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Operations Management in Logistics and Supply Chain: Issues and Directions in the South African Manufacturing Industry

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Abstract

Efficient operations management within logistics and supply chains is vital for strengthening the performance and competitiveness of South Africa's manufacturing industry. However, the sector faces persistent challenges, including inadequate infrastructure, rising transportation costs, regulatory inconsistencies, and limited technological integration, all of which undermine operational efficiency and responsiveness. This study adopted a quantitative research design, employing standardised questionnaires administered to logistics and supply chain professionals within a South African manufacturing firm. Statistical analysis revealed a significant positive relationship between integrated logistics practices and supply chain efficiency, underscoring the critical importance of coordination and effective information flow. Based on these findings, strategic recommendations include investing in digital logistics platforms, developing staff capabilities through targeted training, and fostering stakeholder collaboration. The study contributes data-driven insights into logistics and supply chain dynamics in emerging economies and offers practical strategies to improve operational efficiency, competitiveness, and sustainability in South Africa's manufacturing sector..

Keywords
Operations Management, Logistics Management, Supply Chain Management, Manufacturing Industry, South Africa

1. Introduction
The effective management of logistics and supply chain operations is fundamental to the growth and global competitiveness of South Africa's manufacturing sector (Mabotja, 2024). While the country strives to strengthen its economic foundation, it continues to face significant operational challenges, including inadequate infrastructure,

volatile supply chains, weak demand forecasting, rising transportation costs, and limited adoption of digital technologies. These inefficiencies delay production, increase operational expenses, and undermine the reliability of transportation networks (Ndone, 2023). This research is therefore motivated by the need to investigate these challenges within the South African context, identify limitations in current practices, and propose strategic approaches to enhance operational efficiency and resilience. In doing so, the study aims to contribute to the development of sustainable supply chain systems that support industrial advancement and broader economic growth.

1.1 Problem Statement

The South African manufacturing sector faces persistent inefficiencies in logistics and supply chain operations, driven by inadequate infrastructure, limited technological integration, and fragile logistical networks. These challenges escalate operating costs, cause recurrent delays, and diminish global competitiveness. The absence of cohesive and adaptive supply chain strategies further constrains the sector's ability to respond to shifting market demands. There is, therefore, an urgent need for context-specific solutions to address these structural limitations and improve overall industrial performance.

1.2 Aim of the study

This study seeks to investigate the fundamental challenges affecting logistics and supply chain operations in South Africa's manufacturing sector and to identify the most effective strategies for enhancing efficiency and productivity.

1.3 Objectives

To better complete the study, the following objectives were identified; (1) To investigate the relationships between logistics and supply chain management within the manufacturing industry; (2) To identify the key challenges that hinder the effectiveness of logistics and supply chain operations. Finally, (3) the study intends to provide strategic recommendations for strengthening operations management practices in logistics and supply chain functions, with the goal of improving efficiency, responsiveness, and overall competitiveness in the sector.

1.4 Scope and limitations of the study

This study is confined to the manufacturing industry in South Africa, with a specific focus on operations management within logistics and supply chain systems in one selected company. It examines existing challenges, inefficiencies, and strategic barriers that hinder productivity and innovation. Core areas of operations management considered include inventory tracking, capacity planning, delivery, procurement, and warehouse management, with attention given to how systemic issues such as infrastructural deficiencies, inconsistent supply networks, technological shortcomings, and regulatory constraints affect operational efficiency and supply chain flexibility.

The scope deliberately excludes non-manufacturing sectors such as agriculture, mining, and services to ensure a concentrated analysis of manufacturing-specific dynamics. However, the study is limited by its reliance on data from a single company and selected respondents, which restricts the generalisability of findings to the broader South African manufacturing sector or international contexts. These limitations notwithstanding, the study provides context-specific insights and practical recommendations relevant to improving logistics and supply chain practices in South African manufacturing.

1.4 Value of the study

This study contributes to both academic scholarship and industrial practice by offering data-driven insights into the operational challenges facing logistics and supply chain management in South Africa's manufacturing sector. It extends the literature on supply chain management in emerging economies, where empirical research remains limited, and highlights the contextual factors such as infrastructure, regulatory frameworks, and technological adoption that shape operational performance. For practitioners, the findings provide actionable strategies for enhancing efficiency, reducing costs, and improving responsiveness to market demands. By aligning logistics and supply chain practices with sustainable and competitive objectives, the study supports policymakers, managers, and industry stakeholders in strengthening the resilience and global competitiveness of South African manufacturing.

2. Brief literature review

2.1 Logistics

Logistics is the delivery of goods between supply and demand to obtain specific needs, such as those of clients or businesses (Thuc,2019). Logistics assets can include tangible items like nutrition, machinery, animals, factories, and

liquors, as well as intangible items like period, information, droplets, and gas (Tien,2019). The role of information flow, industrial equipment, mass production, packaging, assets, transporting, inventory control, and, in some cases, protection is a standard of ability to identify logistics. Using special hardware, logistics complexity can be planned, analysed, displayed, and enhanced (Rout and Behera,2021). The willingness to use as few materials as necessary is a proper motivation in trade in goods logistics. (Tao et al.,2016) The Inventory Control Authority defines logistics "the stages of designing, introducing, and managing the productive, effective transportation and storage of goods, services, and information related from raw material to the final of consumption for the purpose of conforming to customer requirements," that also involves the arriving, data storage, core, and outside mobility, as well as resource report for ethical reasons.

2.2 Supply chain management

The supply chain is the circulation of items & services, including all processes that transfer raw materials into finished products (Dubey,2020). It is essential to continuously simplify an industry responsible for the repair to gain customer value and an industry strategic advantage (Singh,2020). Suppliers' contributions to implement supply chain operations that are as successful and price as possible are referred to as supply chain management (SCM) (Mishra and Singh,2020). Producing in the area of information processes required to handle these activities involves all components of the supply chains. SCM attempts to meet or join a package's production, shipment, and distribution. By tracking inventory, organisations can reduce costs and provide rapid customer service (Tien,2016). This is accomplished by demanding that specialized inventory levels, manufacturing and reliability, data transfer, revenue, and organizational provider stocks be given special attention (Anh and Thuc,2019).

The shipping costs of the extension have been lowered (Dulebenets,2018). More research is being done on accurate charge scheduling for trains in intermodal transportation warehouses (Gaustaroba et al.,2016). Load optimization aims to choose vehicle specifications and arrange circulation divisions to train trucks to enhance station usage while minimizing setting and travel costs in the terminal (Siri et al.,2023). Embrace a new hybrid model that merges OR strategies with AI discovery ways to accomplish high-quality services for various intermodal transportation situations by embracing the attributes of both technologies (Rentschler, 2025). One of Spain's top enterprises that uses multimodal transport has attributed the answer to a real challenge (Pencheva et al.,2022).

Sourcing is the preliminary stage in the supply chain (Ivanov,2021). A lot of work has been done on sourcing in recent years. This helps businesses expand their capacity by improving manufacturing procedures (Blanchard,2021). OEMs outsource greater design and analysis work to their suppliers, which demands complex functions and interesting products. It offers the chance for a supplier to develop skills and experience through lessons, reducing expenses (Shen et al.,2016). The variation in component values influences contract discussions. Using resale as part of a sourcing strategy is a fascinating topic. According to (Goggins, 2018), an analysis of a purchasing issue by a single purchaser and many possible distributors who obtain personally identifiable details concerning their operating expenses may be one of the first in this reference. Before encouraging distributors to make an offer on this contract, an excellent sourcing cost is assumed for the customer who clearly explains a payout for each possible motivation's volume (Moretti,2018). English bidders, Dutch tenders, first-priced discounts, and Vickery estate sales are some formats used for commercial transactions (Dulebenets, 2018). Examine a supply chain in which a supplier type sells items off his supplies or ability as a pack, continue to pose, and complain about a multiple supply chain with a single vendor and two distributors.

2.3 Future directions of logistics and supply chain management

The logistical challenge of individuals' livelihoods has emerged as a source of contention. Traditional research in this domain has predominantly concentrated on computer components, but with restricted effectiveness (De Corato, 2020). Current study subjects encompass urban logistics, emergency logistics, and agricultural production supply networks. Industrial and technological progress is steering innovative directions in logistics and supply chain management (Ivanov, 2021). An illustrative application is the advancement of information and communication technology, which has stimulated study on e-business and associated distribution system selection (Rentschler, 2025). Technologies like RFID, cloud computing, and big data offer substantial prospects for future research (Goggins, 2018). Environmental issues continue to be a significant focus of study (Singh, 2020). Population growth, economic development, resource depletion, environmental deterioration, and rising emissions received considerable attention (De Corato, 2020). The global community has pledged to attain sustainable economic and educational development through resource-efficient methods and sustainable living. Numerous regions are transforming industrial and technical competitiveness by investing in sustainable logistics and supply networks, formulating and executing strategic

initiatives, and improving green job prospects (Blanchard,2021). Future research will expand beyond remanufacturing, reverse logistics, and closed-loop distribution networks (Dubey, 2020). Low-carbon logistics is expected to emerge as a primary area of research interest.

3. Methodology

3.1 Research Design

This study adopted a quantitative research methodology to analyse logistics and supply chain dynamics within the South African manufacturing sector. The choice of a quantitative approach was informed by the large participant base and the need for statistical analysis to identify patterns, correlations, and trends. A case study design focusing on a single manufacturing company was employed to enable an in-depth examination of operational practices. While this approach provides rich, context-specific insights, it also limits the generalisability of findings to the wider industry.

3.2 Population and Sample

The study employed purposive sampling to ensure the inclusion of participants with direct knowledge of logistics and supply chain operations. A total of 100 respondents were selected from an overall population of approximately 300 employees within the chosen manufacturing company. The sample comprised graduate trainees, logistics professionals, supply chain specialists, managers, and other manufacturing personnel. This approach ensured representation across different functional levels, thereby capturing diverse perspectives on the challenges and practices influencing operational efficiency. While purposive sampling strengthens the relevance of responses, it also introduces limitations regarding the generalisability of findings beyond the specific organisational context..

3.3 Data Collection

Data for this study were obtained through a structured questionnaire administered to South African professionals in logistics, supply chain, and operations management within the manufacturing industry. The instrument consisted of closed-ended and Likert-scale items designed to generate quantitative data across key operational areas, including inventory management, transit challenges, capacity planning, lead times, supplier coordination, and technology adoption. Purposive sampling was employed to ensure participation by individuals with relevant expertise and professional experience. Data collection was conducted electronically over a six-week period, maximising both accessibility and geographical reach. To safeguard ethical standards, all responses were anonymised to ensure participant confidentiality.

3.4 Data analysis

The data collected were analysed using IBM SPSS Statistics (version 29). Descriptive statistics, including means, standard deviations, and frequency distributions, were computed to summarise participant responses and identify general trends. In addition, inferential statistical techniques were applied to examine the relationships between variables and to assess the impact of logistics and supply chain challenges on operational performance within the manufacturing sector. This combination of descriptive and inferential analysis ensured both a comprehensive overview and deeper insights into the underlying dynamics of the data..

3.5 Reliability

The reliability of the research instrument was assessed using Cronbach's alpha, a widely recognised and robust statistical measure for evaluating internal consistency. This coefficient determines the extent to which items within a scale or questionnaire are correlated, thereby indicating their ability to measure the same underlying construct. Higher values of Cronbach's alpha reflect stronger internal consistency and, consequently, greater reliability of the instrument..

4. Results and Discussion

4.1 Demographics

a. Parctipants qualification

The data in Figure 1 shows that most participants hold a degree (32%) or an honours qualification (28%), followed by diplomas (18%) and matric-level education (15%), with 7% classified as "other." This distribution indicates that the majority of respondents possess tertiary-level qualifications, suggesting a strong academic foundation and relevant expertise. For the purposes of this study, such qualifications enhance the credibility of the findings, as participants are likely to provide informed perspectives on logistics and supply chain challenges in the manufacturing sector.

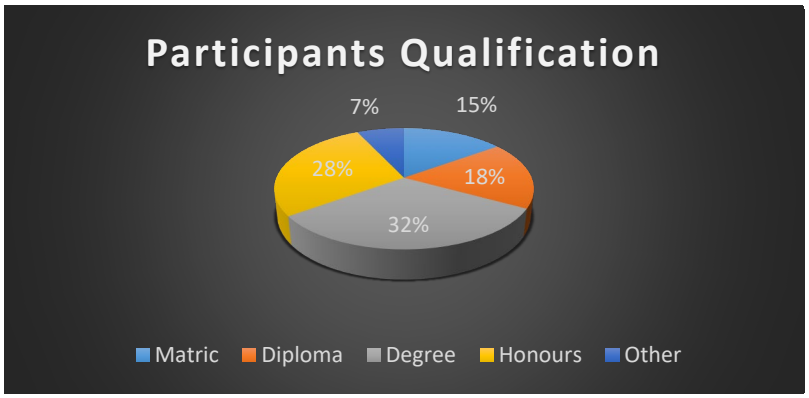

Figure 1. Participants Qualification

b. Parctipants position

The results in Figure 2 indicates that supply chain consultants (32%) and managers (27%) form the largest share of participants, followed by forklift drivers (13%), graduate programme members (10%), team leaders (10%), and supervisors (8%). This distribution reflects a strong representation from both strategic and operational roles within the supply chain. For the study, this balance is valuable as it captures insights from professionals engaged in decision-making and coordination, as well as those directly involved in day-to-day logistics activities. Such diversity strengthens the reliability of the findings by integrating perspectives across multiple organisational levels..

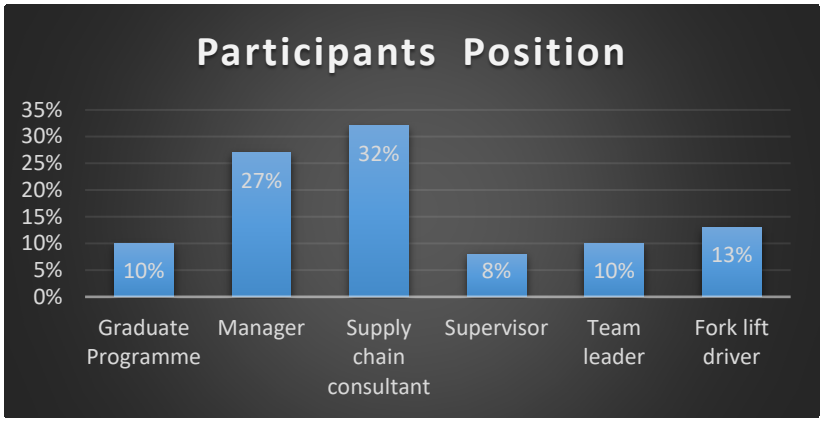

Figure 2. Participants Position

4.2 Descriptive analysis

a. Operations Management Practice

Table 1 indicates that the most highly rated operations management practice is coordinating all aspects of the supply chain including sourcing, procurement, production, and distribution with a mean score of 3.89 (SD = 1.024). This underscores the central role of integrated supply chain coordination in enhancing operational efficiency. Equipment maintenance to prevent unplanned downtime (mean = 3.80, SD = 1.025) and determining production capacity to meet changing demand (mean = 3.78, SD = 1.069) were also ranked highly, reflecting the importance of reliability and adaptability in sustaining productivity. Data-driven approaches to defect reduction and process improvement (mean = 3.76, SD = 0.996), as well as managing raw materials and finished goods (mean = 3.75, SD = 1.175), further emphasise the need for structured control and informed decision-making. Practices with lower mean scores, such as eliminating waste to improve efficiency (mean = 3.56, SD = 0.978) and continuous quality improvement with employee involvement (mean = 3.52, SD = 1.000), still demonstrate moderate agreement, suggesting recognition of their value though perhaps less consistently prioritised. The findings suggest that South African manufacturing firms prioritise supply chain integration and equipment reliability, while lean and quality improvement initiatives, though important, may not yet be fully embedded in practice.

Table 1. Operations Management Practices

Rank	Operations Management Practices	Mean	Std. Deviation
1	Coordinates all aspects of the supply chain: sourcing, procurement, production, and distribution	3.89	1.024
2	Ensures equipment is maintained to avoid unplanned downtime	3.80	1.025
3	Determines the production capacity needed to meet changing demand for products	3.78	1.069
4	A data-driven methodology aimed at reducing defects and improving process performance	3.76	.996
5	Controls the ordering, storage, and use of raw materials and finished goods	3.75	1.175
6	Focuses on eliminating waste and improving efficiency throughout the production process.	3.56	.978
7	Involve continuous quality improvement, employee involvement, and process control	3.52	1.000

b. Logistics Management Practices

The findings in Table 2 reveals that the highest-rated logistics practices are minimising inventory holding by receiving goods only when required for production (mean = 3.97, SD = 0.958) and optimising transport modes (road, rail, air, sea) for cost-effectiveness and timely delivery (mean = 3.97, SD = 0.969). These results highlight the emphasis placed on just-in-time (JIT) principles and transport optimisation to reduce costs and enhance delivery reliability. Efficient storage, retrieval, and dispatch of goods (mean = 3.96, SD = 0.984), along with the movement of raw materials into facilities and outbound finished goods (mean = 3.94, SD = 0.941), further reinforce the significance of operational flow in ensuring timely and effective production cycles. Real-time inventory tracking (mean = 3.94, SD = 0.930) and managing return flows such as repairs, recycling, and rework (mean = 3.94, SD = 0.941) also demonstrate strong recognition of the value of visibility and circular supply chain practices. The relatively lower score for using performance indicators such as delivery lead time, order accuracy, and transportation costs (mean = 3.86, SD = 1.005) suggests that, while key performance metrics are acknowledged, they may not yet be as rigorously applied as physical flow optimisation strategies. The results indicate that South African manufacturing firms prioritise lean inventory practices, transportation efficiency, and process flow, while performance measurement and KPI-driven logistics, though important, appear less consistently integrated. This aligns with the broader study emphasis on the need for data-driven, technology-enabled improvements to enhance competitiveness and resilience in logistics management**.**

Table 2. Logistics Management Practices

Ranking	Logistics Management Practices	Mean	Standard deviation
1	Minimizes inventory holding by receiving goods only when needed in the production process.	3.97	.958
2	Selects and optimizes modes of transport (road, rail, air, sea) for cost-effective and timely delivery	3.97	.969
3	Involves efficient storage, retrieval, and dispatch of goods	3.96	.984
4	Manages the efficient movement of raw materials into the facility (inbound) and finished goods to customers (outbound).	3.94	.941
5	Real-time tracking of inventory levels across the supply chain	3.94	.930
6	Manages the return flow of products for repairs, recycling, rework, or disposal.	3.94	.941
7	Uses KPIs like delivery lead time, order accuracy, transportation cost per unit, and on-time delivery rates	3.86	1.005

c. Supply Chain Management Practices

Table 3 indicates that the most valued practice is the use of outcomes for continuous process improvement and benchmarking (mean = 3.86, SD = 1.073), reflecting the sector's emphasis on learning and aligning with industry standards to enhance competitiveness. Balancing inventory to minimise holding costs while maintaining product availability ranks second (mean = 3.78, SD = 1.031), highlighting the importance of cost efficiency alongside

reliability. Practices such as identifying and mitigating supply chain disruptions (mean = 3.68) and adopting ERP, SCM, and IoT systems for real-time visibility and automation (mean = 3.65) show moderate emphasis, suggesting that resilience and digital transformation are recognised but not yet fully embedded. Coordination across procurement, logistics, and production (mean = 3.63) and environmentally sustainable practices (mean = 3.63) were also moderately prioritised, indicating growing but uneven integration of holistic and eco-conscious approaches. The lowest-rated practices include predictive analytics to anticipate demand (mean = 3.61) and supplier development for quality and cost competitiveness (mean = 3.46). This implies that while data-driven forecasting and supplier reliability are acknowledged, they are less consistently implemented compared to process improvement and cost optimisation strategies. Findings demonstrate that South African manufacturing firms focus more on immediate efficiency and benchmarking while areas such as digital innovation, predictive analytics, and sustainable supplier management remain underdeveloped. This aligns with the study's identification of systemic challenges and the need for targeted interventions to enhance resilience, innovation, and competitiveness in the sector.

Table 3. Supply Chain Management Practices

Ranking	Supply Chain Management Practices	Mean	Std. Deviation
1	Uses results for continuous process improvement and benchmarking against industry standards	3.86	1.073
2	Balances inventory levels to minimize holding costs while ensuring product availability	3.78	1.031
3	Identifies and mitigates potential disruptions (e.g., supplier failure, transport delays	3.68	1.127
4	Implement ERP systems, SCM software, and IoT for real-time data sharing and process automation	3.65	1.077
5	Coordinates activities across procurement, production, logistics, and distribution	3.63	1.107
6	Reduces environmental impact through eco-friendly sourcing, energy-efficient transport, and recycling	3.63	1.186
7	Uses historical data, market trends, and predictive analytics to anticipate customer demand	3,61	1,081
8	Involves selecting and developing reliable suppliers for quality materials at competitive prices	3.46	1.086

d. Logistics Challenges

The findings in Table 4 reveals that the most critical challenge facing logistics in the South African manufacturing sector is rising fuel prices, inefficient routing, and vehicle maintenance (mean = 3.75, SD = 1.184), which substantially inflate logistics expenses and undermine cost efficiency. The shortage of qualified logistics and supply chain professionals (mean = 3.72) also ranks highly, reflecting persistent skill gaps that affect operational effectiveness. Other significant obstacles include complex customs procedures and compliance requirements (mean = 3.70), which delay cross-border shipments, and poor warehouse design, inadequate technology, or labour shortages (mean = 3.67), all of which compromise efficiency. Challenges related to maintaining optimal stock levels (mean = 3.66) and the inability to track shipments in real time (mean = 3.66) highlight weaknesses in inventory management and digital integration. Supplier delays and inconsistencies (mean = 3.63) and inadequate transport infrastructure such as roads, rail, and ports (mean = 3.57) further exacerbate inefficiencies, limiting responsiveness and increasing costs. The results underscore that South African manufacturing logistics is constrained by a combination of rising operational costs, skill shortages, regulatory complexities, and weak infrastructure. These challenges directly align with the study's aim of examining systemic inefficiencies in supply chain and logistics, pointing to the urgent need for targeted interventions in digital tracking, workforce development, and infrastructure investment.

Table 4. Logistics Challenges

Ranking	Logistics Challenges	Mean	Std. Deviation
1	Rising fuel prices, inefficient routing, and vehicle maintenance contribute to high logistics expenses	3.75	1.184
2	Shortage of qualified logistics and supply chain professionals affects operational efficiency.	3.72	1.296
3	Complicated customs procedures and compliance requirements delay cross-border shipments.	3.70	1.251
4	Poor layout design, inadequate technology, or labor shortages reduce warehouse efficiency	3.67	1.173
5	Difficulties in maintaining optimal stock levels lead to either stockouts or overstocking	3.66	1.241
6	Inability to track goods and shipments in real-time hampers responsiveness and decision-making	3.66	1.281
7	Delays or inconsistencies from suppliers disrupt production schedules and customer orders.	3.63	1.292
8	Inadequate road networks, rail systems, and port facilities can delay transportation and increase costs	3.57	1.174

e. Reliability Analysis: Cronbach Alpha

Table 5 reports the Cronbach's alpha coefficients for the four measured constructs. All values exceed the 0.9 threshold, demonstrating excellent internal consistency and reliability of the research instrument. Specifically, operations management practices ($\alpha = 0.911$, 7 items), logistics management practices ($\alpha = 0.921$, 7 items), and supply chain management practices ($\alpha = 0.913$, 8 items) all achieved strong reliability, indicating that the questionnaire items consistently measure their intended constructs.

Table 5. Cronbach Alpha

Variables	Cronbach's Alpha Based on Standardized Items	Number of Items
Operations Management Practices	0.911	7
Logistics Management Practices	0,921	7
Supply Chain Management Practices	0,913	8
Logistics Challenges	0.951	8

The highest reliability was observed in logistics challenges ($\alpha = 0.951$, 8 items), suggesting particularly strong coherence among items addressing barriers within logistics systems. These results confirm that the survey instrument is both robust and dependable for analysing operational, logistics, and supply chain practices within the South African manufacturing context.

4.3 Strategic improvements

Addressing the challenges within logistics and supply chain operations in South Africa's manufacturing sector requires targeted strategic interventions. The case study highlighted critical issues, including infrastructural inefficiencies, fragmented supply chain networks, and limited adoption of digital technologies. While the study is limited to a single manufacturing case and may not fully capture the diversity of practices across industries, its findings provide a strong basis for wider industrial application. Investment in modern transport infrastructure, particularly road, rail, and port systems, is essential to improve the movement of goods and reduce delays. Public–private partnerships (PPPs) could play a central role in financing and accelerating these improvements, consistent with the evidence of bottlenecks caused by outdated logistical systems. Equally, advancing digital transformation through the adoption of technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and blockchain would enhance visibility, strengthen coordination, and enable real-time decision-making.

Human capital development is also critical. The findings underscored a lack of expertise in systems thinking, data analytics, and logistics software, pointing to the need for stronger collaboration between industry, government, and higher education institutions to close the skills gap. Furthermore, integration across the supply chain must be enhanced

by fostering collaboration between manufacturers, suppliers, and distributors, thereby addressing fragmentation and improving responsiveness. Regulatory reforms to simplify customs procedures and cross-border processes would mitigate delays identified in the case analysis, while promoting sustainable logistics practices, such as energy-efficient storage, waste management, and environmentally responsible transport, would balance cost-efficiency with ecological accountability. Finally, strengthening supply chain resilience through strategies such as supplier diversification, data-driven demand forecasting, and scenario planning is vital for adaptability in the face of disruption. Although the study's scope is narrow, the convergence between its findings and the recommended strategies highlights clear pathways for building a more competitive, resilient, and sustainable manufacturing sector in South Africa.

5. Conclusion

This study examined the interplay between logistics and supply chain management (SCM) within South Africa's manufacturing sector, revealing a strong correlation with operational efficiency and competitiveness. Key challenges identified include inadequate infrastructure, rising transportation costs, limited technological integration, and skills shortages, all of which constrain effective performance. Addressing these issues through digital transformation, workforce development, and improved cross-functional collaboration offers practical pathways to enhance operations management practices. The findings provide data-driven insights and actionable recommendations that support long-term improvements in logistics and supply chain efficiency, thereby strengthening productivity and competitiveness within South Africa's manufacturing industry. However, the study's focus on a single manufacturer limits the generalisability of its conclusions, underscoring the need for broader, sector-wide research.

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