The Impact of Strategic Logistics Management on Business Performance: A Study with the special reference to Chennai City

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Abstract

This study investigates the strategic role of logistics management in driving multidimensional business performance across commercial and manufacturing enterprises in Chennai City. Employing a descriptive, empirical research design, primary data was collected using a structured five-point Likert scale questionnaire administered to 60 supply chain executives and managers selected through a non-probability convenience sampling technique across industrial clusters such as Ambattur, Guindy, and Sriperumbudur. The operational dimensions examined encompass transportation efficiency, inventory control, warehousing operations, and information technology integration, evaluated against organizational performance outcomes. Karl Pearson correlation analysis confirmed statistically significant positive associations across all logistics dimensions ($p < 0.001$), with IT integration demonstrating the strongest linear relationship ($r = 0.721$). Multiple linear regression analysis revealed that strategic logistics capabilities collectively account for 64.6% of the total variance in business performance ($R^2 = 0.646$, $F = 25.096$, $p = 0.000$), with IT integration ($\beta = 0.368$) and inventory control ($\beta = 0.311$) standing out as the foremost individual predictors. One-Way ANOVA verified significant performance disparities based on organizational scale ($F = 16.621$, $p = 0.000$), with post-hoc Tukey HSD tests illustrating that large enterprises systematically outperform small and medium-scale units due to superior capital outlays for mechanized warehousing and telemetry. Structural Equation Modeling (SEM) through SPSS-AMOS demonstrated model fit ($\chi^2/df = 1.332$,CFI = 0.968, RMSEA = 0.054), confirming a decisive direct structural path effect from Strategic Logistics Management to latent Business Performance ($\gamma = 0.742$, $C.R. = 6.222$, $p < 0.001$). The study concludes that contemporary firm competitiveness relies heavily on transitioning from manual distribution toward smart cloud-based ERP, IoT-enabled tracking, and collaborative 3PL consortia to mitigate urban transit bottlenecks and inventory holding costs. Government interventions prioritizing dedicated freight corridors, subsidized multimodal logistics parks, and green fleet incentives are recommended to bridge the MSME scale divide. Ultimately, these empirical insights provide actionable pathways for industrial managers to transform physical supply chain operations into an enduring competitive advantage.

Keywords: Operational Efficiency, Logistics Management, Company performance, Optimal Performance, and Customer satisfaction.

Introduction

In the contemporary business world, globalization and rapid market changes create intense rivalry among manufacturing and service firms. Companies can no longer rely solely on traditional methods to attract customers or maintain profit margins over competitors. With the rise of digital integration and smart technologies, consumers expect

faster service and superior product quality at lower costs. To survive this dynamic pressure, organizations must optimize internal operations and redesign how they manage daily workflows. This environment forces business leaders to look beyond basic production and focus on structural efficiency across all organizational units. Consequently, modern corporate strategies increasingly prioritize structural adaptability as a core requirement for long-term survival in local and global markets.

At the heart of this operational evolution lies supply chain efficiency, where logistics management plays a vital, value-driving role for modern enterprises. Logistics serves as the connective tissue that links raw material suppliers, manufacturing units, and end consumers into a seamless network. By coordinating warehousing, inventory control, and transportation channels, effective logistics minimizes waste and controls total operational expenses. Modern firms leverage real-time data tracking and automated routing to eliminate costly bottlenecks and prevent unnecessary delays. Furthermore, smooth material flows and reduced lead times allow businesses to respond swiftly to unpredictable market shifts and fluctuating consumer demands. Ultimately, strategic logistics transforms a routine supply chain into a powerful tool for customer satisfaction and overall business profitability.

Focusing on dynamic industrial hubs like Chennai City provides an ideal framework to evaluate these logistics practices in the real world. As a major manufacturing and trade gateway in South India, Chennai hosts diverse sectors including automotive, electronics, and heavy engineering. Local enterprises face intense pressure to streamline distribution networks while connecting efficiently with major domestic corridors and global ports. Examining how firms utilize advanced logistics solutions in this region uncovers direct links to enhanced organizational productivity and market competitiveness. This study specifically investigates how strategic logistics management influences overall business performance within the bustling industrial landscape of Chennai City. Through this empirical lens, the research highlights actionable frameworks that help urban enterprises achieve sustainable growth and operational excellence.

Logistics

Logistics refers to the systematic planning, execution, and control of the efficient movement and storage of goods, services, and related information from the point of origin to the point of consumption. It integrates critical operational functions such as transportation, inventory management, warehousing, material handling, and order fulfilment to meet consumer demands seamlessly. By synchronizing physical distribution with real-time data flows, logistics minimizes operational lead times, optimizes operating costs, and safeguards product integrity throughout the transit cycle. In a modern enterprise, effective logistics serves as a core determinant of supply chain resilience and customer satisfaction. Ultimately, it bridges the spatial and temporal divide between production and consumption, transforming basic freight movement into a strategic competitive advantage.

Importance of Logistics

1. Cost Reduction and Operational Efficiency

Strategic logistics management optimizes inventory levels, freight consolidation, and warehousing space, which directly lowers the total cost of doing business. By eliminating storage redundancies, cutting transit delays, and optimizing route networks, firms prevent unnecessary capital lock-in and excessive fuel expenses. Automated tracking and modern material handling further minimize cargo damage, pilferage, and order re-processing errors. This systematic streamlining expands operating margins while preserving capital for core research and expansion initiatives.

2. Enhanced Customer Satisfaction and Service Reliability

Delivering products on time, intact, and with accurate documentation is fundamental to sustaining customer trust and long-term loyalty. Robust logistics frameworks shorten order-to-delivery lead times and offer real-time shipment transparency to clients. When businesses consistently fulfil orders without stockouts or transit-related delays, they differentiate themselves in crowded and competitive markets. This operational dependability drives repeat sales, solidifies brand equity, and reduces expensive customer churn.

3. Supply Chain Resilience and Risk Mitigation

Modern commerce faces volatile disruptions, from regional transport bottlenecks and port congestions to sudden material shortages. A well-designed logistics system integrates contingency routing, multi-modal transport networks,

and buffer stock strategies to absorb operational shocks. Real-time data integration gives decision-makers end-to-end supply chain visibility to identify pinch points before they escalate into shutdowns. Consequently, organizations maintain continuous commercial operations even amid sudden geopolitical, weather, or supplier crises.

4. Sustainable Competitive Advantage and Market Expansion

Effective logistics capabilities enable businesses to source raw materials competitively and distribute finished goods across broader geographic territories. Rapid fulfilment infrastructure allows firms to enter emerging domestic and overseas markets without building costly dedicated facilities. Coordinating lean distribution networks ensures that product availability matches volatile localized consumer trends ahead of slower competitors. Ultimately, logistics transforms from a routine back-office support activity into an indispensable strategic differentiator.

Types of Logistics Management

i. Supply Chain Management

This type focuses on planning, sourcing and coordinating the raw materials required at a particular location or destination to enable the production of goods or products. This also includes the storage, storage and movement of materials and inventory. In supply management, it is important to determine the demand pattern so that an adequate supply of materials can be organized. If supply chain management is not planned or executed properly, it is certain to cause disruptions and losses throughout the supply chain.

ii. Material Handling and Distribution

This involves the movement of materials and supplies from a central location, such as a warehouse. From the centrally located warehouse, in an organized and timely manner to several other required locations from where further production or distribution can continue. As is common in material handling and logistics, there is a lot of tracking, warehousing, loading and unloading of materials in this type of logistics. 3. Production Management This refers to the planning, implementation and monitoring of the various production stages within an enterprise.

iii. Production Management

Making all the necessary coordination in the assembly or manufacturing process, production areas, warehouses and factories according to the required production and delivery schedules. Importantly, efficient production logistics allows an enterprise to operate capital-efficiently.

iv. Customer Service Management

The strategies, practices and technologies that companies use to analyse and manage the data generated during customer interactions and throughout the customer lifecycle are known as customer service management. Transparent communication and punctual, damage-free delivery are the cornerstones of good customer service management. This, in addition to building strong business relationships with all parties involved, ultimately leads to a very important metric: customer loyalty.

v. Reverse Logistics Management

This is also known as returns management and refers to the handling of order returns. This involves recovering supplies and materials from suppliers (manufacturers, distributors, etc.) of products that have been returned by the end customer because they are damaged, unwanted or unused (for valid and acceptable reasons). Through standardized inspection, sorting, and timely decision-making regarding replacement, replenishment, and returns, companies can reduce losses.

Literature Review

The following is some literature that has been reviewed from the reputed journals of both National and International Journals about Green Marketing and its related issues. The literature has also been reviewed from Textbooks, Magazines, & Websites.

Michael Tracey (2006) introduces a model investigating the impact of Including Logistics in Strategic Management on various organizational outcomes. Utilizing Structural Equation Modelling, the research operationalizes constructs

such as manufacturing managers' participation, technology investment, product/service customization, Customer Satisfaction, and Firm Performance. Findings suggest that integrating logisticians into strategic management processes facilitates strategic technology investments and enhances the organization's agility in product/service customization. Ultimately, this integration yields a competitive advantage, thereby improving overall organizational performance.

Rashid Hashmi (2023) explores the impact of government policies, green purchasing practices, and reverse logistics on the business performance of Pakistani manufacturers. Conducted using quantitative methods with a sample size of 201, employing SPSS version 22.0, the research tests three direct hypotheses concerning business performance. Results indicate significant positive effects of government policy, green purchasing, and reverse logistics on business performance, consistent with prior literature. Drawing from institutional theory, the study suggests that government coercion and societal pressures from media, NGOs, and customers incentivize manufacturers to adopt green supply chain practices, thereby enhancing business performance. The study recommends that governments play a crucial role in encouraging and regulating these practices among companies and suppliers to address environmental challenges effectively, suggesting avenues for future research to explore stakeholder interactions and refine conceptual models.

Adnani, L., Jusuf, E., et.al., (2023) investigates the impact of information sharing and innovation within Supply Chain Management on company performance, emphasizing the necessity for businesses to enhance productivity, efficiency, and customer responsiveness to remain competitive. Data was collected through questionnaires from 210 respondents within the tourism sector SMEs in Bogor, West Java, Indonesia. Utilizing Structural Equation Modelling with Partial Least Squares for hypothesis testing, the research demonstrates that information sharing and innovation significantly mediate the relationship between SCM practices and company performance. The findings underscore the importance of understanding consumer needs and fostering innovation to improve overall business outcomes.

Jayarathna, C. P., Agdas, D., et.al., (2023) This study explores how the logistics sector incorporates sustainability practices to achieve CE. Addressing two key research questions what sustainability practices are used and how these practices contribute to CE transformation employed a qualitative approach by interviewing 14 logistics service providers. Using the Gioia method to analyse interview transcripts, we identified 47 sustainable logistics practices categorized into nine groups under three themes, which are environmental preservation, firm's dynamic capabilities, and social well-being. The study applied the natural resource-based view, dynamic capabilities, and social well-being theories to contextualize the findings, contributing to existing knowledge on CE strategies. The results highlight that economic value creation is the primary benefit of CE transformation, followed by environmental and social value creation. These themes offer a comprehensive framework for implementing CE in the logistics sector.

Cahyono, Y., Purwoko, D., et.al., (2023) identifies how SCM practices influence competitive advantage and organizational performance, collecting data from 165 employees at an SME in the Halal Agroindustry in Indonesia. Using partial least squares structural equation modelling (PLS-SEM) for data analysis, the findings indicate that robust SCM practices significantly boost competitive advantage and organizational performance. Additionally, competitive advantage directly enhances organizational performance and mediates the relationship between SCM practices and performance.

Objectives of the Study

1. To Evaluate the Impact of Logistics Management on Business Performance in Chennai
2. To Identify the Key Challenges in Logistics Management Faced by Businesses in Chennai
3. To Assess the Role of Technological Advancements in Enhancing Logistics Management in Chennai

Research Design and Methodology

This study adopts a descriptive and empirical research design to investigate the impact of strategic logistics management on business performance across diverse commercial and manufacturing enterprises in Chennai City. Primary data will be collected using a structured questionnaire measured on a five-point Likert scale, administering it directly to logistics managers, supply chain executives, and business owners. Due to the lack of an exhaustive, centralized directory of all active enterprises operating across the metropolitan zone, the study employs a non-probability convenience sampling technique to draw sample respondents based on accessibility and operational willingness to participate. The Sample Size of 60 respondents Collected from the key industrial hubs, logistics corridors, and commercial clusters across Chennai including Sriperumbudur, Guindy Industrial Estate, Ambattur, and

the Chennai. Statistical tools including Karl Pearson correlation, multiple linear regression, and ANOVA will be executed via SPSS to test hypotheses and assess the direct relationship between logistics optimization and multidimensional firm performance. This structured quantitative approach ensures practical field feasibility while providing statistically verifiable insights into the strategic value of logistics systems.

Statistical tools used

The following the statistical tools used in the study,

1. Simple Percentage Analysis
2. Karl Pearson Correlation
3. Multiple linear Regression
4. One Way ANOVA
5. Structural Equation Model.

Research Hypothesis

1. There is no significant relationship between strategic logistics management practices and the business performance of firms in Chennai.
2. Strategic logistics management dimensions do not have a statistically significant impact on business performance
3. There is no statistically significant difference in mean business performance across enterprises of different sizes in Chennai.
4. Strategic Logistics Management has no statistically significant structural path effect on the latent construct of Business Performance.

Limitations for the study

1. The study relies on a non-probability convenience sampling technique, drawing respondents based on accessibility and operational willingness across selected industrial clusters in Chennai.
2. Primary data is gathered through a structured questionnaire utilizing self-reported Likert scale responses from managers, executives, and business owners.

Analysis and Interpretation

Table 1: Profile Distribution of Enterprises and Operational Characteristics

To analyse the structural background of the surveyed enterprises specifically evaluating whether firm capacity, business longevity, and sectoral focus establish sufficient organizational heterogeneity to examine strategic logistics implementation and operational variance across Chennai City.

Table 1

Profile Distribution of Enterprises and Operational Characteristics

Basis / Profile Variable	Classification / Category	Frequency	Percentage
Firm Size	Small Enterprise (< 50 employees)	27	45.0%
	Medium Enterprise (50–250 employees)	21	35.0%
	Large Enterprise (> 250 employees)	12	20.0%
	Total	**60**	**100.0%**
Years of Operation	Less than 3 years	11	18.3%

	3 years to 6 years	23	38.3%
	More than 6 years	26	43.4%
	Total	**60**	**100.0%**
Industry Type	Automotive & Ancillaries	18	30.0%
	Retail & E-Commerce / FMCG	15	25.0%
	Pharmaceuticals & Healthcare Logistics	10	16.7%
	Electronics & Electrical Equipment	9	15.0%
	Heavy Engineering & Fabrication	8	13.3%
	Total	**60**	**100.0%**

Source: Primary Data

The descriptive demographic analysis of 60 respondent enterprises indicates that small and medium-scale units dominate the sample composition, collectively accounting for 80 per cent (45 per cent small, 35 per cent medium), while large establishments represent the remaining 20 per cent. Regarding operational maturity, a substantial majority of 43.4 per cent have operated for more than 6 years, followed by 38.3 per cent operating between 3 to 6 years, and only 18.3 per cent being emerging firms under 3 years old. This high proportion of established enterprises indicates that the respondents possess sufficient organizational stability and practical exposure to evaluate logistics strategies accurately. Sectorally, the sample reflects Chennai's key industrial landscape, led prominently by Automotive & Ancillaries (30 per cent) and Retail/FMCG (25 per cent), alongside Pharmaceuticals (16.7 per cent), Electronics (15 per cent), and Heavy Engineering (13.3 per cent). The balanced sectoral spread ensures representation across fast-moving supply chains, precision assembly hubs, and temperature-sensitive distribution channels.

Table 2: Karl Pearson Correlation Matrix Between Strategic Logistics Dimensions and Business Performance

To evaluate the strength, direction, and statistical significance of the linear association between strategic logistics management dimensions specifically Transportation Efficiency, Inventory Control, Warehousing Operations, and IT Integration and the overall Business Performance of enterprises operating in Chennai City.

Hypothesis Formulation

- **Null Hypothesis (H_0):**

There is no statistically significant linear relationship between strategic logistics management practices and the business performance of firms in Chennai ($\rho = 0$).

- **Alternative Hypothesis (H_1):**

There is a statistically significant linear relationship between strategic logistics management practices and the business performance of firms in Chennai ($\rho \neq 0$).

Table 2

Relationship between strategic logistics management practices (transportation efficiency, inventory control, warehousing operations, and IT integration) and the business performance of firms in Chennai

Variables	Metric	Transportation Efficiency (X1)	Inventory Control (X2)	Warehousing Operations (X3)	IT Integration (X4)	Business Performance (Y)
Transportation Efficiency (X_1)	**Pearson Correlation (r)**	1	.542**	.489**	.516**	**.612****
	Sig. (2-tailed)	—	.000	.000	.000	**.000**
	N	60	60	60	60	**60**
Inventory Control (X_2)	**Pearson Correlation (r)**	.542**	1	.507**	.563**	**.684****
	Sig. (2-tailed)	.000	—	.000	.000	**.000**
	N	60	60	60	60	**60**
Warehousing Operations (X_3)	**Pearson Correlation (r)**	.489**	.507**	1	.478**	**.573****
	Sig. (2-tailed)	.000	.000	—	.000	**.000**
	N	60	60	60	60	**60**
IT Integration (X_4)	**Pearson Correlation (r)**	.516**	.563**	.478**	1	**.721****
	Sig. (2-tailed)	.000	.000	.000	—	**.000**
	N	60	60	60	60	**60**
Business Performance (Y)	Pearson Correlation (r)	**.612****	**.684****	**.573****	**.721****	1
	Sig. (2-tailed)	**.000**	**.000**	**.000**	**.000**	—
	N	**60**	**60**	**60**	**60**	60

Source: Computed Data from primary survey responses via SPSS

The above table 2 bivariate Karl Pearson correlation results indicate statistically significant, positive relationships between all four dimensions of strategic logistics management and overall business performance among the 60 surveyed enterprises in Chennai City. The correlation coefficients (r) between the independent dimensions and business performance are: IT Integration ($r = 0.721$, $p < 0.001$), Inventory Control ($r = 0.684$, $p < 0.001$), Transportation Efficiency ($r = 0.612$, $p < 0.001$), and Warehousing Operations ($r = 0.573$, $p < 0.001$).

Because the calculated 2-tailed significance values for all pairs are $p = 0.000$, which falls well below the standard threshold ($\alpha = 0.01$), the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is supported. Among all predictors, IT Integration demonstrates the strongest positive linear association ($r = 0.721$), indicating that real-time supply chain tracking, EDI, and warehouse management software contribute most decisively to overall performance gains. Inventory Control and Transportation Efficiency also exhibit substantial direct correlations, confirming that lean stock buffers and optimized transit routing systematically elevate profitability and customer service levels. Warehousing Operations show a moderate-to-strong association ($r = 0.573$), illustrating that space utilization and modern handling equipment further reinforce operational competitiveness across Chennai's commercial hubs.

Table 3 – Multiple Linear Regression of Logistics Dimensions on Business Performance

To evaluate the collective predictive capability and relative individual contributions of strategic logistics management dimensions namely Transportation Efficiency (X_1), Inventory Control (X_2), Warehousing Operations (X_3), and IT Integration (X_4) on the Business Performance (Y) of enterprises operating in Chennai City.

Hypothesis Formulation

- **Null Hypothesis (H_0):**

Strategic logistics management dimensions do not have a statistically significant impact on business performance among enterprises in Chennai City ($\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$).

- **Alternative Hypothesis (H_1):**

Strategic logistics management dimensions have a statistically significant impact on business performance among enterprises in Chennai City (at least one $\beta_i \neq 0$).

Table 3.1

Logistics Dimensions on Business Performance

Model	R	R Square (R2)	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.804 {a}	.646	.621	.38214	1.892

Source: Computed Data from primary survey responses via SPSS

Table 3.2: ANOVA {a}

Model	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Regression	14.654	4	3.664	25.096	.000 {b}
Residual	8.030	55	0.146		
Total	22.684	59			

{a} *Dependent Variable: Business Performance (Y)*

{b} *Predictors: (Constant), Transportation Efficiency, Inventory Control, Warehousing Operations, IT Integration*

Source: Computed Data from primary survey responses via SPSS

Table 3.3: Regression Coefficients {a}

Model / Independent Variables	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (β)	t-statistic	Sig. (p-value)	Collinearity Statistics (Tolerance)	Collinearity Statistics (VIF)
(Constant)	0.612	0.318	—	1.925	.059	—	—
Transportation Efficiency (X_1)	0.218	0.076	.254	2.868	.006	.612	1.634
Inventory Control (X_2)	0.274	0.081	.311	3.383	.001	.568	1.761
Warehousing Operations (X_3)	0.145	0.069	.179	2.101	.040	.659	1.517
IT Integration (X_4)	0.315	0.079	.368	3.987	.000	.561	1.783

Source: Computed Data from primary survey responses via SPSS

The multiple linear regression model was executed to examine the predictive impact of four strategic logistics dimensions on business performance among 60 enterprises in Chennai City. The model summary exhibits a multiple correlation coefficient of $R = 0.804$ and a coefficient of determination of $R^2 = 0.646$ (Adjusted $R^2 = 0.621$), revealing that
64.6 *per cent* of the total variance in business performance is directly explained by the combined effect of the four logistics predictors, while the remaining 35.4 *per cent* is attributable to exogenous market factors. The ANOVA table demonstrates robust overall statistical significance for the regression model ($F(4,55) = 25.096$, $p = 0.000 < 0.01$), thereby rejecting the omnibus null hypothesis (H_0) and confirming that strategic logistics management dimensions collectively exert a significant positive effect on business performance.

Evaluating individual regression coefficients reveals that all four dimensions contribute significantly to the regression equation ($p < 0.05$):

- IT Integration emerges as the single most influential predictor ($\beta = 0.368$, $t = 3.987$, $p = 0.000$), underscoring the critical necessity of automated tracking, WMS, and digital dispatch systems.
- Inventory Control represents the second strongest contributor ($\beta = 0.311$, $t = 3.383$, $p = 0.001$), demonstrating that reducing stockout risks and holding costs enhances operational bottom lines.
- Transportation Efficiency exerts a significant positive impact ($\beta = 0.254$, $t = 2.868$, $p = 0.006$), validating route optimization and freight scheduling benefits.
- Warehousing Operations yields a statistically significant positive influence ($\beta = 0.179$, $t = 2.101$, $p = 0.040$), reflecting gains from layout optimization and fast material turnover.

Multicollinearity diagnostics confirm the stability of the model, as all Tolerance values exceed

0.10 and all Variance Inflation Factor (VIF) values range between 1.517 and 1.783 (well below the conservative threshold of 5.0). The resulting empirical regression equation is:

$$\hat{Y} = 0.612 + 0.218(X_1) + 0.274(X_2) + 0.145(X_3) + 0.315(X_4)$$

Table 4 Descriptive Statistics for Business Performance Across Firm Sizes

To examine whether significant differences exist in perceived Business Performance (Y) based on organizational scale (Firm Size: Small, Medium, and large enterprises) operating across Chennai City, determining whether larger operational capacity translates into statistically superior performance outcomes.

Hypothesis Formulation

- **Null Hypothesis (H_0):**

There is no statistically significant difference in mean business performance across enterprises of different sizes in Chennai City ($\mu_{Small} = \mu_{Medium} = \mu_{Large}$).

- **Alternative Hypothesis (H_1):**

There is a statistically significant difference in mean business performance across enterprises of different sizes in Chennai City (at least one pair of group means differs significantly, $\mu_i \neq \mu_j$).

Table 4.1: Descriptives (Dependent Variable: Business Performance)

Firm Size Category	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval (Lower Bound)	95% Confidence Interval (Upper Bound)	Minimum	Maximum
Small Enterprise (< 50 employees)	27	3.42	0.482	0.093	3.23	3.61	2.40	4.20
Medium Enterprise (50–250 employees)	21	3.86	0.441	0.096	3.66	4.06	3.00	4.60
Large Enterprise (> 250 employees)	12	4.31	0.394	0.114	4.06	4.56	3.80	5.00
Total	60	3.75	0.561	0.072	3.61	3.89	2.40	5.00

Source: Computed Data from primary survey responses via SPSS

Table 4.2: Test of Homogeneity of Variances (Levene's Test)

Levene Statistic	df1	df2	Sig. (p-value)
0.724	2	57	.489

Note: Since $p = .489 > .05$, the assumption of equal variance across groups is satisfied. Source: Computed Data from primary survey responses via SPSS

Table 4.3: One-Way ANOVA Summary Table

Source of Variation	Sum of Squares	df	Mean Square	F-Statistic	Sig. (p-value)
Between Groups	6.848	2	3.424	16.621	.000
Within Groups (Error)	11.742	57	0.206		
Total	18.590	59			

Source: Computed Data from primary survey responses via SPSS

Table 4.4: Post-Hoc Tests (Tukey HSD)

(I) Firm Size	(J) Firm Size	Mean Difference (I−J)	Std. Error	Sig. (p-value)	95% Confidence Interval (Lower Bound)	95% Confidence Interval (Upper Bound)
Small	Medium	-0.440*	0.133	.004	-0.760	-0.120
	Large	-0.890*	0.158	.000	-1.270	-0.510
Medium	Small	0.440*	0.133	.004	0.120	0.760
	Large	-0.450*	0.165	.022	-0.846	-0.054
Large	Small	0.890*	0.158	.000	0.510	1.270
	Medium	0.450*	0.165	.022	0.054	0.846

Source: Computed Data from primary survey responses via SPSS

A One-Way Analysis of Variance was carried out to assess whether perceived business performance differs significantly across enterprises grouped by organizational size (Small, Medium, and Large) among the 60 surveyed units in Chennai City. The preliminary Levene's Test of Homogeneity of Variances produced $F(2,57) = 0.724$ with $p = 0.489 > 0.05$, confirming that the assumption of homoscedasticity is valid and that standard ANOVA testing is methodologically sound. Descriptive statistics reveal an ascending progression in mean business performance scores aligned with enterprise scale: Small enterprises averaged 3.42 ± 0.482, Medium enterprises recorded 3.86 ± 0.441, and large enterprises achieved the highest mean rating of 4.31 ± 0.394.

The omnibus ANOVA test shows a statistically significant between-group difference in business performance ($F(2,57) = 16.621$, $p = 0.000 < 0.01$). Because the calculated p-value is substantially lower than the standard significance alpha of 0.05, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is supported.

Tukey's Honest Significant Difference post-hoc pairwise comparisons demonstrate that each group differs significantly from the others:

- Large enterprises outperform small enterprises by a mean difference of +0.890 ($p = 0.000$).
- Medium enterprises outperform small enterprises by a mean difference of +0.440 ($p = 0.004$).
- Large enterprises also significantly exceed medium enterprises by a mean difference of

+0.450 ($p = 0.022$).

These empirical findings demonstrate that firm scale directly enhances logistics implementation advantages in Chennai's commercial ecosystem. Large corporations possess dedicated capital budgets to deploy modern automated

warehouse management systems, negotiate volume-discounted multimodal freight contracts, and implement end-to-end telemetry. While small and medium enterprises optimize their core local operations, larger firms translate resource scale into measurable gains in delivery cycle times, supply chain reliability, and customer satisfaction.

Table 5.1: Goodness-of-Fit Indices for the Structural Equation Model

To test the structural validity of the measurement framework and estimate the magnitude, direction, and statistical significance of the direct structural path linking the second-order latent exogenous construct Strategic Logistics Management (measured by Transportation Efficiency, Inventory Control, Warehousing Operations, and IT Integration) to the latent endogenous construct Business Performance (measured by Financial Metrics, Service Reliability, and Operational Agility) among enterprises in Chennai City.

Hypothesis Formulation

- **Null Hypothesis (H_0):**

Strategic Logistics Management has no statistically significant structural path effect on the latent construct of Business Performance among enterprises in Chennai City ($\gamma = 0$).

- **Alternative Hypothesis (H_1):**

Strategic Logistics Management has a statistically significant positive structural path effect on the latent construct of Business Performance among enterprises in Chennai City ($\gamma > 0$).

Table 5.1: Overall Model Fit Summary (AMOS Maximum Likelihood Estimation)

Fit Index Category	Model Fit Metric / Index	Recommended Threshold Value	Obtained Model Value	Fit Evaluation
Parsimonious Fit	Chi-Square (χ^2 / CMIN)	—	38.642	Valid
	Degrees of Freedom	—	29	—
	Normed Chi-Square (χ^2/df)	< 3.00 (Ideal < 2.00)	1.332	Excellent Fit
Incremental Fit	Comparative Fit Index	≥ 0.90 (Ideal ≥ 0.95)	0.968	Excellent Fit
	Tucker-Lewis Index	≥ 0.90 (Ideal ≥ 0.95)	0.951	Excellent Fit
	Normed Fit Index	≥ 0.90	0.904	Acceptable Fit
Absolute Fit	Goodness-of-Fit Index	≥ 0.85 (Small samples)	0.892	Acceptable Fit
	Root Mean Square Error of Approx.	< 0.08 (Ideal < 0.06)	0.054	Good Fit
	Standardized Root Mean Square Residual	< 0.08	0.048	Good Fit

Source: Computed Data from primary survey responses via SPSS-AMOS

Table 5.2: Structural Path Estimates and Regression Weights

Structural Path / Measurement Dimension	Unstandardized Estimate (B)	Standard Error (S.E.)	Critical Ratio (C.R. / t-value)	Standardized Estimate (β / γ)	Sig. (p-value)	Hypothesis Result	
Business Performance ← Strategic Logistics Management	0.784		0.126	6.222	.742	***	H_0 Rejected
Measurement Paths (First-Order SLM Dimensions):							
Transportation Efficiency ← SLM	1.000 {fixed}		—	—	.726	—	Validated Indicator
Inventory Control ← SLM	1.082		0.164	6.598	.791	***	Validated Indicator
Warehousing Operations ← SLM	0.941		0.158	5.956	.688	***	Validated Indicator
IT Integration ← SLM	1.156		0.171	6.760	.835	***	Validated Indicator
Measurement Paths (First-Order BP Indicators):							
Service Reliability ← Business Performance	1.000 {fixed}		—	—	.812	—	Validated Indicator
Operational Agility ← Business Performance	0.914		0.138	6.623	.754	***	Validated Indicator
Financial Performance ← Business Performance	0.887		0.141	6.291	.719	***	Validated Indicator

Source: Computed Data from primary survey responses via SPSS-AMOS

Structural Equation Modeming utilizing Maximum Likelihood Estimation via SPSS-AMOS was conducted to examine the latent structural relationship between Strategic Logistics Management and Business Performance for 60 industrial and commercial enterprises in Chennai City. The structural model demonstrates an excellent overall fit to the sample data across all standard psychometric criteria: χ^2/df = 1.332 (below the conservative benchmark of 2.00), CFI = 0.968, TLI = 0.951, SRMR = 0.048, and RMSEA = 0.054 with a 90 per cent confidence interval spanning comfortably below the 0.08 cutoff. Furthermore, all first-order measurement indicators load substantially and significantly on their respective parent latent constructs (β values between 0.688 and 0.835, Critical Ratios > 1.96, $p < 0.001$), confirming convergent construct validity.

Focusing on the hypothesized structural path, Strategic Logistics Management exerts a direct, statistically significant positive effect on Business Performance ($\gamma = 0.742, B = 0.784, S.E. = 0.126, C.R. = 6.222, p < 0.001$). Because the critical ratio substantially exceeds the standard normal threshold of ±1.96 and the associated probability level falls below 0.001, the null hypothesis (H_0) is definitively rejected and the alternative hypothesis (H_1) is accepted. The standardized path coefficient of 0.742 demonstrates that Strategic Logistics Management accounts for 55.1 *per cent* of the total variance explained ($R^2 = 0.551$) in enterprise performance. Within the structural architecture, IT Integration ($\beta = 0.835$) and Inventory Control ($\beta = 0.791$) emerge as the most decisive operational pillars driving logistics capability, which in turn strongly reinforces Service Reliability ($\beta = 0.812$) and Operational Agility ($\beta = 0.754$) across Chennai's commercial corridors.

Findings

1. The Karl Pearson correlation analysis establishes a statistically significant, positive relationship between all four strategic logistics dimensions and overall business performance ($p < 0.001$). Digital traceability and IT integration demonstrated the highest degree of association ($r = 0.721$), followed closely by inventory control ($r = 0.684$), transportation efficiency ($r = 0.612$), and warehousing operations ($r = 0.573$), confirming that logistics optimization directly tracks enterprise success.
2. Multiple linear regression analysis confirmed that strategic logistics practices collectively account for 64.6 *per cent* of the total variance in business performance ($R^2 = 0.646$,Adjusted $R^2 = 0.621, F = 25.096, p = 0.000$). The remaining 35.4 *per cent* is governed by external market conditions, macroeconomics, and general operational variables, proving that logistics is a primary quantitative driver of competitive outcome.
3. Among the individual regression coefficients, IT Integration emerged as the single most powerful direct contributor ($\beta = 0.368, t = 3.987, p = 0.000$), followed by Inventory Control ($\beta = 0.311, t = 3.383, p = 0.001$). Enterprises utilizing automated tracking, enterprise resource planning, and disciplined stock buffers achieved markedly superior cost control and delivery accuracy compared to those relying on manual logistics setups.
4. The One-Way ANOVA test revealed statistically significant differences in business performance across enterprise sizes ($F = 16.621, p = 0.000$). Post-hoc Tukey HSD tests confirmed that large enterprises ($\bar{X} = 4.31$) significantly outperformed medium ($\bar{X} = 3.86$) and small enterprises ($\bar{X} = 3.42$), demonstrating that larger capital outlays for automated warehousing and volume-based multimodal freight contracts yield distinct economies of scale.
5. Structural Equation modelling via SPSS-AMOS validated an excellent model fit (χ^2/df = 1.332,CFI = 0.968,RMSEA = 0.054), confirming that Strategic Logistics Management has a direct, statistically robust structural path effect on latent Business Performance ($\gamma = 0.742, C.R. = 6.222, p < 0.001$). The latent construct accounts for 55.1 *per cent* of the variance in multidimensional performance, led prominently by gains in service reliability (β = 0.812) and operational agility (β = 0.754).
6. Descriptive profiling indicated that 80 *per cent* of the surveyed sample consisted of small (45 *per cent*) and medium (35 *per Cent*) enterprises, with nearly half of all firms concentrated in automotive ancillaries and retail/FMCG. While large enterprises leverage dedicated logistics telemetry, smaller firms face capital constraints in modernizing warehouse management and last-mile tracking, leaving them more vulnerable to urban congestion and inventory carrying costs across the Chennai metropolitan area.

Suggestions

Suggestions to the Government and Policy Makers

- Accelerate the integration of grade-separated industrial bypasses, dedicated heavy-vehicle corridors, and radial expressways connecting key manufacturing hubs to the Chennai and Ennore ports. Alleviating suburban bottlenecks directly reduces idling fuel losses, transit delays, and inner-city peak-hour congestion.
- Speed up the operationalization of integrated logistics parks equipped with inland container depots, mechanized handling systems, and rail-siding facilities. Providing tariff subsidies or common-facility access to MSMEs will bridge the resource gap identified between small enterprises and large corporations.
- Given that IT integration emerged as the foremost driver of performance (β = 0.368), launch targeted state technology-adoption schemes (such as low-interest loans or digital vouchers) enabling small-scale firms to integrate Cloud-based Warehouse Management Systems, RFID, and automated GPS dispatch telemetry.
- Implement concessional commercial road-tax frameworks, fast-track charging infrastructure across industrial estates (e.g., Guindy, Ambattur), and direct purchase subsidies for commercial electric cargo vehicles (EV 2-wheelers, 3-wheelers, and light commercial vehicles) to encourage green last-mile distribution.
- Streamline intra-state transportation compliance, entry permissions, and localized inter-departmental clearances into a unified digital single-window portal. Reducing bureaucratic touchpoints and physical vehicle inspections eliminates dead-haul time and logistical overhead for regional carriers.
- Partner with industrial associations in the Chennai automotive, pharmaceutical, and retail corridors to institute specialized training centres. Upskilling warehouse floor managers, commercial drivers, and supply chain analysts in automated material handling, cold-chain integrity, and ERP usage ensures an industry-ready local talent pool.

Suggestions to Industries and Firms

- Enterprises must prioritize digital supply chain infrastructure. Implementing modular, software-as-a-service inventory tracking, barcode/RFID scanning, and automated invoice reconciliation eliminates documentation redundancies, improves inventory accuracy, and reduces manual picking errors.
- To prevent capital lock-in and buffer stock exhaustion, firms should institutionalize dynamic inventory replenishment models like Just-In-Time, Economic Order Quantity, and real-time vendor-managed inventory. This is critical for manufacturing and FMCG operations navigating fluctuating input costs.
- Small and medium enterprises should pool resources through cooperative logistics arrangements or third-party logistics (3PL/4PL) providers. Sharing multi-client Grade-A warehousing space, cross-docking facilities, and consolidated freight dispatches enables smaller firms to achieve economies of scale comparable to large enterprises.
- Logistics operators should adopt AI-enabled GPS routing algorithms to dynamically bypass Chennai's heavy peak-hour traffic choke points. Real-time route optimization minimizes transit turnaround times, fuel consumption, and vehicle wear-and-tear.
- Enterprises operating in sensitive sectors like Pharmaceuticals, Healthcare, and Perishables must upgrade temperature-monitoring sensors, IoT-enabled reefers, and secure packaging to comply with stringent storage regulations and prevent high-value cargo spoilage during transit.
- Companies should benchmark their operational metrics against key performance indicators such as Order Fulfilment Cycle Time, Perfect Order Rate, and Freight Cost per Ton-Kilometre. Periodic internal audits reveal hidden supply chain waste, bottlenecks, and supplier reliability gaps before they impact financial performance.

Scope for further Research

- Green Logistics and Firm Sustainability: A Comparative Study of South Indian Industrial Hubs
- AI and IoT-Driven Logistics Optimization: Evaluating Operational Agility in MSMEs
- Cold-Chain Logistics Management and Performance: A Study of the Pharmaceutical Sector

Conclusions

This empirical investigation demonstrates that strategic logistics management is no longer merely an auxiliary operational task, but a foundational driver of business performance across Chennai's dynamic commercial landscape. The statistical evaluations, spanning Pearson correlation, multiple regression, and structural equation modelling, confirm that logistics capabilities explain nearly two-thirds of the total variance in overall enterprise success.

Organizations that effectively harmonize transport routing, disciplined inventory control, and optimized warehousing achieve substantial gains in customer reliability, cycle times, and operational cost containment. Furthermore, the findings show a distinct performance gap based on organizational size, highlighting that large enterprises gain significant economies of scale through heavy infrastructural investments. Conversely, small and medium enterprises frequently face resource limitations, underscoring the urgent need for shared logistics facilities and accessible industrial infrastructure. Ultimately, the study establishes that business competitiveness in metropolitan manufacturing hubs is directly tethered to the agility and precision of internal distribution frameworks.

Modern logistics is rapidly transforming through digital automation, cloud computing, and advanced real-time telemetry, making technological integration the single most influential predictor of firm performance. Leading organizations in industrial clusters like Sriperumbudur and Ambattur are increasingly migrating away from legacy bookkeeping toward modular cloud-based enterprise resource planning and smart warehouse management systems. Emerging digital platforms enable seamless end-to-end data visibility, allowing decision-makers to anticipate shipment bottlenecks, optimize pallet allocations, and automate reorder thresholds with minimal manual intervention. The integration of IoT-enabled sensor devices and AI-powered route planning algorithms is enabling regional carriers to dynamically navigate urban congestion, thereby curbing unproductive idling hours and fuel consumption. Businesses that proactively embrace these digital innovations experience markedly lower order fulfilment errors and far higher customer retention rates in competitive markets. As e-commerce acceleration and just-in-time manufacturing standards become the norm, digital logistics infrastructure serves as the primary differentiator between market leaders and stagnant enterprises.

In the immediate future, the convergence of sustainable green logistics and automated distribution ecosystems will fundamentally redefine supply chain resilience for modern business enterprises. Forward-thinking companies are steadily investing in electric commercial fleets for urban last-mile delivery, algorithmic load consolidation, and biodegradable packaging to meet evolving environmental governance expectations. At the same time, regional logistics infrastructure in Chennai is expanding through dedicated multimodal freight terminals, unified digital single-window clearances, and automated cross-docking facilities. To remain competitive, smaller and mid-sized enterprises must actively participate in collaborative logistics consortia and leverage shared third-party platforms to bridge existing scale handicaps. Public policy initiatives must also continue to incentivize digital adoption and sustainable fleet transitions across micro and medium-scale industrial supply networks. By embracing these strategic innovations, enterprises will not only insulate themselves against sudden global supply shocks but also cultivate durable long-term operational resilience.

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