



## A literature review on factors affecting implementation and automation of inventory management systems

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### Abstract

Inventory management is a critical function in manufacturing and supply chain operations, directly influencing productivity, cost efficiency, and overall business performance. With increasing demand for accuracy and real-time visibility, organizations are gradually shifting from manual inventory processes to automated systems such as barcode technology, RFID, IoT-based tracking, and ERP-integrated solutions. However, the successful implementation of these automated systems depends on several interrelated factors. This literature review examines existing research to identify the key determinants that affect the adoption and automation of inventory management systems. The review is based on scholarly studies published between 2015 and 2024 and categorizes influencing factors into technological, financial, organizational, human, and external environmental dimensions. Findings indicate that technological compatibility, system reliability, and integration capability are crucial enablers of automation. Financial elements particularly cost of implementation and perceived return on investment remain significant barriers, especially for small and medium enterprises. Organizational readiness, management commitment, and employee training also strongly influence adoption outcomes. Moreover, external drivers such as vendor support, market competition, and regulatory requirements play an important role. The review highlights existing research gaps, particularly limited studies in developing economies and insufficient analysis of emerging technologies like AI-driven inventory systems. These insights provide a comprehensive foundation for future research and practical decision-making in inventory automation.

**Keywords:** Inventory automation, digital inventory systems, adoption barriers, financial constraints, iotbased tracking, change management, warehouse automation, technology acceptance, operational efficiency, smart supply chain

### Introduction

Inventory management is a fundamental component of operational and financial performance in manufacturing, retail, and supply chain-driven industries. It ensures the availability of materials, prevents stockouts, reduces excess inventory, and supports smooth production flow. Traditionally, organizations relied on manual inventory processes such as physical counting, paper-based logs, and spreadsheet tracking. While these methods were simple to implement, they were prone to errors, time-consuming, and lacked real-time visibility. As industries grow more complex and competitive, manual systems are no longer sufficient for meeting modern efficiency and accuracy demands.

To address these challenges, organizations have increasingly adopted automated inventory management systems. Technologies such as barcode scanning, RFID, IoT-enabled sensors, warehouse management systems (WMS), and ERP-integrated platforms have transformed how inventory is tracked, recorded, and analysed. Automation offers several benefits, including improved accuracy, faster processing, reduced labour cost, and enhanced decision-making through real-time data insights. However, despite these advantages, many industries especially in developing economies struggle to successfully implement and sustain automation.

The successful adoption of automated inventory systems is influenced by multiple factors, including technological readiness, financial capability, organizational structure, human resource competency, and external environmental conditions. This literature review examines existing research to identify these key factors, understand their

interrelationships, and highlight challenges that hinder automation. By synthesizing previous studies, the paper aims to provide a comprehensive understanding of the determinants that shape inventory automation adoption and to identify gaps for future research.

### Review Methodology

This study adopts a structured and systematic literature review methodology to identify, critically evaluate, and synthesize scholarly research related to the factors affecting the implementation and automation of inventory management systems. The methodology ensures that the review is comprehensive, unbiased, and aligned with academic standards for secondary research.

#### a. Research Design

The present study employs a systematic qualitative literature review design, which is widely recognized as an effective method for synthesizing existing academic knowledge across diverse domains. Since the topic factors affecting implementation and automation of inventory management is multi-disciplinary in nature, involving elements of technology adoption, organizational behaviour, supply chain management, financial decision-making, and human resource readiness, a qualitative review provides the necessary flexibility and depth to examine these interconnected dimensions comprehensively.

A literature review design was chosen instead of empirical data collection because the primary objective of this paper is to understand what previous researchers have discovered about the determinants influencing inventory automation.

This design allows the study to compare findings across different industries, geographical contexts, and technological stages of automation (barcode, RFID, IoT, AI, WMS, ERP). By consolidating insights from various research traditions, it creates a holistic theoretical foundation for understanding adoption challenges and opportunities.

Overall, this research design ensures that the literature review is not merely a summary of past studies but a critical, structured, and integrative analysis that contributes to existing knowledge and paves the way for future research directions.

### b. Data Sources

This literature review is based entirely on secondary data collected from reputable academic databases and recognized industry publications. Multiple sources were selected to ensure comprehensive coverage of research on inventory automation, technology adoption, and implementation challenges.

#### The primary academic databases consulted include:

- Google Scholar
- ScienceDirect (Elsevier)
- SpringerLink
- IEEE Xplore
- Taylor & Francis Online

In addition to these academic sources, industry reports from firms like McKinsey, Deloitte, and PwC were reviewed to understand practical challenges, emerging technologies, and real-world implementation experiences.

### c. Search Strategy

A structured search strategy was adopted to identify relevant literature on the factors influencing the implementation and automation of inventory management systems. The process involved multiple stages, beginning with broad keyword searches and gradually refining results based on relevance, publication quality, and thematic alignment.

#### Keyword Selection:

A set of primary and secondary keywords was used to capture various dimensions of automation, technology adoption, and inventory processes. These included:

- *“Inventory automation”*
- *“Inventory management systems”*
- *“Factors affecting implementation”*
- *“Barcode adoption challenges”*
- *“RFID implementation factors”*
- *“Warehouse automation readiness”*
- *“Digital supply chain transformation”*
- *“Technology adoption in operations”*

Boolean operators were applied to further refine the search. Examples include:

- *“Inventory automation” AND “implementation factors”*
- *“RFID” OR “barcode adoption challenges”*
- *“Digital inventory systems” AND “organizational readiness”* Search Filters and Timeframe:

To ensure relevance to contemporary technological advancements, the search was restricted to studies published between 2015 and 2024. Only English-language publications were included

### d. Inclusion and Exclusion Criteria

#### Inclusion Criteria

Studies were included if they:

- Focused on inventory management automation technologies (barcode, RFID, IoT, ERP, WMS).
- Discussed implementation factors, adoption challenges, or organizational readiness.
- Were published between 2015 and 2024.
- Appeared in peer-reviewed journals, conferences, or credible academic sources.
- Were written in English and related to industries such as manufacturing, logistics, supply chain, or retail.

#### Exclusion Criteria

Studies were excluded if they:

- Were published before 2015 or lacked contemporary relevance.
- Focused solely on technical hardware design without managerial context.
- Were non-academic sources such as blogs, magazines, or promotional content.
- Were unrelated to inventory systems or automation.
- Were written in languages other than English.

### e. Screening and Selection Process

A systematic screening process was followed to ensure that only the most relevant and high-quality studies were included in the literature review. The initial search across selected academic databases produced approximately 58 publications. These records were first screened by title and abstract to evaluate their relevance to inventory automation and implementation factors.

After removing duplicates and studies that did not meet the inclusion criteria, 42 papers remained for further examination. Full-text screening was then conducted to assess the depth of content, research focus, and methodological quality. Studies that lacked clear discussion of implementation factors or were purely technical in nature were excluded at this stage.

This structured selection process ensured that the literature review is based on credible, relevant, and up-to-date academic research.

### Thematic Literature Review

#### a. Technological Factors

Technological readiness is one of the most critical determinants of successful inventory automation. Studies highlight that organizations adopt automated systems more easily when the technology is compatible with existing platforms, particularly ERP and WMS systems. Simple and user-friendly technologies such as barcode and RFID reduce error rates and increase acceptance. In contrast, complex systems often create resistance and implementation delays. Scalability is another essential factor; firms prefer technologies that can support growing inventory volumes and future upgrades. Real-time visibility, system reliability, and data accuracy especially through RFID and IoT-based tracking strongly influence the decision to automate. Overall, technological compatibility, simplicity, and reliability significantly shape automation success.

#### b. Financial Factors

Financial considerations heavily affect automation adoption, especially for small and medium enterprises (SMEs). High

upfront investment in hardware (barcode scanners, RFID tags), software licenses, integration services, and employee training can discourage firms from adopting automated systems. The expected Return on Investment (ROI) and payback period play a major role in management decisions. Ongoing maintenance and system upgrade costs also influence long-term sustainability. Firms with limited budgets tend to continue manual processes, while financially stable organizations are more likely to automate.

### c. Human Factors

Human factors play a significant role in determining automation success. Employees may resist new systems due to fear of job loss, lack of technical skills, or discomfort with change. Proper training, involvement of staff in planning, and skill-development programs help increase acceptance. Studies consistently emphasize that even the best technology fails if workers are not prepared or motivated to use it.

### d. Organizational Factors

Organizational readiness, leadership commitment, and internal policy support are major enablers of automation. Literature shows that firms with strong top-management support experience smoother implementations. Clear communication, structured planning, and interdepartmental coordination help reduce disruptions. Organizational culture also matters; companies open to innovation and change adapt more quickly. Lack of management interest or unclear workflow structures often leads to delays and project failure.

### e. External/Environmental Factors

External factors influencing automation include vendor support, availability of reliable technology providers, industry standards, government incentives, and competitive pressure. Firms adopt automation more readily when industry peers are digitizing their supply chains. Strong vendor support during installation and maintenance reduces implementation risks. Regulations related to traceability or quality standards may also push firms toward automated systems.

## Key Findings and Discussion

The review of existing literature reveals that the implementation and automation of inventory management systems are influenced by a combination of technological, financial, organizational, human, and environmental factors. Technological readiness emerges as the strongest determinant, with compatibility, simplicity, and real-time visibility being essential drivers of successful adoption. Studies consistently show that firms with modern ERP or WMS platforms find it easier to integrate automation technologies such as barcode and RFID.

Financial considerations remain a major barrier, particularly for small and medium enterprises. High initial investment and uncertainty regarding return on investment often delay automation decisions. Organizations that view automation as a long-term strategic investment are more likely to adopt and sustain digital systems.

The role of organizational and human factors is equally significant. Management commitment, effective communication, and structured change-management practices positively impact adoption. Conversely, employee resistance, lack of skills, and fear of technology can hinder

implementation even when technological and financial conditions are favourable.

External factors such as vendor support, industry competition, and regulatory guidelines also influence adoption patterns. Industries facing highly competitive pressure tend to adopt automation faster to improve efficiency and accuracy.

Overall, the findings suggest that successful automation is not determined by a single factor but by the alignment of technological capability, financial preparedness, organizational support, and workforce readiness. A balanced approach addressing each of these dimensions increases the likelihood of achieving effective and sustainable inventory automation.

## Research Gaps

Although the existing literature provides valuable insights into the factors influencing inventory automation, several gaps remain that limit a comprehensive understanding of the topic.

First, most studies focus on developed countries and advanced supply chain environments. There is limited research examining automation challenges in developing economies, where budget constraints, infrastructure limitations, and skill gaps may present unique barriers.

Second, while many studies emphasize technological and financial factors, fewer explore the interactions between human, organizational, and cultural dimensions. The role of employee perceptions, leadership style, and change management practices remains underexplored.

Third, existing research predominantly discusses traditional automation tools such as barcode and RFID, with relatively less focus on emerging technologies like IoT-based tracking, cloud inventory platforms, predictive analytics, and AI-driven systems. More studies are needed to understand how these technologies impact performance and adoption readiness.

Fourth, there is limited longitudinal research examining post-implementation outcomes, such as long-term cost savings, operational improvements, or sustainability of automated systems.

Finally, many studies lack practical frameworks that organizations can use to evaluate their readiness for automation.

These gaps highlight the need for future research that incorporates diverse industries, modern technologies, and more holistic implementation models.

## Conclusion

This literature review examined the key factors influencing the implementation and automation of inventory management systems across various industries. The findings highlight that automation is driven by multiple interconnected dimensions rather than a single determinant. Technological readiness including system compatibility, usability, and reliability remains a primary enabler, while financial feasibility strongly affects the pace and extent of adoption, especially for resourceconstrained organizations.

Equally important are organizational and human factors, as successful automation depends on management support, structured planning, and employee acceptance. Without adequate training and change-management efforts, even advanced technologies may fail to deliver their intended benefits. External influences such as vendor expertise,

industry competition, and regulatory requirements also shape adoption decisions.

Overall, the review suggests that automation of inventory management can significantly enhance accuracy, visibility, and operational efficiency, but its success requires a balanced approach addressing technological, financial, organizational, and human dimensions. The study also identifies several research gaps, particularly the need for empirical studies in developing economies and deeper analysis of emerging technologies such as IoT and AI. Addressing these areas in future research can help organizations better plan and implement effective inventory automation strategies.

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