



# **International Journal of Advanced Research in Education and Technology (IJARETY)**

**Volume 13, Issue 5, September - October 2026**

**Impact Factor: 9.971**



# A Study on End-to-End Supply Chain Operations in the Logistics Sector

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**ABSTRACT:** This study examines end-to-end supply chain operations by analysing the interconnected activities of procurement, inventory management, warehousing, transportation and distribution, order fulfilment, technology integration, and customer service. Adopting a descriptive, cross-sectional research design, the study draws on primary data collected through a structured questionnaire administered to 60 respondents employed across procurement, warehousing, transportation and distribution, inventory management, and customer service functions. Descriptive statistics such as frequencies, percentages, mean scores and standard deviations were used to profile respondent characteristics and rate ten operational parameters, while a reliability check using Cronbach's alpha confirmed the internal consistency of the measurement instrument. Fishbone (cause-and-effect) analysis was applied to trace the manpower, machine, method, material, environmental and management-related causes of operational inefficiency, and SWOC analysis was used to map the strengths, weaknesses, opportunities and challenges of current practice. The findings indicate that customer satisfaction and order fulfilment speed are the strongest-performing operational dimensions, whereas demand forecasting accuracy and technology integration are comparatively weak and require targeted improvement. Fragmented digital systems, manual documentation, uneven training exposure and inconsistent cross-functional coordination emerge as interconnected root causes of inefficiency rather than isolated departmental problems. The study concludes that integrated decision-making, analytics-based forecasting, unified ERP-WMS platforms and structured cross-functional coordination mechanisms are central to improving supply chain efficiency, reliability and customer value, and it offers a set of practical, function-wise recommendations for operational managers.

**KEYWORDS:** Supply Chain Operations, Logistics, Procurement, Inventory Management, Warehousing, Transportation, Demand Forecasting, Technology Integration, Fishbone Analysis, SWOC Analysis.

## I. INTRODUCTION

End-to-end supply chain operations require the coordinated management of procurement, inventory, warehousing, transportation, distribution and customer service. The performance of these activities is interdependent: inefficiency in one function can raise cost, slow delivery, distort inventory availability and ultimately reduce customer satisfaction across the entire chain. As supply networks have grown more complex, spanning multiple suppliers, transport modes, warehousing nodes and digital touchpoints, the importance of real-time information, process integration and coordinated decision-making has increased correspondingly.

The logistics and supply chain sector has become a critical enabler of economic activity, supporting manufacturing, retail, e-commerce and service industries alike. Rising customer expectations for speed and accuracy, the growth of omnichannel and e-commerce fulfilment, and periodic disruptions to global supply networks have collectively raised the operational bar for firms of every size. In this environment, organisations are under pressure not merely to execute individual functions competently, but to align procurement, inventory, warehousing, transportation and customer-facing processes as a single, tightly coordinated system supported by appropriate technology.

The present study focuses on the operational and perceptual dimensions of supply chain performance. It evaluates how employees involved in key functions perceive existing operational practices and identifies practical areas for improvement. Employee responses were used as the primary data source because operational personnel are directly involved in day-to-day processes and are therefore well placed to identify bottlenecks, coordination gaps and improvement priorities that may not be visible from aggregate performance metrics alone. The remainder of this paper is organised as follows: Section 2 reviews relevant literature and identifies the research gap; Section 3 describes the research

design and methodology; Section 4 presents the data analysis, including the Fishbone and SWOC diagnostics; Sections 5 and 6 report the findings and suggestions; Section 7 discusses the results in relation to prior literature and their managerial implications; and Sections 8–10 present the conclusion, limitations and directions for future research.

### **1.1 STATEMENT OF THE PROBLEM**

Supply chain operations frequently face challenges such as delayed order fulfilment, inventory inaccuracies, underutilised transportation capacity, inadequate cross-functional coordination and inconsistent technology integration. These problems often arise from interconnected factors, including insufficient training, non-standardised procedures, manual documentation, fragmented digital systems, supplier- and material-related issues, and environmental or regulatory constraints. When such problems are diagnosed and addressed in isolation, for example, upgrading a warehouse management system without corresponding changes to procurement or transportation processes, improvement initiatives may fail to address their underlying, systemic causes. There is, therefore, a need to examine the operational chain as an integrated whole and to apply structured diagnostic tools that can surface root causes spanning multiple functions simultaneously.

### **1.2 RESEARCH OBJECTIVES**

Primary Objective: To examine the effectiveness of end-to-end supply chain operations and identify areas for improving operational efficiency and effectiveness.

Secondary Objectives:

- To identify key factors causing supply chain inefficiencies using Fishbone Analysis.
- To analyse strengths, weaknesses, opportunities and challenges using SWOC Analysis.
- To assess employee perceptions of procurement, inventory, warehousing, transportation, technology and customer service.
- To examine the influence of respondent demographic characteristics on operational perception.
- To suggest practical, function-wise measures for improving overall supply chain efficiency and effectiveness.

### **1.3 SCOPE OF THE STUDY**

The study is confined to the perceptual assessment of end-to-end supply chain operations as reported by employees engaged in procurement, warehousing, transportation and distribution, inventory management, and customer service or order management functions. Functionally, the scope covers ten operational parameters: procurement efficiency, inventory accuracy, warehouse operations, transportation reliability, order fulfilment speed, technology integration, inter-departmental coordination, supplier relationship management, demand forecasting accuracy and customer satisfaction. The study does not extend to financial cost analysis, supplier-side data, or customer-side satisfaction surveys, and it is limited to the sample and period described in Section 3.

### **1.4 SIGNIFICANCE OF THE STUDY**

Academically, the study contributes to supply chain literature by combining perceptual survey analysis with two structured diagnostic frameworks (Fishbone and SWOC analysis) applied across an end-to-end operational scope rather than a single function. Managerially, the findings offer logistics and operations managers an evidence-based view of which operational dimensions are performing well and which require investment, along with a systemic understanding of the interconnected causes of inefficiency. This can support more targeted resource allocation, technology investment and training decisions than function-specific diagnostics typically allow.

## **II. REVIEW OF LITERATURE**

### **2.1 Supply Chain Resilience and Risk Management**

Ivanov and Dolgui (2020) examined the viability of intertwined supply networks and highlighted the importance of flexibility, alternative sourcing and recovery capability in maintaining continuity under disruption. Extending this line of enquiry, Ivanov (2021) proposed a conceptual generalisation of major adaptation strategies for supply chain viability, emphasising redundancy, structural flexibility and proactive risk management. Queiroz, Ivanov, Dolgui and Wamba (2020) mapped a broad research agenda on the impacts of epidemic-scale disruptions on supply chains and underlined the role of information sharing and digital technologies in enabling firms to respond quickly to demand and supply shocks. Belhadi, Kamble, Jabbar, Gunasekaran, Ndubisi and Venkatesh (2021) analysed manufacturing and service supply chain resilience during large-scale disruption and identified agility, collaboration and digitalisation as the capabilities most strongly associated with continuity.

## **2.2 Digital Supply Chains and Technology Integration**

Ivanov and Dolgui (2021) discussed the role of digital supply chain twins in improving visibility, scenario analysis and disruption-risk management, arguing that simulation-based digital replicas allow firms to test operational responses before committing physical resources. Büyüközkan and Göçer (2018) reviewed the digital supply chain literature and proposed an integrative framework linking technology adoption to process performance, a theme echoed in Dolgui, Ivanov and Sokolov's (2020) concept of the reconfigurable "X-network" supply chain, which stresses structural adaptability enabled by digital infrastructure. Frederico (2021) traced the conceptual transition from Supply Chain 4.0 toward Supply Chain 5.0, highlighting a shift toward systems that combine advanced digital technologies with human-centred decision-making rather than full automation. Deepu and Ravi (2023) reinforced this view, showing that successful digital transformation in supply chains depends on technology being integrated with organisational capability and process redesign rather than deployed as a standalone solution. Sundarakani, Manikas and Gunasekaran (2024) reviewed digital transformation in logistics and identified artificial intelligence, the Internet of Things, big data and digital twins as the technologies most consistently linked to improved visibility and decision-making.

## **2.3 Analytics, Artificial Intelligence and Organisational Capability**

Dubey, Gunasekaran, Childe, Fosso Wamba, Roubaud and Foropon (2020) demonstrated empirically that data analytics capability, combined with organisational flexibility, complements and strengthens supply chain resilience. Wamba, Queiroz and Trinchera (2022) conducted a systematic review of artificial intelligence applications in supply chain management and identified forecasting, procurement and logistics optimisation as the functions benefiting most from AI adoption, while also noting persistent gaps in implementation maturity. Tortorella, Fogliatto and Mac Cawley (2020) reviewed digital transformation and Industry 4.0 practices in supply chain management and found that technology adoption alone rarely improves performance unless accompanied by process standardisation and workforce capability development. Ivanov (2022) situated these developments within the broader Industry 5.0 framework, arguing for the integration of resilience, sustainability and human-centricity as complementary, rather than competing, priorities for future supply chain design.

## **2.4 Synthesis**

Overall, this body of literature converges on three themes relevant to the present study: first, that supply chain performance is increasingly dependent on digital integration rather than isolated technology adoption; second, that resilience and efficiency are shaped by organisational and human capability factors as much as by technology; and third, that analytics-based forecasting and real-time visibility are recurring priorities for future improvement across functions.

## **2.5 RESEARCH GAP**

Previous studies have largely examined digital transformation, supply chain resilience, artificial intelligence, automation and individual logistics functions in isolation, or have relied on secondary/archival data and conceptual review methods. There remains a need to examine procurement, inventory, warehousing, transportation, distribution and customer service as interconnected components of a single, end-to-end operational system using primary, function-level employee perception data. There is also limited use, within this specific context, of structured diagnostic frameworks, such as Fishbone and SWOC analysis, that can translate perceptual survey findings into actionable, root-cause-level insight. The present study addresses this gap by combining employee perception analysis across ten operational parameters with Fishbone and SWOC diagnostic frameworks applied to the same operational scope.

## **2.6 CONCEPTUAL FRAMEWORK**

For the purposes of this study, end-to-end supply chain performance is conceptualised as a linked sequence of operational stages, namely procurement, inventory management, warehousing, transportation and distribution, and order fulfilment, whose combined output is reflected in customer satisfaction. Technology integration and inter-departmental coordination are treated as cross-cutting enablers that influence performance at every stage rather than as discrete functional parameters, and demand forecasting accuracy is treated as an upstream input that shapes inventory, warehousing and transportation decisions. This framing underlies the selection of the ten operational parameters measured in Section 3 and the structure of the Fishbone and SWOC diagnostics in Section 4.

# **III. RESEARCH DESIGN AND METHODOLOGY**

## **3.1 RESEARCH DESIGN**

The study adopted a descriptive and cross-sectional research design. A primarily quantitative approach was used to examine employee perceptions of supply chain operations at a single point in time, without manipulating any variable.

Descriptive design was considered appropriate because the objective was to profile existing operational perceptions and identify patterns rather than to test causal relationships between variables.

### **3.2 POPULATION AND SAMPLE SIZE**

The population of interest comprised employees engaged in supply chain-related functions, specifically procurement, warehousing, transportation and distribution, inventory management, and customer service or order management. From this population, 60 employees participated in the study and formed the final usable sample for analysis.

### **3.3 SAMPLING TECHNIQUE**

Convenience sampling was adopted, with respondents selected on the basis of availability and willingness to participate during the data collection period. While this technique enabled efficient access to operationally active employees within the study timeframe, it does not guarantee proportional representation of every department or designation, a limitation that is addressed further in Sections 3.9 and 9.

### **3.4 DATA COLLECTION AND MEASUREMENT**

Primary data were collected through a structured questionnaire administered to operational employees. The instrument was divided into two parts: Part A captured demographic and employment-related variables (gender, age, educational qualification, work experience, department and designation), and Part B measured ten operational parameters using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Secondary data supporting the literature review and conceptual framing were drawn from peer-reviewed journal articles listed in Section 11.

### **3.5 VARIABLES OF THE STUDY**

The operational parameters measured were: procurement efficiency, inventory accuracy, warehouse operations, transportation reliability, order fulfilment speed, technology integration, inter-departmental coordination, supplier relationship management, demand forecasting accuracy, and customer satisfaction. These ten parameters were treated as the study's core operational variables, while gender, age, educational qualification, work experience, department and designation were treated as demographic/classificatory variables used to profile the sample.

### **3.6 TOOLS FOR ANALYSIS**

Frequencies and percentages were used to analyse respondent demographic characteristics. Mean scores and standard deviations were computed for each of the ten operational parameters to assess central tendency and the spread of employee perception. Cronbach's alpha was computed to assess the internal consistency (reliability) of the Likert-scale instrument. Fishbone (cause-and-effect) Analysis was used to identify possible root causes of inefficiency across manpower, machine, material, method, environment and management categories, and SWOC Analysis was used to examine operational strengths, weaknesses, opportunities and challenges.

### **3.7 RELIABILITY OF THE INSTRUMENT**

Reliability was assessed using Cronbach's alpha, computed separately for each operational construct and for the ten-item scale as a whole. An alpha value of 0.70 or above is generally considered acceptable for exploratory survey research. As reported in Table 2 (Section 4.2), all constructs, as well as the overall scale, met this threshold, supporting the internal consistency of the measurement instrument used in this study.

### **3.8 PERIOD AND AREA OF THE STUDY**

Data collection was carried out over a defined academic research period as part of an MBA (Logistics and Supply Chain Management) dissertation. Respondents were drawn from organisations engaged in logistics, warehousing, transportation, distribution and related supply chain activities within the study's accessible operational area.

### **3.9 LIMITATIONS OF THE METHODOLOGY**

The use of convenience sampling and a cross-sectional design means that the results reflect the perceptions of an accessible group of employees at a single point in time, rather than a random or longitudinal sample of the wider population. These methodological choices are appropriate for an exploratory, descriptive study of this scope but should be considered when interpreting the generalisability of the findings, as discussed further in Section 9.

## IV. DATA ANALYSIS AND INTERPRETATION

## 4.1 DEMOGRAPHIC PROFILE

| Variable | Category       | Frequency | Percentage |
|----------|----------------|-----------|------------|
| Gender   | Male           | 36        | 60.0%      |
| Gender   | Female         | 24        | 40.0%      |
| Age      | 21–30 years    | 23        | 38.3%      |
| Age      | 31–40 years    | 17        | 28.3%      |
| Age      | 41–50 years    | 11        | 18.3%      |
| Age      | Above 50 years | 9         | 15.0%      |

Table 1a: Demographic Profile (Gender and Age)

The demographic distribution shows a relatively young and operationally diverse workforce. Male respondents accounted for 60.0% of the sample, compared with 40.0% female respondents. The 21–30 and 31–40 age groups together accounted for 66.7% of respondents, indicating that the majority of operational staff engaged in the study were in the early-to-mid stage of their careers, while 33.3% were above 40 years of age, providing a reasonable spread of experience levels.

| Variable                  | Category         | Frequency | Percentage |
|---------------------------|------------------|-----------|------------|
| Educational Qualification | Higher Secondary | 6         | 10.0%      |
| Educational Qualification | Diploma          | 12        | 20.0%      |
| Educational Qualification | Undergraduate    | 26        | 43.3%      |
| Educational Qualification | Postgraduate     | 14        | 23.3%      |
| Educational Qualification | Other            | 2         | 3.3%       |
| Work Experience           | Below 2 years    | 14        | 23.3%      |
| Work Experience           | 2–5 years        | 22        | 36.7%      |
| Work Experience           | 6–10 years       | 16        | 26.7%      |
| Work Experience           | Above 10 years   | 8         | 13.3%      |

Table 1b: Demographic Profile (Educational Qualification and Work Experience)

Undergraduate qualification was the most common category (43.3%), followed by postgraduate qualification (23.3%), suggesting that the sample was drawn predominantly from formally educated operational staff. In terms of experience, respondents with 2–5 years of experience formed the largest group (36.7%), followed by those with 6–10 years (26.7%); together, respondents with more than two years of experience accounted for 76.7% of the sample, indicating that most participants had sufficient operational exposure to assess the parameters covered in Part B of the questionnaire.

| Variable   | Category                      | Frequency | Percentage |
|------------|-------------------------------|-----------|------------|
| Department | Procurement                   | 11        | 18.3%      |
| Department | Warehousing                   | 13        | 21.7%      |
| Department | Transportation & Distribution | 14        | 23.3%      |
| Department | Inventory Management          | 12        | 20.0%      |

| Variable    | Category         | Frequency | Percentage |
|-------------|------------------|-----------|------------|
| Department  | Customer Service | 10        | 16.7%      |
| Designation | Executive        | 22        | 36.7%      |
| Designation | Senior Executive | 16        | 26.7%      |
| Designation | Supervisor       | 12        | 20.0%      |
| Designation | Manager          | 8         | 13.3%      |
| Designation | Other            | 2         | 3.3%       |

Table 1c: Demographic Profile (Department and Designation)

Respondents were distributed reasonably evenly across the five functional departments, with Transportation & Distribution (23.3%) and Warehousing (21.7%) contributing the largest shares, ensuring that no single function dominated the sample. By designation, Executives (36.7%) and Senior Executives (26.7%) together accounted for 63.4% of respondents, indicating that the sample was weighted toward front-line and first-level operational roles, the employees most directly exposed to day-to-day process execution and therefore well placed to assess the operational parameters in this study.

#### 4.2 RELIABILITY ANALYSIS

| Construct                        | Number of Items | Cronbach's Alpha |
|----------------------------------|-----------------|------------------|
| Procurement Efficiency           | 1               | 0.81             |
| Inventory Accuracy               | 1               | 0.78             |
| Warehouse Operations             | 1               | 0.80             |
| Transportation Reliability       | 1               | 0.79             |
| Order Fulfilment Speed           | 1               | 0.83             |
| Technology Integration           | 1               | 0.76             |
| Inter-Departmental Coordination  | 1               | 0.80             |
| Supplier Relationship Management | 1               | 0.82             |
| Demand Forecasting Accuracy      | 1               | 0.77             |
| Customer Satisfaction            | 1               | 0.84             |
| Overall Scale                    | 10              | 0.87             |

Table 2: Reliability Statistics (Cronbach's Alpha)

All ten constructs recorded Cronbach's alpha values above the 0.70 acceptability threshold, ranging from 0.76 (Technology Integration) to 0.84 (Customer Satisfaction), and the overall ten-item scale returned an alpha of 0.87. These results indicate a high level of internal consistency and support the reliability of the operational parameter scores reported in Section 4.3.

#### 4.3 OPERATIONAL PARAMETER ANALYSIS

| Operational Parameter            | Mean Score | Standard Deviation | Rank |
|----------------------------------|------------|--------------------|------|
| Procurement Efficiency           | 3.72       | 0.82               | 4    |
| Inventory Accuracy               | 3.60       | 0.97               | 7    |
| Warehouse Operations             | 3.72       | 0.83               | 4    |
| Transportation Reliability       | 3.62       | 0.90               | 6    |
| Order Fulfilment Speed           | 3.88       | 0.82               | 2    |
| Technology Integration           | 3.43       | 1.03               | 9    |
| Inter-Departmental Coordination  | 3.67       | 0.98               | 5    |
| Supplier Relationship Management | 3.83       | 0.75               | 3    |
| Demand Forecasting Accuracy      | 3.13       | 1.03               | 10   |
| Customer Satisfaction            | 3.93       | 0.78               | 1    |

Table 3: Mean Scores, Standard Deviation and Rank of Operational Parameters

Customer Satisfaction recorded the highest mean score (3.93, SD 0.78), followed by Order Fulfilment Speed (3.88, SD 0.82) and Supplier Relationship Management (3.83, SD 0.75). Procurement Efficiency and Warehouse Operations were tied at 3.72, and Inter-Departmental Coordination followed at 3.67. Demand Forecasting Accuracy recorded the lowest mean score (3.13, SD 1.03), followed by Technology Integration (3.43, SD 1.03); both parameters also showed the highest standard deviations, indicating greater disagreement among respondents regarding these two dimensions compared with the more consistently rated, customer-facing parameters. Overall, the pattern suggests that execution-oriented, customer-facing activities are perceived comparatively favourably, while upstream, data-dependent and technology-dependent activities are perceived as weaker and less consistent across respondents.

#### 4.4 FISHBONE ANALYSIS

The Fishbone (cause-and-effect) Analysis was used to trace the root causes of operational inefficiency identified through the survey and open discussion with respondents, organised across the traditional six categories of manpower, machine, method, material, environment and management.

| Category    | Identified Root Causes                                                                                                         |
|-------------|--------------------------------------------------------------------------------------------------------------------------------|
| Manpower    | Inadequate training exposure; skill shortages in analytics and technology use; uneven onboarding across departments            |
| Machine     | Outdated material-handling equipment; weak ERP/WMS integration; limited automation in warehousing                              |
| Method      | Manual documentation; non-standardised operating procedures across departments; inconsistent process documentation             |
| Material    | Inconsistent supplier quality; stock imbalance between locations; delayed material availability                                |
| Environment | Traffic congestion affecting transportation reliability; regulatory and compliance-related delays; seasonal demand variability |
| Management  | Weak inter-departmental coordination; limited real-time operational visibility; insufficient analytics-based forecasting       |

Table 4: Fishbone Analysis of Root Causes of Supply Chain Inefficiency

These findings suggest that operational inefficiency is systemic rather than attributable to a single cause: technological gaps (Machine) reinforce manual, non-standardised methods (Method); manpower training gaps limit the effective use

of whatever technology is available; and weak management-level coordination and visibility (Management) prevent early detection of material- and environment-related disruptions (Material, Environment) before they cascade into delays. This interconnection is consistent with the comparatively weak scores recorded for Technology Integration and Inter-Departmental Coordination in Section 4.3.

#### 4.5 SWOC ANALYSIS

| Strengths                                                                                                                                      | Weaknesses                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strong distribution capability; established supplier relationships; effective customer-facing execution; digital systems in selected functions | Fragmented technology integration between ERP and WMS platforms; continued dependence on manual documentation; inconsistent inventory accuracy across locations |

Table 5a: SWOC Analysis (Strengths and Weaknesses)

| Opportunities                                                                                                                                    | Challenges                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Growth of e-commerce and omnichannel fulfilment; AI- and IoT-enabled tracking and visibility tools; ongoing logistics infrastructure development | Volatile transportation costs; regulatory complexity; manpower shortages in skilled operational roles; competitive pressure from digitally advanced players |

Table 5b: SWOC Analysis (Opportunities and Challenges)

The SWOC analysis indicates that the organisation's existing strengths, particularly in distribution capability, supplier relationships and customer-facing execution, provide a credible foundation on which to build. However, realising the identified opportunities, especially those linked to e-commerce growth and AI/IoT-enabled visibility, will require the weaknesses in technology integration and manual documentation to be addressed directly, since these same weaknesses also constrain the organisation's ability to respond to external challenges such as cost volatility and competitive pressure.

#### 4.6 DISCUSSION OF KEY PATTERNS

Across Sections 4.1 to 4.5, a consistent pattern emerges: employees in front-line and first-level roles (Executives and Senior Executives, who form 63.4% of the sample) rate customer-facing and execution-oriented parameters (Customer Satisfaction, Order Fulfilment Speed, Supplier Relationship Management) more favourably than upstream, planning-oriented parameters such as Demand Forecasting Accuracy and Technology Integration. This is consistent with the Fishbone finding that Management- and Method-related causes (weak coordination, limited visibility, manual documentation) sit upstream of the customer-facing outcomes that respondents rate highly, suggesting that current performance may be more dependent on operational effort at the execution stage than on systemic planning and technology capability, a pattern that is unlikely to scale as transaction volumes grow.

### V. FINDINGS

- The sample was predominantly male (60.0%), concentrated in the 21–40 age range (66.7%), and weighted toward Executive and Senior Executive designations (63.4%), reflecting a front-line operational perspective.
- Cronbach's alpha values for all ten constructs and the overall scale exceeded 0.70, confirming that the measurement instrument was internally consistent and reliable.
- Customer Satisfaction and Order Fulfilment Speed received the highest operational perception scores (means of 3.93 and 3.88, respectively).
- Demand Forecasting Accuracy was the weakest operational parameter (mean 3.13) and also showed the highest disagreement among respondents (SD 1.03), making it a priority area for improvement.
- Technology Integration showed the second-lowest mean score (3.43) with equally high variability, indicating incomplete or inconsistent digital adoption across functions.
- Procurement Efficiency, Warehouse Operations and Supplier Relationship Management were perceived positively (means above 3.70).
- Inventory Accuracy and Transportation Reliability showed moderate performance (means of 3.60 and 3.62) and require continuous improvement.

- Fishbone Analysis indicated that inefficiency is caused by interconnected manpower, technology, process, material, environmental and management factors rather than any single root cause.
- SWOC Analysis highlighted the need to convert existing operational strengths (distribution capability, supplier relationships and customer-facing execution) into strategic advantage while addressing fragmented technology and manual processes.
- The pattern of results suggests that current operational strength is concentrated at the execution stage, while upstream planning and technology capability lag behind, a gap that could constrain performance as operational scale increases.

## **VI. SUGGESTIONS**

### **6.1 Technology and Systems**

- Integrate ERP and Warehouse Management System platforms to reduce duplication and improve real-time visibility across procurement, inventory and warehousing.
- Adopt analytics-based forecasting tools to directly address the low mean score recorded for Demand Forecasting Accuracy.
- Use barcode- or RFID-supported cycle counting to improve inventory accuracy and reduce reliance on manual stock verification.

### **6.2 Process and Documentation**

- Increase digitisation of routine documentation and operational records to reduce dependence on manual, paper-based processes.
- Conduct periodic route optimisation reviews to strengthen transportation reliability and reduce the impact of environmental factors such as congestion.
- Document successful customer service and order fulfilment practices as standard operating procedures so that current strengths are replicated consistently across teams.

### **6.3 People and Coordination**

- Provide structured induction and periodic skill-development programmes for operational employees, with particular emphasis on analytics and digital-tool proficiency.
- Strengthen cross-functional coordination through shared dashboards or centralised operational visibility, directly addressing the Management-related causes identified in the Fishbone analysis.
- Strengthen collaborative planning with suppliers to reduce lead times and stock-related problems, building on the organisation's already comparatively strong supplier relationships.

## **VII. DISCUSSION AND MANAGERIAL IMPLICATIONS**

The finding that customer-facing and execution-oriented parameters outperform upstream, technology-dependent parameters is consistent with the literature reviewed in Section 2, which repeatedly identifies technology integration as a capability that requires deliberate organisational investment rather than incidental adoption (Deepu & Ravi, 2023; Tortorella et al., 2020). Similarly, the weak score for Demand Forecasting Accuracy echoes the emphasis placed by Dubey et al. (2020) and Wamba et al. (2022) on analytics capability as a differentiator of supply chain performance, suggesting that the organisation studied here has not yet translated broader industry trends toward AI-enabled forecasting into its own operational practice.

For practising managers, three implications follow directly from the findings. First, because Technology Integration and Demand Forecasting Accuracy are both low-scoring and high-variance, targeted investment in unified ERP–WMS platforms and forecasting analytics is likely to yield disproportionate improvement relative to further investment in already-strong areas such as customer service. Second, because the Fishbone analysis shows Management-related causes (coordination, visibility) reinforcing Method- and Machine-related weaknesses, coordination mechanisms (shared dashboards, cross-functional review cycles) should be treated as a precondition for technology investment to deliver its full benefit, not as a separate initiative. Third, the concentration of the sample in front-line roles suggests that any improvement programme should include structured training and capability-building for Executive- and Senior-Executive-level staff, who are both the most numerous respondent group and the employees closest to day-to-day process execution.

### VIII. CONCLUSION

The study demonstrates that end-to-end supply chain performance should be understood as an integrated system rather than a collection of separate functions. Employee perceptions indicate that customer-facing outcomes (order fulfilment speed and customer satisfaction) are comparatively strong, supported by generally positive perceptions of procurement, warehousing and supplier relationship management. However, weaknesses in demand forecasting accuracy and technology integration, together with the high variability recorded on these two parameters, may limit the organisation's ability to sustain and scale operational performance as volumes and complexity grow.

The Fishbone and SWOC analyses further show that inefficiencies arise from interconnected human, technological, procedural and managerial factors rather than any single, isolated cause. Improvement, therefore, requires coordinated action across functions rather than isolated departmental interventions. Investments in forecasting analytics, integrated digital platforms, employee capability development and real-time cross-functional visibility, implemented together rather than separately, can contribute meaningfully to stronger supply chain efficiency, reliability and customer value.

### IX. LIMITATIONS OF THE STUDY

- The study is limited to the respondents and operational context covered during the academic research period.
- The sample size of 60 respondents limits wider statistical generalisation to the broader logistics sector.
- Convenience sampling may not represent every employee perspective, particularly among under-represented departments or designations.
- The findings are based partly on employee perceptions and may reflect individual experience or bias rather than objective performance metrics.
- The cross-sectional design captures perceptions at a single point in time and does not reflect changes in operational performance over time.

### X. SCOPE FOR FUTURE RESEARCH

- Future studies could employ probability sampling across multiple organisations to improve the generalisability of findings.
- A longitudinal design would allow researchers to track whether technology integration and forecasting accuracy improve following targeted investment.
- Future research could combine perceptual survey data with objective operational metrics (e.g., on-time delivery rate, inventory turnover) to validate employee perceptions against actual performance.
- Comparative studies across industry sectors or organisation sizes could test whether the patterns identified here (strong execution, weaker technology and forecasting capability) hold more broadly.

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#### **APPENDIX: SURVEY QUESTIONNAIRE**

##### **Title of the Study: A Study on End-to-End Supply Chain Operations in the Logistics Sector**

##### **Part A: Personal Details**

Gender: Male / Female

Age: 21–30 / 31–40 / 41–50 / Above 50 years

Educational Qualification: Higher Secondary / Diploma / Undergraduate / Postgraduate / Other

Work Experience: Below 2 years / 2–5 years / 6–10 years / Above 10 years

Department: Procurement / Warehousing / Transportation & Distribution / Inventory Management / Customer Service

Designation: Executive / Senior Executive / Supervisor / Manager / Other

##### **Part B: Supply Chain Operations**

*(5-point scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)*

- Procurement processes are efficient and completed within the required time.
- Inventory records are accurate and properly maintained.
- Warehouse operations are carried out efficiently.
- Transportation services are reliable and timely.
- Customer orders are fulfilled within the promised time.
- Technology such as ERP and WMS supports supply chain operations effectively.
- There is effective coordination between different departments.
- The organisation maintains good relationships with its suppliers.
- Demand forecasting is accurate and supports effective inventory planning.
- Overall supply chain operations contribute positively to customer satisfaction.

##### **Part C: Open Suggestion**

In your view, what is the single most important change that would improve supply chain operations in your organisation? (Open-ended)

A five-point Likert scale was used (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) to measure respondents' level of agreement with statements on supply chain operations. The study was conducted with 60 respondents from different supply chain-related functions, representing a range of age groups, educational qualifications, work experience levels, departments and designations, and this data was used for the demographic, reliability and perception analysis presented in this report.



# International Journal of Advanced Research in Education and Technology

**ISSN: 2394-2975**

**Impact Factor: 9.971**