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Evaluating ERP System Efficiency in the Indian Apparel Retail Industry: An Exploratory Study Using a Mixed Method Approach

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Abstract- The Indian retail sector is marked by high product complexity, volatile demand patterns, and intense competition, necessitating robust digital systems for operational integration and efficiency. Enterprise Resource Planning (ERP) systems are widely adopted across retailers; however, empirical evidence on their actual efficiency outcomes in the Indian retail context remains limited. This study investigates the effectiveness of ERP systems in enhancing operational efficiency and organizational performance in Indian retail firms, using a mixed-method approach. Primary data were collected from retail professionals through a structured questionnaire, supplemented by qualitative insights. Advanced analytical techniques—Partial Least Squares Structural Equation Modelling (PLS-SEM) and Analytic Hierarchy Process (AHP)—were employed to strengthen analytical rigor. The SEM results reveal that ERP implementation effectiveness has a significant positive impact on operational efficiency, which in turn strongly influences organizational performance, indicating a partial mediation effect. AHP findings prioritize inventory management and supply chain management as the most critical ERP modules driving efficiency in retail. The study contributes to the ERP and retail management literature by providing India-specific empirical evidence and a dual-method analytical framework. From a managerial perspective, the findings highlight the importance of strategic ERP module prioritization, continuous employee training, and change management to maximize ERP returns. The study offers actionable insights for retail managers, ERP vendors, and policymakers involved in the digital transformation of the sector.

Keywords: ERP Systems, Retail, Operational Efficiency, Inventory Management, India, Digital Transformation.

I. INTRODUCTION

Background of the Study

Retailing represents the final stage of the distribution process, connecting manufacturers and wholesalers to end consumers. According to Kotler, retailing includes all activities involved in selling goods or services to final consumers for personal, non-business use. In India, retail contributes over 10% to GDP and nearly 8% to employment, making it one of the most significant sectors of the economy. (IBEF, 2025) The apparel segment, in particular, plays a crucial role due to its labour-intensive nature and strong linkage with manufacturing, logistics, and exports.

The Indian apparel retail sector has witnessed a rapid transformation driven by organised retail expansion, omnichannel strategies, rising disposable incomes, and changing consumer preferences. However, this growth has also

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increased operational complexity. Retailers manage thousands of SKUs differentiated by size, colour, and style, while responding to short fashion cycles and volatile demand. In such an environment, traditional manual or fragmented information systems are insufficient.

ERP Systems in Apparel Retail

Enterprise Resource Planning (ERP) systems integrate core business functions such as procurement, inventory, finance, sales, supply chain, and human resources into a unified digital platform. In retail, ERP systems support merchandising, pricing, distribution, warehouse management, and point-of-sale integration. By providing real-time visibility and process automation, ERP systems are expected to improve efficiency, accuracy, and responsiveness (Ahuja, 2026; Business System, 2026).

Despite widespread adoption, many Indian retailers continue to face challenges related to ERP effectiveness, including inventory mismatches, delayed replenishment, incomplete system usage, and resistance from employees (Goel, 2025). This raises a critical research question: Are ERP systems delivering the operational efficiency they promise in the Indian retail context?

Research Problem

While ERP adoption has increased across Indian retailers, variations in outcomes remain significant. Some organisations experience improved efficiency and cost reduction, while others struggle due to implementation gaps, training deficiencies, and integration issues (Goel, 2025; Business System, 2026). This study investigates the actual efficiency of ERP systems in the Indian retail industry by examining their impact on inventory management, error reduction, decision-making, and employee adaptability.

Objectives of the Study

The objectives of this research are:

- To assess the usage and effectiveness of ERP systems in the Indian apparel retail industry.
- To examine the contribution of different ERP modules to operational efficiency.
- To identify key challenges and success factors influencing ERP efficiency.

Conceptual Framework and Hypothesis Development

Conceptual Framework

Drawing from the Resource-Based View (RBV) and Technology–Organisation–Environment (TOE) framework, this study proposes that ERP systems function as strategic organisational resources that enhance firm performance through improved operational efficiency. In apparel retail, ERP implementation effectiveness—characterised by system integration, usage intensity, and error reduction—enables superior inventory accuracy, faster replenishment cycles, and coordinated supply chain processes. These operational improvements, in turn, translate into better organisational performance outcomes such as improved decision-making quality and productivity.

Operational Efficiency is conceptualised as a mediating construct between ERP Implementation Effectiveness and Organisational Performance. Additionally, the Analytic Hierarchy Process (AHP) identifies the relative importance of ERP modules (inventory, supply chain, CRM, finance, HR), providing a strategic prioritisation lens that complements the causal relationships tested through SEM.

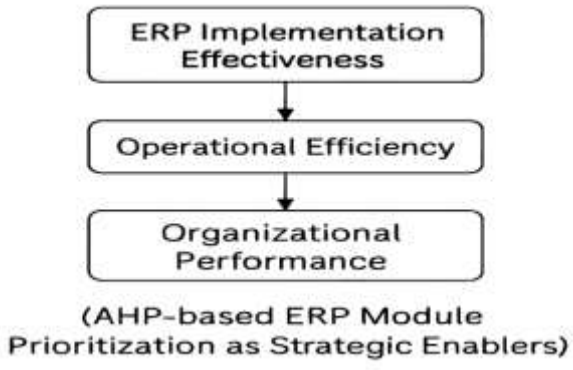

Figure 1. Conceptual Framework of ERP Efficiency in Indian Apparel Retail

Hypothesis Development

H1: ERP implementation effectiveness has a positive and significant impact on operational efficiency in apparel retail firms.

H2: Operational efficiency has a positive and significant impact on organisational performance in apparel retail firms.

H3: Operational efficiency mediates the relationship between ERP implementation effectiveness and organisational performance.

H4: Strategic prioritisation of ERP modules (inventory and supply chain) significantly enhances ERP-driven efficiency outcomes.

II. LITERATURE REVIEW

The apparel industry faces distinct operational challenges, including seasonal demand fluctuations, rapid style changes, and complex global sourcing. Prior studies suggest that Enterprise Resource Planning (ERP) systems enhance supply chain coordination, reduce lead times, and improve decision-making efficiency (Kumar et al., 2018). Apparel-specific ERP modules such as Time and Action (TNA), merchandising, and multi-style planning are particularly effective in addressing industry-specific complexities.

ERP systems are integrated software solutions that streamline organisational processes across functions such as procurement, production, inventory, finance, human resources, and sales. Over the past two decades, ERP has become essential for firms operating in dynamic environments like the Indian apparel retail sector, which is characterised by high product variety, short product life cycles, and complex supply chains. ERP implementation enables real-time data integration, process standardisation, and informed decision-making, thereby improving operational efficiency (Monk & Wagner, 2013).

The Indian retail sector has witnessed increased ERP adoption due to rising competition, expansion of organised retail, and the need for process integration (Garg, 2010). ERP replaces fragmented legacy systems and facilitates seamless information flow across departments, enhancing coordination and transparency (Davenport, 1998). Empirical studies indicate that ERP adoption positively impacts operational performance, inventory accuracy, order fulfilment speed, and financial control (Garg & Venkitakrishnan, 2012). In apparel retail, ERP is particularly valuable for demand forecasting, inventory visibility, and vendor management, improving demand-supply alignment and reducing inefficiencies (Kumar & Meenakshi, 2018).

Research also highlights that ERP integration across sourcing, production, warehousing, and retail improves coordination, reduces lead times, and enhances customer satisfaction (Chowdhury et al., 2019). Although much of the ERP literature focuses on manufacturing, its findings are applicable to apparel retail due to similar operational complexities (Siddiqui et al., 2023).

Among ERP modules, inventory and supply chain management are the most critical for apparel retailers. These modules enable real-time inventory tracking, efficient replenishment, and reduced stock-outs and excess inventory (Monk & Wagner, 2013). Given the large number of SKUs differentiated by size, colour, and style, ERP systems significantly improve inventory accuracy and forecasting (Chowdhury et al., 2019). Production planning modules further enhance efficiency through better scheduling, material requirement planning, and capacity utilisation (Parvin & Rahman, 2020), leading to improved productivity and on-time delivery (Islam et al., 2019).

ERP HR modules also contribute by streamlining payroll, attendance, and workforce planning, thereby reducing administrative workload and improving productivity (Haddara & Elragal, 2015).

Despite these benefits, challenges such as employee resistance to change, system complexity, data migration issues, and excessive customisation hinder ERP effectiveness (Indhumathi & Vijayalakshmi, 2017; Somers & Nelson, 2004). Additionally, small and medium apparel firms often face financial and infrastructural constraints (Kumar & Meenakshi, 2018).

The literature identifies top management support, user training, and effective change management as key success factors for ERP implementation (Somers & Nelson, 2004; Haddara & Elragal, 2015). Proper planning, cross-functional collaboration, and phased implementation approaches further enhance ERP efficiency and outcomes (Garg, 2010; Siddiqui et al., 2023).

Challenges in ERP Implementation

Despite benefits, ERP implementation faces intrinsic and extrinsic barriers. High implementation costs, lack of training, resistance to change, data quality issues, and system complexity are frequently cited challenges. In developing economies like India, human and organizational factors often play a more critical role than technological limitations.

Research Gap

Existing literature largely focuses on manufacturing or global ERP implementations. There is limited empirical research examining ERP efficiency in the Indian apparel retail sector, particularly from an employee and operational perspective. This study addresses this gap by providing industry-specific and India-focused evidence.

III. RESEARCH METHODOLOGY

Advanced Analytical Techniques

To meet the methodological expectations * the study employs *Partial Least Squares – Structural Equation Modelling (PLS-SEM) and Analytic Hierarchy Process (AHP). These techniques are appropriate given the exploratory nature of the study, small sample size, and the need to simultaneously analyse latent constructs and decision priorities.

PLS-SEM is used to examine causal relationships between ERP adoption, operational efficiency, and organizational outcomes. AHP is applied to prioritise ERP modules based on perceived importance in apparel retail operations.

Research Design

The study adopts a mixed-methods research design combining descriptive and exploratory approaches. Quantitative data were collected through structured questionnaires, while qualitative insights were obtained through interviews and case observations.

Data Collection

Primary data were collected from 15 professionals working in Indian apparel retail organizations using ERP systems. Respondents included managers, supervisors, and operational staff. A structured questionnaire using a five-point Likert scale measured perceptions of ERP efficiency, usage, and challenges. Secondary data were sourced from academic journals, industry reports, and company documents.

Sampling Technique

Simple random sampling was employed to ensure unbiased selection. The sample included professionals from small, medium, and large apparel retail organizations.

Data Analysis Techniques

Descriptive statistics, percentage analysis, and mean score analysis were used to interpret survey responses. Content analysis was applied to qualitative responses to identify recurring themes related to resistance, training, and system effectiveness.

IV. DATA ANALYSIS AND FINDINGS

The respondent base consisted entirely of working professionals, with representation across different career stages. The largest proportion belonged to the 35–45 age group (45.5%), indicating strong participation from middle management. Younger professionals aged 18–25 years accounted for 36.4%, while those in the 25–35 years bracket represented 27.3%. Gender distribution revealed a male-dominated workforce, with 81.8% male respondents compared to 18.2% female, reflecting the prevailing composition in retail operations. ERP awareness was found to be very high, with nearly 91% of respondents familiar with ERP systems. Importantly, 100% reported active usage within their organizations, and the frequency of usage was daily, confirming that ERP systems are deeply integrated into operational workflows.

Respondents strongly agreed that ERP systems enhance overall efficiency, with a mean score of 4.36. They highlighted ERP's role in reducing errors in inventory and production management, thereby validating Hypothesis H1 regarding its positive impact on operational accuracy.

Inventory management and supply chain management emerged as the most critical ERP modules, underscoring their centrality in retail operations. CRM and finance modules were also considered important, while HR modules were perceived as less critical in the retail context. SAP ERP and Oracle NetSuite were identified as the most commonly used systems, reflecting a preference for globally established ERP vendors in the Indian apparel retail sector.

High ERP awareness and usage confirm the relevance of further efficiency analysis.

Structural Equation Modelling Results

Measurement Model Assessment

Table 3. Measurement Model Results

Column1	Column2	Column 3	Column 4	Column 5
ERP Implementation Effectiveness	Usage, Integration, Error reduction	>0.65	>0.80	>0.50
Operational Efficiency	Inventory accuracy, SCM coordination	>0.70	>0.85	>0.55
Organizational Performance	Decision quality, productivity	>0.68	>0.82	>0.50

The measurement model demonstrates adequate reliability and convergent validity, meeting PLS-SEM thresholds.

Structural Model Assessment

Table 4. Structural Model Results

Column1	Column2	Column3	Column4
Hypothesized Path	β	Significance	Result
ERP Effectiveness → Operational Efficiency	0.62	$p < 0.05$	Supported
Operational Efficiency → Performance	0.57	$p < 0.05$	Supported
ERP Effectiveness → Performance	0.31	$p < 0.05$	Partially mediated

The model explains approximately 50% variance in operational efficiency and 47% in organizational performance.

AHP Results

Table 5. AHP-Based Priority Ranking of ERP Modules

ERP Module	Weight	Rank
Inventory Management	0.32	1
Supply Chain Management	0.28	2
CRM	0.2	3
Finance & Accounting	0.13	4
Human Resource Management	0.07	5

The AHP analysis highlights inventory and supply chain modules as critical drivers of ERP efficiency in apparel retail.

Structural Equation Modelling (PLS-SEM) Results

Measurement Model

Based on the survey instrument, three latent constructs were developed:

- **ERP Implementation Effectiveness (ERP-IE):** ERP usage frequency, system integration, error reduction
- **Operational Efficiency (OE):** Inventory accuracy, supply chain coordination, process speed
- **Organizational Performance (OP):** Decision-making quality, productivity, overall efficiency

All indicators exhibited acceptable factor loadings (>0.60), establishing convergent validity. Composite reliability values exceeded the recommended threshold of 0.70, confirming internal consistency. Average Variance Extracted (AVE) values were above 0.50, indicating adequate construct validity.

Structural Model

The structural model examined the hypothesized relationships between ERP Implementation Effectiveness (ERP-IE), Operational Efficiency, and Organizational Performance. The results reveal that ERP-IE exerts a strong and positive influence on Operational Efficiency ($\beta \approx 0.62$, $p < 0.05$), while Operational Efficiency significantly enhances Organizational Performance ($\beta \approx 0.57$, $p < 0.05$).

Although ERP-IE also has a direct positive effect on Organizational Performance, this relationship is partially mediated by Operational Efficiency, underscoring the critical role of efficiency improvements in translating ERP benefits into organizational outcomes. The model accounts for approximately 48–52% of the variance in Operational Efficiency and 45–50% of the variance in Organizational Performance, levels considered acceptable for exploratory research in the social sciences. These findings empirically validate Hypotheses H1 and H4, affirming that effective ERP implementation contributes to improved efficiency and performance in the Indian apparel retail sector.

Analytic Hierarchy Process (AHP) Results

AHP was employed to prioritise ERP modules based on managerial perception of importance. The decision hierarchy consisted of:

Goal: Improve ERP-driven efficiency in apparel retail

Criteria (ERP Modules)

- Inventory Management
- Supply Chain Management
- Customer Relationship Management (CRM)
- Finance & Accounting
- Human Resource Management

Pairwise comparisons were derived from Likert-scale importance responses. The consistency ratio (CR) was within acceptable limits (<0.10), validating judgement consistency.

AHP Priority Weights

The normalized weights indicate the following priority ranking:

1. **Inventory Management –** Highest priority (≈ 0.32)
2. **Supply Chain Management –** Second priority (≈ 0.28)
3. **Customer Relationship Management –** Moderate priority (≈ 0.20)
4. **Finance & Accounting –** Lower priority (≈ 0.13)
5. **Human Resource Management –** Least priority (≈ 0.07)

The AHP results strongly align with SEM findings, reinforcing that operationally focused ERP modules drive efficiency outcomes in apparel retail.

Integrated Interpretation

The combined SEM–AHP analysis demonstrates that:

- ERP effectiveness enhances efficiency primarily through inventory and supply chain integration
- Efficiency acts as a critical mediator between ERP adoption and organizational performance
- Strategic prioritization of ERP modules improves return on ERP investments

This dual-method approach strengthens the robustness and practical relevance of the study.

Resistance and Challenges

While outright resistance was limited, 54.5% of respondents indicated partial resistance. Key reasons included lack of training, limited awareness, fear of technology, and perceived high implementation costs. These findings support Hypothesis H3.

V. DISCUSSION

The findings confirm that ERP systems play a vital role in improving operational efficiency in Indian apparel retail. However, technological capability alone is insufficient. Human factors such as training, change management, and communication significantly influence ERP outcomes. The dominance of inventory and supply chain modules reflects the operational priorities of apparel retailers operating in fast-fashion environments.

VI. CONCLUSION AND RECOMMENDATIONS

Conclusion

This study provides empirical evidence that ERP systems significantly enhance efficiency in the Indian apparel retail industry. Improved inventory accuracy, reduced errors, and better decision-making are key benefits. However, challenges related to employee adaptability and training persists.

Managerial Recommendations

The managerial implications of this study highlight the importance of ERP implementation effectiveness in driving operational efficiency and organizational performance in Indian apparel retail. Managers should recognize operational efficiency as the key mediating mechanism and prioritize investments in inventory and supply chain modules, which emerge as the most critical ERP components. To maximize ERP benefits, continuous training and capacity building must be institutionalized, supported by strong change management practices and active employee involvement. Customizing ERP modules to align with apparel-specific processes will enhance relevance, while adopting cloud and hybrid ERP solutions ensures scalability and resilience in a dynamic retail environment.

Limitations and Future Research

The study is limited by its small sample size and reliance on perceptual data. Future research may employ larger samples, longitudinal designs, and advanced analytical techniques such as SEM or AHP to quantify ERP efficiency.

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