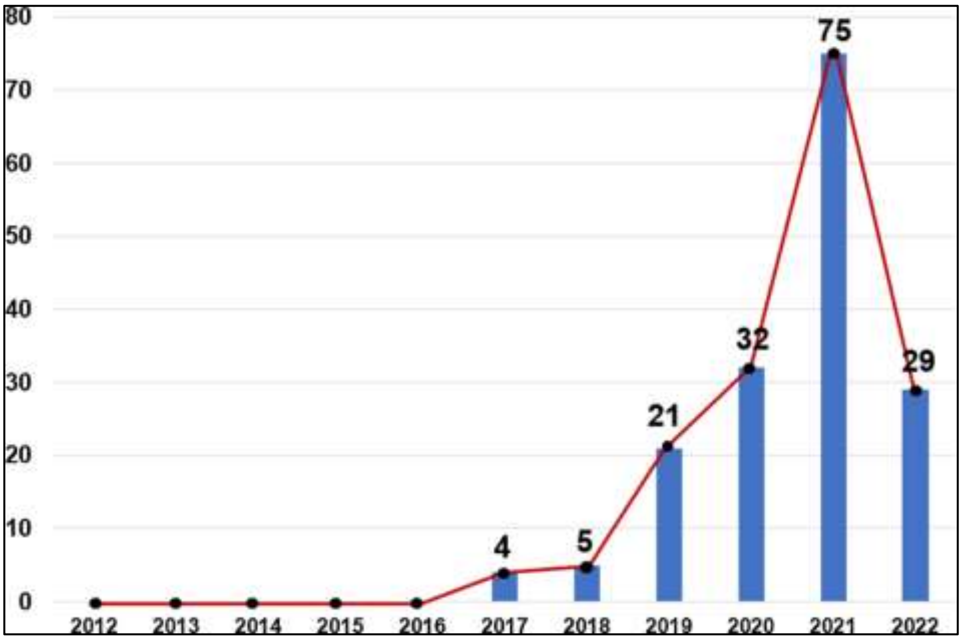


Figure 4: Digital twin for product versus project lifecycles' development in manufacturing and construction industries

(Source: Abanda et al., 2025)

Stimulated by advances in large language models, researchers designed an intelligent digital twin-based framework for decision support that would allow automatic interpretation, reasoning, and solving closed-loop supply chain operation problems, and synchronization of physical and digital objects. Knowledge graph, benchmark, and accurate query-explanation consistency were the metrics for evaluating the framework's performance in decision-making related to steel distribution and scrap collection. In a simulation study, LLMs can be tested as behavioral proxies in logistics environments and compared to humans (Xu et al., 2026).

Enterprise Adoption Barriers and Governance Challenges

Despite all the positive trends, there are still significant structural obstacles preventing large-scale AI adoption. Recent research revealed that, at this point,t the existing body of literature on LLMs in the area of supply chain management is underdeveloped (Ghosh, Virmani & Tripathi, 2026). Currently,y the situation can be described in terms of fragmented knowledge and an exploratory approach to LLMs in the area of supply chain management, which does not have a single framework for developing theoretical and practical applications. The fragmented approach to the topic is explained by the fact that some issues regarding governance and standardization are yet to be solved. At the same time, the existing enterprise concerns related to security and customization are reflected in various market reports. OpenAI tried to solve some of those concerns by providing enterprises with AI solutions incorporating better models and data protection and functioning within enterprise workflows (Chang & Lu, 2025). In this connection, it should be mentioned that all vendors face similar problems regarding governance of their products. Thus, Microsoft released a new version of Azure AI services with better customization and security opportunities for business applications.

Discussion

Together, these results suggest a truly huge discrepancy between forecasts about explosive market growth and the actual level of development of research that substantiates such forecasts. Despite market analysts giving optimistic estimates on the growth of enterprise AI reaching hundreds of billions of dollars, most of such optimism is based on the announcements and forecasts of vendors and not on the independent confirmation of their successes. In the scientific literature itself, the fragmented state of affairs is recognized since there is no way to establish connections between the capabilities of LLMs and the practical outcomes in the area of business operations (Nordlander, 2026). The advantages associated with greater precision in forecasting and lower delay in planning, while being very attractive, largely result from the efforts of a rather narrow circle of researchers tied to some technology vendors. However, governance, explainability, and data security considerations suggest that enterprise AI implementation may very well come before organizational readiness. The heavy reliance on cloud computing suggests that there are still questions about vendor lock-in and data sovereignty that remain unanswered (Trimborn, 2026). In sum, it can be said that this entire discussion implies that decision intelligence using large language models is indeed an emerging discipline where hype does not yet equal evidence.

Conclusion

It is clear from this research that AI and LLMs have brought about revolutionary changes in decision intelligence in ERP, supply chain, and manufacturing ecosystems. The commercial evidence shows the rapid development trends in these spheres, and the AI in enterprise and AI-enabled ERP market is predicted to show rapid development in the next decade. There is substantial academic evidence proving the benefits of accurate forecasts, delayed planning, and inter-departmental cooperation through the proper use of LLMs in business processes. This research also highlights the lack of theoretical frameworks and the fact that empirical evidence is limited to the case study. Hybrid solutions, including the use of language models together with digital twins and predictive systems, have shown great potential and good results but are still not tested in industry. The problems of governance, data protection, and model explainability do not allow enterprises to apply LLMs extensively. In general, large language models represent innovative technology for enterprise decision intelligence,e which is continuously evolving.

Reference

1. Aderibigbe, A. O., Ohenhen, P. E., Nwaobia, N. K., Gidiagba, J. O., & Ani, E. C. (2023). Artificial intelligence in developing countries: Bridging the gap between potential and implementation. Computer Science & IT Research Journal, 4(3), 185-199. https://www.academia.edu/download/109270546/ARTIFICIAL_INTELLIGENCE_IN_DEVELOPING_COUNTRIES_BRIDGING_THE_GAP_BETWEEN_POTENTIAL_AND_IMPLEMENTATION.pdf
2. Abanda, F. H., Jian, N., Adukpo, S., Tuhaise, V. V., & Manjia, M. B. (2025). Digital twin for product versus project lifecycles' development in manufacturing and construction industries. Journal of Intelligent Manufacturing, 36(2), 801–831. Springer.
3. Appinventiv. (2025). AI in ERP system: Revolution for your business in 2026. Appinventiv. https://appinventiv.com/blog/ai-in-erp-systems/?utm_source=chatgpt.com
4. Aghaei, R., Kiaei, A. A., Boush, M., Vahidi, J., Barzegar, Z., & Rofoosheh, M. (2025). The potential of large language models in supply chain management: Advancing decision-making, efficiency, and innovation. arXiv preprint arXiv:2501.15411. https://arxiv.org/abs/2501.15411
5. Ångström, R. C., Björn, M., Dahlander, L., Mähring, M., & Wallin, M. W. (2023). Getting AI implementation right: Insights from a global survey. California Management Review, 66(1), 5-22. https://journals.sagepub.com/doi/abs/10.1177/00081256231190430
6. Chang, C. C., & Lu, Y. (2025). Balancing Mission and Market: OpenAI's Struggle with Profit vs. Purpose. Corp. & Bus. LJ, 6, 1. https://access.heinonline.com/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/cablj6&section=3
7. Ghosh, S. K., Virmani, N., & Tripathi, P. M. (2026). Exploring the challenges of using large language models in supply chain management: a decision-making framework. LogForum, 22(2), 229-248. https://bibliotekanauki.pl/articles/64409500.pdf
8. Jha, R., Jha, R., & Islam, M. (2025). Forecasting US data center CO2 emissions using AI models: Emissions reduction strategies and policy recommendations. Frontiers in Sustainability, 5, 1507030. https://www.frontiersin.org/journals/sustainability/articles/10.3389/frsus.2024.1507030/full
9. Liao, X., Yao, C., Jin, F., Zhang, J., & Liu, L. (2024). Barriers and facilitators to implementing imaging-based diagnostic artificial intelligence-assisted decision-making software in hospitals in China: a qualitative study using the updated Consolidated Framework for Implementation Research. BMJ open, 14(9), e084398. https://bmjopen.bmj.com/content/14/9/e084398.abstract
10. Lu, T., Garcia, E., & Lee, J. (2024). Optimizing supply chain demand forecasting and inventory management using large language models. International Journal of Innovative Research in Computer Science and Technology, 12(6), 89-94. https://www.academia.edu/download/120476037/12_Optimizing_Supply_Chain_Demand_Forecasting_and_Inventory_Management_Using_Large_Language_Models.pdf
11. Nordlander, J. (2026). Systematic Process Selection for LLM-Based AI Implementation: An Operations Management Perspective on Efficiency in Administrative and Knowledge Work. https://oj.sfkvalitet.se/2026JNExamensarbete.pdf
12. Paul, J., & Barari, M. (2022). Meta-analysis and traditional systematic literature reviews—What, why, when, where, and how?. Psychology & Marketing, 39(6), 1099-1115. https://onlinelibrary.wiley.com/doi/abs/10.1002/mar.21657
13. Peng, H., Davidson, S., Shi, R., Song, S. L., & Taylor, M. (2023). Chiplet cloud: Building ai supercomputers for serving large generative language models. arXiv preprint arXiv:2307.02666. https://arxiv.org/abs/2307.02666

14. Perepelitsyn, A. (2023). Method of creation of FPGA based implementation of Artificial Intelligence as a Service. Radioelectronic and Computer Systems, (3), 27-36. http://nti.khai.edu/ojs/index.php/reks/article/view/reks.2023.3.03
15. Polívka, M. (2023). The importance of Industry 4.0 technologies when selecting an ERP system–An empirical study. https://dspace.zcu.cz/bitstreams/3816ad1c-9ca8-4ecc-938a-756333cf0837/download
16. Samokhvalov, I. (2024). Transforming management reporting with intelligent process automation (IPA): Enhancing business analytics, forecasting, and decision-making in organizations. https://www.theseus.fi/handle/10024/860490
17. Trimborn, Q. (2026). A Threat to Sovereignty Lock-in Mechanisms in Consumer Digital Ecosystems. Available at SSRN 7029478. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=7029478
18. The Business Research Company. (2026, July). Enterprise artificial intelligence market report 2026. The Business Research Company. Enterprise AI Market Share Report 2026-2030
19. Wan, X., Yang, D., Wang, T., & Deveci, M. (2025). Closed-loop supply chain decision considering information reliability and security: should the supply chain adopt federated learning decision support systems?. Annals of Operations Research, 349(1), 169-205. https://link.springer.com/article/10.1007/s10479-023-05477-1
20. Wu, J., Yang, S., Zhan, R., Yuan, Y., Chao, L. S., & Wong, D. F. (2025). A survey on llm-generated text detection: Necessity, methods, and future directions. Computational Linguistics, 51(1), 275-338. https://aclanthology.org/2025.cl-1.8/
21. Wu, S., Oltramari, A., Francis, J., Giles, C. L., & Ritter, F. E. (2025). Cognitive LLMs: Toward human-like artificial intelligence by integrating cognitive architectures and large language models for manufacturing decision-making. Neurosymbolic Artificial Intelligence, 1, 29498732251377341. https://journals.sagepub.com/doi/abs/10.1177/29498732251377341
22. Wang, L., Dong, K., & Zhao, X. (2025). A novel LLM time series forecasting method based on integer-decimal decomposition. Scientific Reports, 15, 23004.
23. Xu, T., Shi, L., Zhang, H., Lin, Y., Jiang, H., Zhan, D., ... & Shen, Z. J. M. (2026). LLM Agents in Transportation-enabled Service Platforms: From Behavioral Simulation to Platform Decision Support. Available at SSRN 7235878. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=7235878