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Supply Chain Management Framework for Hardware Products of Information Technology Companies: A Statistical and Empirical Analysis

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Abstract

The supply chain management (SCM) landscape for hardware products within Information Technology (IT) companies presents a uniquely complex array of challenges encompassing global sourcing, component shortages, technological obsolescence, and multi-tier supplier interdependencies. This empirical study develops and validates a comprehensive SCM framework tailored specifically to IT hardware products, drawing on primary survey data collected from 312 supply chain professionals across 45 mid-to-large-scale IT companies in India. Employing a mixed-methods research design, the study integrates structural equation modelling (SEM), regression analysis, factor analysis, and descriptive statistics to examine the relationships among seven key SCM constructs: supplier integration, demand forecasting accuracy, inventory optimization, logistics efficiency, information technology adoption, risk mitigation, and supply chain performance. The findings reveal that supplier integration ($\beta = 0.43$, $p < 0.001$) and IT adoption ($\beta = 0.38$, $p < 0.001$) are the strongest predictors of overall supply chain performance. The proposed SCMF-IT framework presents actionable strategies for IT companies seeking to build resilient, agile, and cost-efficient hardware supply chains. The study contributes significantly to both academic discourse and managerial practice in the domain of technology-driven supply chain management.

Keywords: ***Supply Chain Management, IT Hardware Products, Structural Equation Modelling, Supplier Integration, Demand Forecasting, SCMF-IT Framework, Inventory Optimization, Risk Mitigation***

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Introduction

The global information technology industry has witnessed an unprecedented surge in hardware production and distribution over the past two decades. From semiconductors and printed circuit boards to assembled computing systems and networking infrastructure, the hardware supply chain of IT companies spans continents, involves hundreds of sub-suppliers, and operates under extreme pressure to balance cost, speed, and quality. Unlike fast-moving consumer goods, IT hardware components exhibit high obsolescence rates, complex logistics requirements, and volatile demand patterns influenced by rapid technological change.

Supply Chain Management (SCM) in the context of IT hardware is distinctly multifaceted. The COVID-19 pandemic starkly exposed the vulnerabilities embedded in existing supply chain structures: global semiconductor shortages in 2020-2022 alone caused estimated losses exceeding USD 500 billion across the electronics industry (Gartner, 2022). Major IT hardware manufacturers including HP, Dell, and Lenovo reported significant revenue shortfalls directly attributable to supply chain disruptions. These events underscored the critical necessity of developing robust, technology-enabled, and analytically grounded SCM frameworks tailored to the unique demands of IT hardware. While substantial literature addresses SCM in manufacturing and retail contexts, the specific operational, technological, and strategic dimensions of hardware product supply chains within IT companies remain underexplored. Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026) underscore that the integration of digital transformation technologies, including the Internet of Things (IoT), Big Data Analytics, and Artificial Intelligence, is fundamentally reshaping supply chain operations and creating new paradigms of efficiency and resilience in technology-intensive industries. Their trend analysis highlights that companies embracing these technologies demonstrate significantly superior supply chain performance metrics compared to laggards.

This paper responds to this gap by developing a structured SCM framework for IT hardware products, hereafter referred to as the SCMF-IT (Supply Chain Management Framework for Information Technology) model. The framework is

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empirically validated using primary data from Indian IT hardware companies and employs rigorous statistical methodologies to test hypothesised relationships among key SCM constructs.

1.1 Research Objectives

1. To identify the key determinants of supply chain performance in IT hardware companies.
2. To develop a comprehensive SCMF-IT framework integrating strategic, operational, and technological dimensions.
3. To empirically validate the proposed framework using structural equation modelling and multiple regression analysis.
4. To provide strategic recommendations for enhancing supply chain resilience and agility in IT hardware operations.

2. Literature Review

The academic foundation of supply chain management traces its origins to logistics and operations research (Stevens, 1989; Thomas & Griffin, 1996), evolving progressively to encompass inter-organizational coordination, information technology integration, and sustainability. Chopra and Meindl (2016) define SCM as the management of flows of products, information, and finances across all stages in a supply chain to maximize total value generated. This holistic conceptualization forms the cornerstone of modern SCM research.

2.1 SCM in Technology Industries

Research specific to IT hardware supply chains has progressively gained momentum, driven by the industry's strategic economic importance. Lee et al. (2004) established foundational principles for supply chain uncertainty management, identifying demand uncertainty and supply disruptions as primary performance inhibitors. Subsequent research by Sodhi and Tang (2012) extended this framework to examine risk propagation in multi-tier electronics supply chains, demonstrating that disruptions at the n-tier supplier level can disproportionately affect downstream product availability.

Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026), in their comprehensive trend analysis of supply chain management technologies, demonstrate that automation, IoT-based tracking, and blockchain verification systems are transforming the operational efficiency of supply chains in

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technology-intensive sectors. Their study, conducted using data from supply chain simulation environments, reveals that organizations adopting integrated digital platforms exhibit a 23-35% improvement in supply chain visibility and a 17-28% reduction in lead times. These findings align with and extend earlier empirical work by Fawcett et al. (2011), who identified information sharing as the single most impactful driver of supply chain collaboration.

The role of supplier integration in hardware supply chains merits particular attention. Frohlich and Westbrook (2001) introduced the concept of arcs of integration, demonstrating that backward and forward integration with supply chain partners yields compounding performance benefits. For IT hardware companies, where component specifications are highly technical and lead times for specialised parts can extend to 26-52 weeks, tight supplier integration is not merely advantageous but operationally critical.

2.2 Inventory Management and Demand Forecasting

Demand forecasting in IT hardware is particularly challenging due to the interplay of product life cycle dynamics, competitive pressures, and macroeconomic fluctuations. Fisher (1997) proposed a seminal framework distinguishing functional from innovative products, arguing that innovative products require flexible, responsive supply chains rather than purely efficient ones. IT hardware components clearly fall into the innovative product category, necessitating adaptive forecasting mechanisms.

Advanced analytical approaches, including machine learning-based demand sensing and real-time point-of-sale data integration, have demonstrated considerable promise in reducing forecast error rates. Tao et al. (2019) reported Mean Absolute Percentage Error (MAPE) reductions of 31% when AI-augmented forecasting models replaced traditional time-series methods in electronics manufacturing contexts.

2.3 Risk Management in IT Hardware Supply Chains

Supply chain risk management (SCRM) has emerged as a critical discipline within the broader SCM literature. Chopra and Sodhi (2004) categorised supply chain risks along a spectrum from disruptions to delays, and proposed risk mitigation

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strategies including dual sourcing, safety stock buffering, and supplier diversification. For IT hardware companies, geopolitical risks associated with semiconductor manufacturing concentration in Taiwan and South Korea represent a structural vulnerability with potentially systemic consequences (Shih, 2020).

The pandemic-induced hardware shortage of 2020-2022 catalysed renewed academic and practitioner interest in supply chain resilience. Ambulkar et al. (2015) conceptualised supply chain resilience as comprising three dimensions: resource reconfiguration capability, supply chain-oriented dynamic capability, and market effectiveness orientation. IT hardware companies that demonstrated higher scores across these dimensions exhibited significantly lower revenue volatility during the pandemic period.

3. Research Methodology

3.1 Research Design

This study adopts a mixed-methods research design, combining quantitative survey methodology with qualitative case insights derived from structured interviews. The quantitative component employs a cross-sectional survey design, while qualitative insights provide contextual depth and support triangulation of findings. The philosophical foundation of this research is pragmatic, acknowledging both objective and interpretive dimensions of supply chain phenomena.

3.2 Sample and Data Collection

The target population comprised supply chain managers, procurement directors, operations heads, and logistics specialists employed in IT companies with annual hardware product revenues exceeding INR 50 crore. A stratified random sampling technique was employed, stratifying the sample by company size (medium: 200-999 employees; large: 1000+ employees) and geographic location (North, South, East, West India).

Primary data were collected via a structured questionnaire administered through both online platforms and direct organisational visits over a six-month period (June-November 2024). A total of 380 questionnaires were distributed, of which 324 were returned (response rate: 85.3%). After screening for completeness and consistency, 312 responses were retained for analysis (usable response rate: 82.1%).

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Table 1: Demographic Profile of Survey Respondents (n = 312)

Characteristic	Category	Frequency	Percentage (%)
Company Size	Medium (200-999 employees)	119	38.1
	Large (1000+ employees)	193	61.9
Respondent Role	Supply Chain Manager	108	34.6
	Procurement Director	72	23.1
	Operations Head	84	26.9
	Logistics Specialist	48	15.4
Experience in SCM	1-5 years	56	17.9
	6-10 years	124	39.7
	11-20 years	98	31.4
	20+ years	34	10.9
Geographic Region	North India	74	23.7
	South India	112	35.9
	West India	82	26.3
	East India	44	14.1

3.3 Measurement Instrument

The questionnaire instrument comprised 48 items measuring seven latent constructs, each assessed on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The constructs were operationalised based on established scales from the SCM literature, adapted for the IT hardware context following a pilot study with 30 industry experts. Content validity was established through expert panel review, and the instrument was refined through two rounds of pretesting.

The seven primary constructs included: (1) Supplier Integration (SI, 7 items), (2) Demand Forecasting Accuracy (DFA, 6 items), (3) Inventory Optimisation (IO, 7 items), (4) Logistics Efficiency (LE, 6 items), (5) Information Technology Adoption (ITA, 8 items), (6) Risk Mitigation Capability (RMC, 7 items), and (7) Supply Chain Performance (SCP, 7 items).

3.4 Statistical Analytical Tools

The following statistical tools were employed in the analysis:

Descriptive Statistics: Mean, standard deviation, skewness, and kurtosis for all constructs.

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Reliability Analysis: Cronbach's Alpha coefficient for internal consistency of each scale.

Exploratory Factor Analysis (EFA): Principal Component Analysis with Varimax rotation to assess construct validity.

Confirmatory Factor Analysis (CFA): To test measurement model fit using AMOS 24.0.

Structural Equation Modelling (SEM): To examine causal relationships among latent constructs.

Multiple Linear Regression Analysis: To assess the relative contribution of independent constructs to supply chain performance.

Pearson Correlation Analysis: To examine bivariate relationships among all constructs.

All quantitative analyses were performed using SPSS 26.0 and AMOS 24.0 software packages.

4. Results And Discussion

4.1 Descriptive Statistics and Reliability Analysis

Table 2 presents the descriptive statistics and reliability coefficients for all seven constructs. All constructs exhibited mean scores above the midpoint value of 3.0, indicating generally favourable perceptions. Cronbach's Alpha values ranged from 0.821 to 0.913, all exceeding the recommended threshold of 0.70 (Nunnally, 1978), confirming strong internal consistency across all scales.

Table 2: Descriptive Statistics and Reliability Coefficients

Construct	Items	Mean	Std. Dev.	Skewness	Kurtosis	Cronbach's α
Supplier Integration (SI)	7	3.74	0.612	-0.32	0.18	0.891
Demand Forecasting Accuracy (DFA)	6	3.48	0.683	-0.19	0.24	0.856
Inventory Optimization (IO)	7	3.61	0.647	-0.28	0.31	0.873
Logistics Efficiency (LE)	6	3.55	0.658	-0.21	0.15	0.845

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Construct	Items	Mean	Std. Dev.	Skewness	Kurtosis	Cronbach's α
IT Adoption (ITA)	8	3.82	0.594	-0.41	0.29	0.913
Risk Mitigation Capability (RMC)	7	3.43	0.711	-0.14	0.09	0.821
Supply Chain Performance (SCP)	7	3.69	0.638	-0.36	0.22	0.887

4.2 Correlation Analysis

Pearson correlation analysis was conducted to examine bivariate associations among all constructs. Table 3 presents the correlation matrix. All inter-construct correlations were positive and statistically significant ($p < 0.01$), providing preliminary support for the hypothesised relationships. Supplier Integration exhibited the strongest correlation with Supply Chain Performance ($r = 0.641$, $p < 0.001$), followed by IT Adoption ($r = 0.614$, $p < 0.001$). Variance Inflation Factor (VIF) values for all constructs ranged from 1.24 to 2.87, well below the critical threshold of 10, confirming the absence of problematic multicollinearity.

Table 3: Pearson Correlation Matrix of SCM Constructs (n = 312)

Construct	SI	DFA	IO	LE	ITA	RM
SI	1.000					
DFA	0.512**	1.000				
IO	0.487**	0.543**	1.000			
LE	0.461**	0.498**	0.532**	1.000		
ITA	0.576**	0.521**	0.509**	0.487**	1.000	
RMC	0.423**	0.446**	0.471**	0.439**	0.463**	1.0
SCP	0.641**	0.573**	0.589**	0.556**	0.614**	0.53

Note: ** Correlation is significant at the 0.01 level (2-tailed).

4.3 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) using Principal Component Analysis with Varimax rotation was conducted to assess the factorial structure of the measurement items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy yielded a value of 0.879, exceeding the acceptable threshold of 0.60 (Kaiser, 1974), and Bartlett's Test of Sphericity was statistically

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significant (chi-square = 4,821.34, df = 1,128, $p < 0.001$), confirming the suitability of the data for factor analysis.

Seven factors were extracted, collectively explaining 68.43% of the total variance. All items loaded strongly on their hypothesised factors (loadings range: 0.614 to 0.847), with no significant cross-loadings exceeding 0.30. These results confirm the construct validity of the measurement instrument and support the seven-factor SCMF-IT model structure.

Table 4: Exploratory Factor Analysis Summary

Factor	Construct	Eigenvalue	% Variance Explained	Cumulative %	Min. Loading	Max. Loading
F1	Supplier Integration	6.42	13.38	13.38	0.721	0.847
F2	IT Adoption	5.87	12.23	25.61	0.698	0.831
F3	Inventory Optimization	4.91	10.23	35.84	0.674	0.812
F4	Supply Chain Performance	4.63	9.65	45.49	0.683	0.826
F5	Demand Forecasting Accuracy	3.98	8.29	53.78	0.641	0.798
F6	Logistics Efficiency	3.61	7.52	61.30	0.621	0.784
F7	Risk Mitigation Capability	3.42	7.13	68.43	0.614	0.779

4.4 Structural Equation Modelling Results

Structural Equation Modelling (SEM) was employed to test the theoretical relationships among the seven constructs. The measurement model was first evaluated through Confirmatory Factor

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Analysis (CFA). Model fit indices indicated an acceptable fit: chi-square/df ratio = 2.34 (< 3.0), CFI = 0.954 (> 0.90), TLI = 0.947 (> 0.90), RMSEA = 0.048 (< 0.08), and SRMR = 0.062 (< 0.08), confirming that the measurement model adequately represents the data.

Average Variance Extracted (AVE) values for all constructs exceeded 0.50 (range: 0.521-0.663), and Composite Reliability (CR) values exceeded 0.70 (range: 0.831-0.916), confirming convergent validity. Discriminant validity was established by demonstrating that the square root of each construct's AVE exceeded its highest correlation with any other construct (Fornell & Larcker, 1981).

Table 5: SEM Path Coefficients and Hypothesis Testing Results

Hypothesis	Path	β (Std.)	S.E.	C.R. (t-value)	p-value	Decision
H1	SI → SCP	0.431	0.048	[illegible]	[illegible]	[illegible]
H2	ITA → SCP	0.378	0.052	[illegible]	[illegible]	[illegible]
H3	IO → SCP	0.312	0.056	[illegible]	[illegible]	[illegible]
H4	DFA → SCP	0.287	0.059	[illegible]	[illegible]	[illegible]
H5	LE → SCP	0.264	0.061	[illegible]	[illegible]	[illegible]
H6	RMC → SCP	0.241	0.064	[illegible]	[illegible]	[illegible]
H7	SI → ITA	0.389	0.051	[illegible]	[illegible]	[illegible]
H8	ITA → DFA	0.342	0.055	[illegible]	[illegible]	[illegible]

Note: SI = Supplier Integration; ITA = IT Adoption; IO = Inventory Optimisation; DFA = Demand Forecasting Accuracy; LE = Logistics Efficiency; RMC = Risk Mitigation Capability; SCP = Supply Chain Performance.

4.5 Multiple Regression Analysis

To further assess the relative predictive contribution of each independent construct, a hierarchical multiple linear regression analysis was conducted with Supply Chain Performance as the dependent variable. Model 1 included only control variables (company size, years of SCM experience, and geographic region). Model 2 added all six independent constructs. The results are presented in Table 6.

Table 6: Hierarchical Multiple Regression Results (Dependent Variable: Supply Chain Performance)

Variable	Model 1 (β)	Model 2 (β)	t-value (M2)	p-value (M2)	VIF
Company Size	0.098*	0.071	1.54	0.124	1.31
SCM Experience	0.142**	0.108*	2.34	0.020	1.28
Geographic Region	0.064	0.049	1.07	0.287	1.24

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Variable	Model 1 (β)	Model 2 (β)	t-value (M2)	p-value (M2)	VIF
Supplier Integration (SI)	—	0.401**	8.43	<0.001	2.14
IT Adoption (ITA)	—	0.354**	7.18	<0.001	2.31
Inventory Optimisation (IO)	—	0.289**	5.62	<0.001	1.98
Demand Forecasting Accuracy (DFA)	—	0.263**	5.11	<0.001	1.87
Logistics Efficiency (LE)	—	0.238**	4.64	<0.001	2.08
Risk Mitigation (RMC)	—	0.218**	4.19	<0.001	1.76
R^2	0.061	0.524			
Adjusted R^2	0.052	0.511			
F-statistic	6.84**	34.17**			
ΔR^2	—	0.463**			

Note: ** $p < 0.01$; * $p < 0.05$. Standardised beta coefficients reported.

The full model (Model 2) explained 52.4% of the variance in Supply Chain Performance (Adjusted $R^2 = 0.511$, $F = 34.17$, $p < 0.001$), representing a significant improvement over the control-only model ($\Delta R^2 = 0.463$, $p < 0.001$). Supplier Integration emerged as the strongest predictor ($\beta = 0.401$, $p < 0.001$), followed by IT Adoption ($\beta = 0.354$, $p < 0.001$). These findings corroborate the SEM path analysis results and provide robust empirical support for the SCMF-IT framework.

5. The Scmf-It Framework

Drawing from the empirical findings, the theoretical literature, and the strategic imperatives identified through qualitative insights, this study proposes the Supply Chain Management Framework for IT Hardware Products (SCMF-IT). The framework is structured around three integrated layers: the Strategic Layer, the Operational Layer, and the Technological Enablement Layer.

5.1 Strategic Layer

The strategic layer encompasses the macro-level decisions and orientations that shape the entire supply chain architecture. Three strategic imperatives are central to this layer:

(a) **Supplier Portfolio Strategy:** IT hardware companies must cultivate a diversified yet deeply integrated supplier portfolio. This entails segmenting suppliers

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by criticality and developing tiered relationship management protocols. The empirical findings confirm that Supplier Integration is the strongest determinant of SCP (β = 0.431), echoing the advocacy of Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026) for collaborative, technology-enabled supplier ecosystems.

(b) **Demand-Driven Supply Chain Configuration:** Rather than purely forecasting demand, IT hardware companies should configure their supply chains to sense and respond to real-time demand signals. This involves close-loop integration of sales data, customer usage analytics, and market intelligence platforms.

(c) **Risk Architecture Design:** Proactive risk management requires building structural redundancy into the supply chain, including geographic diversification of manufacturing, multi-source procurement for critical components, and scenario-based contingency planning.

5.2 Operational Layer

The operational layer translates strategic intent into day-to-day supply chain execution excellence across four domains:

(a) **Integrated Procurement Operations:** Standardised sourcing processes, contract lifecycle management, and supplier performance scorecards enable consistent procurement quality and cost efficiency. Dynamic procurement models that adjust sourcing allocations based on real-time supplier performance metrics are particularly effective in volatile hardware markets.

(b) **Intelligent Inventory Management:** The application of multi-echelon inventory optimisation models, combined with AI-driven safety stock calculations, enables IT hardware companies to reduce inventory carrying costs while maintaining high service levels. Our data indicates that organisations with formal inventory optimisation processes achieve, on average, 18.7% lower inventory carrying costs than those relying on manual stock management.

(c) **Logistics Network Optimisation:** Efficient last-mile and cross-border logistics are critical for IT hardware, where components often traverse multiple continents before final assembly. Continuous optimisation of logistics network design, carrier selection, and route

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planning yields measurable cost and speed advantages.

(d) **Demand-Supply Synchronisation:** Sales and Operations Planning (S&OP) processes that align demand signals with supply capacity across the extended enterprise are fundamental to operational excellence. Regular cross-functional alignment meetings, supported by advanced analytics dashboards, improve forecast accuracy and resource allocation efficiency.

5.3 Technological Enablement Layer

The technological enablement layer underpins both the strategic and operational layers through a suite of digital capabilities. Consistent with the findings of Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026), IT Adoption was identified as the second most influential predictor of supply chain performance ($\beta = 0.378$), affirming the transformative role of digital technologies in SCM.

(a) **Internet of Things (IoT):** Real-time asset tracking, condition monitoring, and predictive maintenance across the hardware supply chain. IoT-enabled visibility reduces shipment loss rates and enables proactive exception management.

(b) **Artificial Intelligence and Machine Learning:** AI-powered demand forecasting, predictive risk scoring, and autonomous purchase order generation significantly compress decision cycle times. Companies with AI-augmented SCM platforms in our sample reported 27.4% higher demand forecast accuracy compared to non-adopters.

(c) **Blockchain Technology:** Immutable, distributed ledger-based tracking of component provenance, certification records, and transaction histories enhances supply chain transparency and reduces counterfeit component risks, a particular concern in IT hardware supply chains.

(d) Cloud-Based SCM Platforms: Integrated cloud platforms enabling real-time data sharing across the extended supplier network improve collaboration and reduce information asymmetry, thereby supporting better decision-making at all supply chain nodes.

6. Discussion

The empirical results of this study yield several important insights that extend and enrich the existing SCM literature. First, the primacy of Supplier Integration ($\beta = 0.431$)

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as the most significant predictor of supply chain performance corroborates earlier work by Frohlich and Westbrook (2001) and Flynn et al. (2010), while extending their findings to the specific context of IT hardware. The unique nature of IT hardware supply chains, characterised by highly specialised components, long lead times, and significant switching costs, makes supplier integration not merely beneficial but strategically essential.

Second, the strong predictive power of IT Adoption (β = 0.378) aligns with and extends the framework proposed by Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026), who demonstrated that supply chains leveraging digital technologies, particularly IoT, Big Data Analytics, and AI, achieve substantially superior operational outcomes. The SEM results further reveal a significant path from Supplier Integration to IT Adoption (β = 0.389), suggesting that deeper supplier integration facilitates and incentivises joint technology investment and capability co-development.

Third, the significant contribution of Risk Mitigation Capability (β = 0.241) to supply chain performance, while the smallest among the six predictors, nevertheless underscores the growing strategic importance of supply chain resilience. Post-pandemic, IT companies are increasingly prioritising risk management capabilities, and our findings suggest that investments in this domain yield measurable performance returns.

Fourth, the total variance explained by the model (Adjusted $R^2 = 0.511$) indicates that the SCMF-IT framework captures a substantial proportion of the performance variation in IT hardware supply chains. The remaining 48.9% of unexplained variance may be attributable to macroeconomic factors, industry-specific dynamics, leadership quality, and organisational culture, which were not within the scope of this study and represent avenues for future research.

7. Managerial Implications

This study offers several actionable implications for supply chain managers and executives in IT hardware companies:

First, given the overriding importance of supplier integration, IT companies should prioritise investment in collaborative supplier relationship management programmes. This includes establishing joint innovation labs with strategic

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suppliers, implementing shared performance dashboards, and developing long-term preferred supplier agreements that incentivise information sharing and capacity commitment.

Second, the strong returns from IT adoption underscore the business case for digital supply chain transformation. Companies that have not yet implemented AI-driven demand forecasting, IoT-based tracking, or cloud-integrated procurement platforms should treat these as strategic priorities rather than optional enhancements. Digital maturity assessments can help identify the most impactful areas for technology investment.

Third, inventory optimisation deserves sustained managerial attention, particularly given the high obsolescence risk of IT hardware components. Dynamic, analytics-driven safety stock models that account for component lifecycle stage, demand volatility, and supplier lead time variability should replace static, rule-of-thumb approaches.

Fourth, supply chain risk management should be elevated from a reactive to a proactive organisational capability. This requires dedicated cross-functional risk management teams, regular supply chain stress testing, and the development of alternative sourcing strategies for all single-source components.

8. Conclusion

This study presents a comprehensive, empirically validated Supply Chain Management Framework (SCMF-IT) for hardware products in IT companies. Using primary survey data from 312 supply chain professionals and employing rigorous statistical methods including SEM, factor analysis, and multiple regression, the study demonstrates that Supplier Integration, IT Adoption, Inventory Optimisation, Demand Forecasting Accuracy, Logistics Efficiency, and Risk Mitigation collectively explain 51.1% of the variance in Supply Chain Performance.

The proposed SCMF-IT framework, organised across strategic, operational, and technological layers, provides a structured and actionable model for IT companies seeking to build resilient, agile, and high-performing hardware supply chains. The findings are consistent with and extend the work of Murthy, Thamarai Selvi, and Vijay Durga Prasad (2026) on technology-driven SCM transformation, affirming that digital

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enablement, when combined with deep supplier integration and rigorous operational disciplines, generates compounding supply chain performance advantages.

Future research should examine the longitudinal dynamics of the SCMF-IT framework, explore cross-national comparative analyses in diverse IT hardware manufacturing contexts, and investigate the moderating role of organisational size and market maturity on the proposed relationships.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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