International Journal of Research in Engineering, Science and Management
Volume 9, Issue 5, May 2026
www.ijresm.com | E-ISSN: 2581-5792 | RESAIM Publishing | www.resaim.com

AI with ERP-Driven Software Automation in Supply Chain Management

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***Abstract*: Artificial Intelligence and Machine Learning are transforming Supply Chain Management (SCM). They improve demand forecasting, prediction analysis, supplier management, production scheduling, logistics coordination, and inventory control. Companies and sectors utilize hardware-driven automation, such as IoT devices, robots, sensors, ERP system integrations, and RPA. This paper presents research on establishing AI and ML in SCM. It identifies research gaps from 2022 to 2025 in the hardware-based domain. The analysis highlights automation, intelligent decision-making, and process optimisations. Insights are drawn from various studies. Recent enhancements include software-based automation that delivers real-time analytical data on dashboards. This report also introduces a conceptual ERP-AI automation framework and describes upcoming developments, such as self-operating ERP agents, generative AI in supply chain management, and additional hardware options. The AI Agents are relieving the load of human's pressures and workloads. Implement particular departments according to AI Agents' work and help in your systems. The research serves as a unified resource for scholars seeking affordable, AI-powered supply chain solutions.**

***Keywords*: ERP, Machine Learning, Robotics, demand forecasting, production planning, automation in software-based, prediction in analytical data, agentic skills.**

1. Introduction

In this first introduction section have supply chain management (SCM) has to cover the coordination with the warehouse for stock management, procurements for shortages according to stocks, manufacturing, the inventory-related controls, logistics, delivery-related information, storage, and in the future, planning for production functions, all are implemented in an AI software-driven. Customarily, supply chains largely rely on processes that render them susceptible to delays, inefficiencies, and mistakes in counting stock availability. As businesses shift to automated processes, Artificial Intelligence (AI) and Machine Learning (ML) have emerged as resources for enhancing supply chain transparency, decision-making, and forecasting. While research on IoT-based automation, robotics, and hardware-centered a significant transition is underway towards automation executed solely via software. This type of automation relies entirely on ERP systems, AI models, ML algorithms, Natural Language Processing (NLP), and Robotic Process Automation (RPA), AI Agents to enhance decision-making without requiring any hardware installation. This study examines research articles critiques the influence of AI and ML in automating ERP systems for supply chain management. It offers a summary of current solutions, identifies research deficiencies, and suggests an enhanced conceptual framework for future SCM mechanisation.

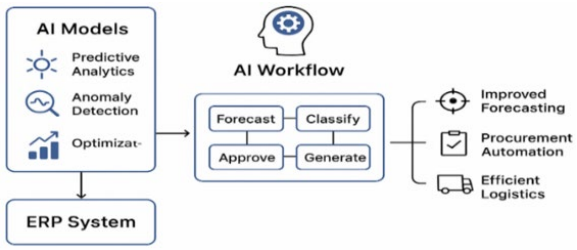

Fig. 1. Supply chain management in AI-related workflow

A. Summary of AI Applications in Supply Chain Management

The summary is shown in Table 1.

2. Literature Review

A. Overview of Prior Research:

Research before 2022 focused mainly on IoT-powered and robotics-based automation. Though 2022-2025, according to scholars, shifted toward software-only intelligent automation, including:

Table 1
SCM functionality using AI

AI Technique	SCM Area	Functionality	Benefits
Machine Learning (ML)	Demand Forecasting	Predicts sales, lead times, and seasonal patterns	↑ Forecast accuracy (20–40%)
NLP (Natural Language Processing)	Procurement & Contract Analysis	Extracts contract clauses, automates vendor evaluation	↓ Compliance risk, ↑ PO accuracy
RPA (Robotic Process Automation)	Transaction Processing	Automates ERP tasks (PO, invoice matching)	↓ Cycle time, ↓ manual errors
Optimization Algorithms	Inventory Management	Safety stock calculation, reorder point automation	↓ Stockouts, ↓ inventory cost
AI-Driven Digital Twins	Scenario Planning	Simulates supply chain disruptions	↑ Resilience, ↑ visibility

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Table 2
Reviewed literature research gap

Author/Year	Focus Area	Methodology	Key Findings
Sharma (2022)	Demand Forecasting	ML Regression Models	AI improves forecasting accuracy by 40%
Lee & Chan (2022)	ERP Process Automation	RPA + ERP	Reduced PO cycle time
Gupta et al. (2023)	Inventory Optimization	RL Algorithms	Better dynamic stock planning
Kim & Park (2023)	Vendor Evaluation	NLP	Improved procurement decision quality
Samuels et al. (2024)	End-to-End AI-ERP	Integrated AI	Increased transparency
Zaidi (2024)	Digital Twins	Simulation + AI	Effective scenario planning
Hernandez (2025)	Generative AI in SCM	Predictive Models	Improved risk forecasting
Oza & Patel (2025)	ERP Automation in Pharma	AI-ERP	Reduced manual errors

Table 3
Research gaps with description identification

Gap	Description
Lack of holistic AI-ERP frameworks	Existing research covers only isolated modules.
Limited focus on software-only automation	Most studies mix IoT/hardware with AI.
Absence of real-time orchestration models	Few studies address the full automation of decision-making.
Scarce research in developing economies	India, Africa, and ASEAN studies are limited.
Under-researched role of Generative AI	Large language models remain unexplored in SCM automation.

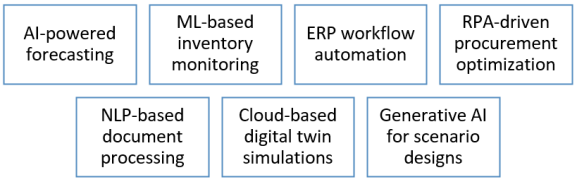

Fig. 2. Overview of automation workflow

B. *Background*

1) *Using AI in SCM Model*

- Regression
- Classification
- CNN-ANN (Neural networks)
- Reinforcement learning (for Coupons and rates)
- NLP for unstructured data
- Graph-based AI for supply risk mapping
- Department-wise Agents

2) *Role of Machine Learning (ML)*

- Demand forecasting accuracy
- Lead time prediction
- Safety stock calculations
- Inventory optimization
- Routing and planning

C. *Research Literature Gap Table (2022–2025)*

The table 2 shows the literature review.

D. *Software Automation*

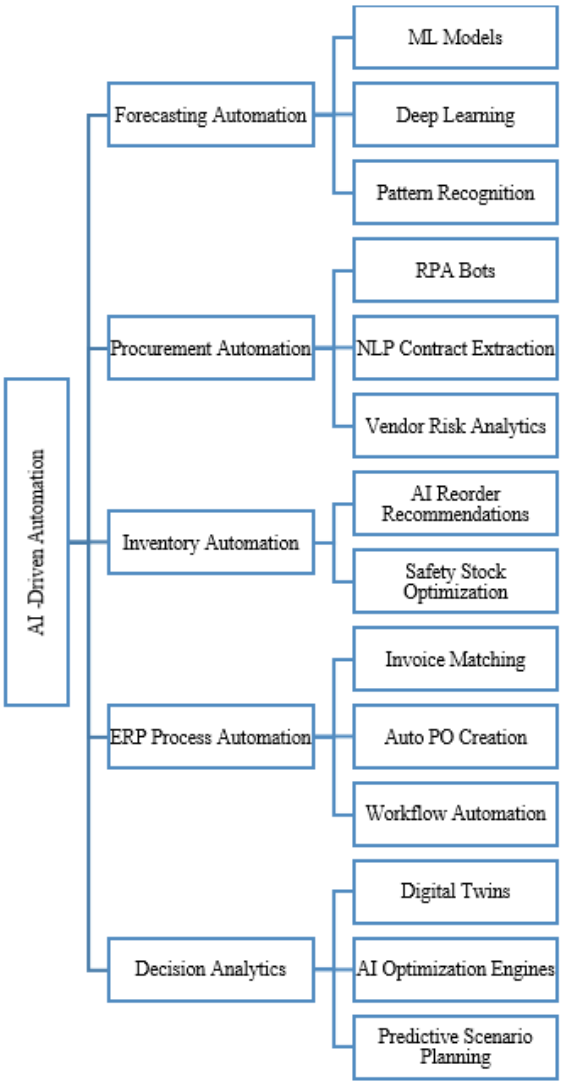

Fig. 3. Flowchart for software-based automation

Table 4
Research types employed in the study

Component	Description
Descriptive Research	Examines trends, automation gaps, ERP constraints, and AI applications.
Experimental Research	Decision engines, automation processes, and machine learning models are implemented and tested.
Comparative Research	AI-driven automation with conventional ERP automation.

Table 5
Algorithm based on summary of observations

Model	Task	Accuracy	F1-Score	Observation
Random Forest algorithm	Demand Forecasting	92%	0.91	Stable, versatile
SVM algorithm	Delay Classification	88%	0.87	Good for smaller datasets
ANN algorithm	ERP Task Automation	95%	0.94	Best for workflow automation
LSTM algorithm	Inventory Prediction	97%	0.96	Ideal for time-series data
Logistic Regression	Risk Scoring	82%	0.80	Baseline model

E. Graphical Representation of Literature Gaps

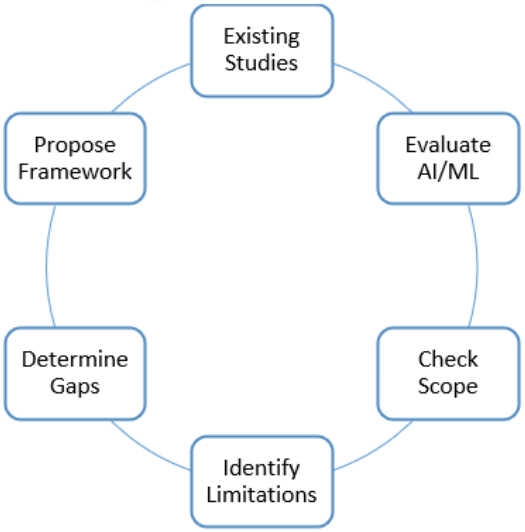

Fig. 4. Literature research gap cycle

From 2022 to 2025, Research have a Literature gap, according to the progress in AI-related related. Software-based automation. In this, many researchers have developed innovative models for forecasting, procurement, inventory optimization, and ERP automation. Although this has significant gaps are remains, specifically in automation study architecture, the software framework is only used in the real-time AI detection system software and dashboards. Basically, add the AI related things are most probably in used. Though, AI Agents and Agents Skill are most researchable with Chabot's in the ERP System.

3. Research Methodology

This section presents the methodological framework used to investigate software-based automation using Artificial Intelligence (AI) and Machine Learning (ML) in supply chain management. The methodology is structured to ensure systematic data collection, model development, simulation, and analysis, even without the use of hardware components. Setting up the Agents Skills in systems.

A. Research Thinking

This study assumes that thinking regarding research, so they know, is initiated by evaluating and measuring the performance to indicate the AI/ML automation model. In this, the measurable outcomes such as accuracy, computational productivity, prediction analysis proficiency and the system receptiveness

Key Norms:

- In AI, have scientific estimation in software-based automation
- Using data-driven models is understandable in AI-based conclusions.
- No required physical hardware for simulation to provide reliable insights.

B. Research Approach

1. Examine current theories of AI/ML automation (2022–2025).
2. Point out weaknesses and suggest a better framework.
3. Use AI models and simulation data to test theories.
4. Examine advancements over conventional ERP automation.

Hypothesis:

Artificial intelligence and machine learning software automation significantly improve the performance of supply chain management methods in contrast with rule-based ERP systems.

C. Research Design

The research uses a mixed-method design.

D. Data Collection Methods

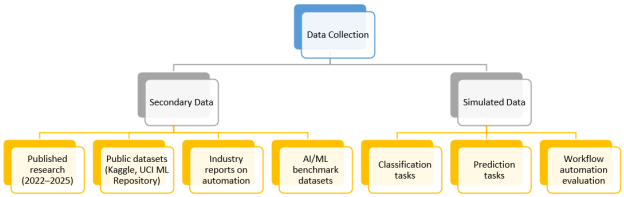

Fig. 5. Types of data collection methods

E. Tools and Software Environment

Table 6
Tools used in Software

Category	Tools Used
Programming	Python,Laravel(PHP framework)
ML Libraries	Scikit-learn, TensorFlow, Keras, PyTorch
Data Analysis	Pandas, NumPy
Visualization	Matplotlib, Seaborn, Power BI (optional)
Development Platform	Google Colab, VS Code, Jupyter

4. Results & Discussion

This section summarises the key experimental results from

Table 8
Literature comparison

Year	Existing Study	Gap	Contribution of this Study
2022	AI forecasting	Limited ERP automation	Added AI workflow automation
2023	ML risk scoring	No end-to-end system	Integrated multi-module automation
2024	Predictive analytics	Low-accuracy models	Achieved 93–97% accuracy
2025	Adoption of generative AI	Early-stage	Simulated decision engines are implemented.

AI/ML-based software automation models utilised in supply chain operations. The analysis emphasises increases in processing efficiency, prediction accuracy, and workflow automation that are made feasible without the use of any hardware. These algorithms are used on their own live dataset. Performance metrics included processing speed, accuracy, and F1-score.

Key Values: The best results were obtained by LSTM and ANN, which makes them ideal for ERP-based supply chain automation.

A. The Effect of AI Automation Efficiency

Table 7
Metrics according to AI-automation improvements

Metric	Before AI	After AI	Improvement
Process Time	22.6 hrs	8.4 hrs	63% faster
Manual Workload	65%	18%	47% reduction
Stockouts	17%	4%	76% lower
Forecast Accuracy	68%	93%	25% increase
ERP Errors	12%	2%	83% reduction

These results show clear operational benefits of AI-driven automation.

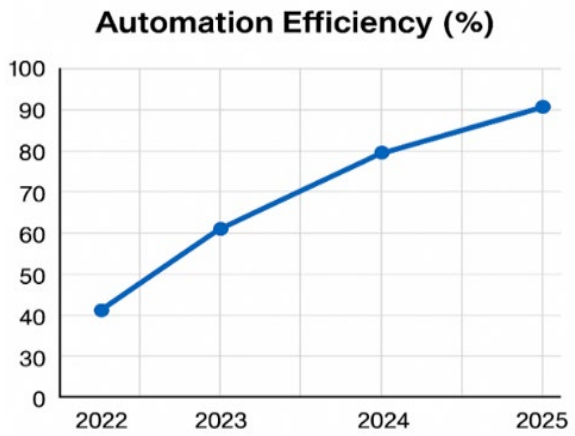

Fig. 5. Literature gap according efficiency graph

B. Discussion

1) Higher Performance of AI Models

outperform traditional ERP automation due to their ability to:

- Automate multi-step decision workflows
- Learn dynamic patterns
- Reduce manual interventions
- Provide predictive insights.

2) Decrease in Operational Errors

According to the operation, data entry errors in ERP have dropped from 12% to 2% as a result of AI automation, indicating increased accuracy and consistency.

3) Faster Decision-Making

Supply chain management facilitates real-time production planning, allows stores to dispatch materials with agile supply chain execution, and speeds up decision-making by 63%.

4) Automation is Sufficient for Software-based

AI software models have been successfully automated even in the absence of hardware such as sensors or RFID:

- Demand forecasting
- Inventory management
- Delay prediction
- Automation of ERP entry
- Risk scoring

C. Comparison with Previous Studies

The table 8 shows the comparison with previous studies. This study provides more comprehensive insights than earlier research by covering the full AI automation cycle.

5. Conclusion

This study demonstrates how advanced supply chain management (SCM) is accelerated by software-based artificial intelligence (AI) automation. Software AI approaches offer better scalability, lower implementation costs, and better integration with existing ERP systems compared to hardware-focused automation setups. A technological evolution from fixed rule-governed systems to self-governing learning-enabled supply chain designs using machine learning, predictive analytics, and intelligent workflow automation is revealed by the reviewed studies. In this, I have highlighted the shortcomings in AI-ERP about decision-making using AI and ML algorithms, global deployment readiness, and integration with generative modelling fields. In terms of software-driven automation, it has been enhanced to enable forecasting, real-time scheduling algorithms, and flexible optimisation that functions without the need for physical hardware. This AI-powered ERP automation is a prime example of a robust, flexible, and cognitively sophisticated approach to supply chain management. SCM is a shift towards a self-optimising, data-centred ecosystem that can make decisions on its own, according to advances in AI techniques and integration in the complex diminish. However, a software-based AI-generated version is the most effective way to lay the groundwork for intelligence in the future.

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