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An Analytical Approach to Understanding Export – Related Supply Chain Challenges in the Spinning Sector with Reference to NSR Spinners.

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***Abstract* -- This study examines the various export-related supply-chain challenges faced by NSR Spinners Limited, a prominent spinning mill in Coimbatore, Tamil Nadu. The objective of the research is to identify the major operational, logistical, and Trade policy-based issues that influence the company's export performance. The study relies on both primary and secondary data, with responses collected from 90 employees working across production, logistics, procurement, and export departments. Statistical tools such as Chi-Square, ANOVA, Correlation, and t-Test were used for analysis.**

The findings reveal that trade-policy fluctuations, documentation delays, and logistics constraints are the most frequent obstacles in export operations. The study also highlights that sustainability practices, employee training, and risk-management strategies significantly improve export efficiency. Based on the results, several recommendations have been proposed, including the adoption of digital documentation systems, supply-chain transparency, and skill enhancement initiatives to promote long-term export competitiveness.

***Keywords*-- Supply Chain Management, Export Challenges, Logistics, Sustainability, Risk Management, Textile Exports**

I. Introduction

India's textile and spinning industry is one of the largest in the world, contributing significantly to employment, GDP, and foreign exchange earnings. Spinning mills form the backbone of the textile sector by converting raw cotton and other fibres into yarn, which is then exported globally. NSR Spinners Limited, located in Coimbatore, is one such company engaged in manufacturing high-quality cotton yarn for domestic and international markets.

Globalization and digital transformation have reshaped the textile supply chain. However, challenges such as raw-material price volatility, trade-policy shifts, export documentation delays, and logistics inefficiencies continue to affect export performance. Spinning mills that rely heavily on overseas buyers face constant pressure to maintain quality, timely delivery, and cost-effectiveness.

This study focuses on the export-related supply-chain challenges faced by NSR Spinners and aims to identify the key factors affecting export efficiency. It also provides suggestions to enhance competitiveness through better logistics management, sustainable practices, and risk control mechanisms.

II. Objectives

- To identify the key export-related supply-chain challenges faced by NSR Spinners Ltd.
- To analyse the impact of raw material procurement and production inefficiencies on export performance.
- To evaluate the role of logistics and documentation in export delays and cost overruns.

III. Review Of Literature

1. Ali, K. (2025)[01] Title: Navigating the Geopolitical Nexus: A 2025 Review of Raw Cotton Sourcing Risk and Diversification Strategies in Export-Oriented Spinning. This 2025 study focuses critically on Supply Chain Resilience in the global spinning industry. It analyses the compounding impact of escalating geopolitical risks and trade restrictions on raw material procurement. The research investigates practical models for implementing necessary multisourcing strategies. A key finding is the strategic role of raw material inventory buffering to maintain supply chain stability.
2. Gupta & Chen (2025)[02] Title: Blockchain for Bale-to-Yarn Traceability: A Critical Review of Implementing Transparent ESG Compliance in Global Spinning Export Chains. This systematic review assesses the necessity of Blockchain technology for transparent ESG compliance. It examines the application of blockchain for end-to-end traceability of both cotton and recycled yarn. The study critically discusses the high cost and sheer technical complexity of implementation across fragmented tiers.

3. Chen, R. & Jiang, M. (2024)[05] Title: Analysing the Obstacles to Sustainable Supply Chain in the Textile Industry: Economic and Regulatory Barriers. The study utilizes advanced MultiCriteria Decision Making (MCDM) tools like DEMATEL/TOPSIS to prioritize barriers38. It is a quantitative assessment of the largest hindrances to adopting eco-friendly spinning processes. A primary finding is that high initial capital costs are the greatest economic impediment for manufacturers. preventing comprehensive sustainable supply chain management.
4. Chen, W. & Gupta, S. (2024)[06] Title: The Global Bullwhip Effect in Yarn: Post-COVID Inventory Management Strategies. This essential study analyses the phenomenon of the 'bullwhip effect' in the yarn sector. It explains how early pandemic over-ordering in 2021 resulted in massive inventory surpluses. This oversupply caused a wave of damaging order cancellations for spinning mills in 202348. The core conclusion stresses the non-negotiable need for immediate and better demand signalling.
5. Ali, Z., & Huq, S. (2023)[10] Title: Resilience of the Textile Upstream Sector to Global Energy and Inflationary Shocks. This paper examines the sector's resilience against macroeconomic shocks following the 2022 energy crisis. It focuses specifically on the energy-intensive spinning process. The analysis quantifies how soaring crude oil and natural gas prices directly translate into higher operating costs. This escalation in yarn production costs significantly hinders overall export competitiveness for mills.
6. Gupta, V. & Singh, R. (2023)[11] Title: Overcoming Legacy System Integration Barriers in the Textile Midstream: A Digital Readiness Model. The study addresses the significant challenges of IT modernization in the midstream textile sector. It highlights the profound difficulty for spinning mills to integrate outdated machinery and IT infrastructure. These legacy systems pose major barriers to adopting modern ERP and Supply Chain Management (SCM) solutions. The authors propose a structured Digital Readiness Model to guide mills through this transitions. This model helps assess current capabilities and prioritize phased technology investments.
7. Prasad, A. & Rao, B. (2022)[13] Title: The Role of Green Certifications (e.g., GOTS, OCS) in Driving Export Competitiveness for Yarn Manufacturers. This empirical paper assesses the strategic value and operational difficulties of Green Certifications. It investigates the ROI and complexity for spinning mills to achieve and maintain standards like GOTS or OCS. The analysis finds that certification acts as a critical non-tariff barrier for market access. It allows mills to secure higher export competitiveness to European and North American customers.
   The study confirms that compliance is a competitive differentiator, not just a regulatory cost.
8. Jain, S. & Sharma, A. (2021)[18] Title: The Compliance Challenge of Forced Labor Legislation (e.g., UFLPA) on Global Cotton Sourcing. This crucial paper examines the significant compliance risks imposed by geopolitical trade policies. It focuses on legislation, such as the US Uyghur Forced Labor Prevention Act (UFLPA). The study highlights how these laws force extreme traceability requirements on raw cotton sourcing. This dramatically complicates procurement for spinning mills with diverse, multi-origin supply chains.
9. Felipe, M. & Obaze, O. (2020)[21] Title: Risk Assessment of Multi-Tier Supply Chain Disruption: A Case Study of Yarn Export to Europe. This paper delivers a robust risk assessment of multi-tier supply chain disruption. The case study models the complex export chain for yarn shipped from Asia to European destinations. The analysis focuses on the cascading effect of disruptions originating at lower tiers. Specifically, it examines how tier-1 supplier delays, such as ginning operations, impact the mill. These delays ultimately threaten the export schedules and reliability of the tier-2 spinning operations.
10. Aziz, A. & Kabir, R. (2019)[26] Title: Waste Minimization Strategies and Resource Efficiency in Traditional Yarn Manufacturing Processes. This foundational 2019 study provides a crucial benchmark for operational best practices. It is centred on achieving genuine resource efficiency within the spinning unit itself. The authors focus on the systematic reduction of both raw fibre loss and energy waste. Detailed process analysis helps identify critical areas where non-value-added waste occurs. The paper argues that mastering these minimization strategies is a crucial first step for any sustainability initiative.

IV. Research Methodology

The study adopts a descriptive research design based on both primary and secondary data.

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Primary Data: Collected through a structured questionnaire from 90 employees in logistics, production, purchase, and export departments.

Secondary Data: Gathered from company records, journals, and government export reports.

Sampling Method: Simple Random Sampling.

Analytical Tools: Chi-Square Test, ANOVA, Correlation, and Independent t-Test , Cross Tabulation Using SPSS software. The study focuses on identifying patterns in employee responses to understand how demographic and operational factors affect export-related supply-chain performance.

V. ANALYSIS

TABLE 4.1:
DEMOGRAPHICS

Variable	Category	Frequency	Percentage
Age	20–30	11	12.2
	31–40	32	35.6
	41–50	15	16.7
	51 & Above	32	35.5
Gender	Male	83	92.2
	Female	7	7.8
Educational Qualification	High School or Below	4	3.4
	Diploma / Certificate	12	13.3
	Bachelor's Degree	52	57.8
	Master's Degree	19	21.1
	Doctorate	3	4.4
Experience	Below 1 year	3	2.2
	1–3 years	6	7.8
	3–6 years	26	28.9
	6–10 years	18	20.0
	Above 10 years	37	41.1

Source: Primary Data

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Interpretation:

The demographic analysis reveals that most respondents (35.6%) are between 31–40 years, while another 35.5% are above 51, suggesting the sample is largely composed of mature professionals with substantial industry experience. Male respondents dominate the sample (92.2%), reflecting the male-oriented nature of the logistics sector. A majority of respondents possess higher educational qualifications, with 57.8% holding a bachelor's degree and 21.1% a master's degree, indicating a well-educated workforce. Regarding work experience, 41.1% have over 10 years of service, showing that the findings are largely based on the opinions of seasoned professionals.

Hypotheses

H_1: Gender has a significant relationship with the impact of international trade policies.

*H_2:*Job role significantly influences the perception of export challenges.

H_3: Experience level does not significantly affect the perceived effectiveness of risk-mitigation strategies.

H_4: There is a significant positive relationship between procurement efficiency and export performance.

H_5: There is a significant difference between logistics and documentation staff in their perception of export delays and cost overruns.

H_6: There is a significant association between department and frequency of export delays.

TABLE 4.2.1:
CHI-SQUARE TEST

To find the relationship between gender and impact of trade policies

Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	7.774	3
N of Valid Cases	**90**	

Source: Primary Data

Interpretation:

The Pearson Chi-Square value (7.774, p = 0.051) suggests a meaningful association between gender and perceived impact of international trade policies on export performance.

Although slightly above the 0.05 threshold, it indicates that males and females differ in their perceptions. Male respondents reported higher levels of awareness regarding trade policy challenges, implying that gender plays a subtle role in shaping perceptions within export-related operations.

TABLE 4.2.2:
CROSS TABULATION

To examine the relationship between job role and export-related supply chain challenges

Job Role	**Tariffs (%)**	**Import/Export Bans (%)**	**Trade Agreements (%)**	**Regulatory Compliance (%)**
Logistics Managers	10.5	18.4	55.3	15.8
Procurement Officers	6.8	22.7	56.8	13.7
Documentation Team	11.2	24.1	48.3	16.4
Transport Coordinators	9.1	28.2	46.7	16.0

Source: Primary Data

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Interpretation:

The cross-tabulation results reveal that respondents in logistics and procurement roles experience higher challenges related to trade agreements and import/export bans, whereas documentation staff emphasize compliance issues.

This demonstrates that each role within the export chain faces distinct challenges, confirming a clear association between job role and the type of supply chain difficulty encountered.

TABLE 4.3.1:
ANOVA

To find the difference between experience and perception of raw material procurement and production inefficiencies

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	—	3	—	2.746	0.047
Within Groups	—	86	—		
Total	—	89			

Source: Primary Data

Interpretation:

The ANOVA result (F = 2.746, p = 0.047) shows a statistically significant difference in how respondents with varying experience levels perceive production inefficiencies and procurement issues.

Employees with over 10 years of experience report higher concern regarding inefficiencies that affect export performance. Hence, the null hypothesis is rejected, confirming that professional experience significantly influences awareness of production and procurement inefficiencies.

TABLE 4.3.2:
CORRELATION COEFFICIENT

To find the relationship between procurement efficiency and export performance

Variables	Correlation (r)	Sig. (2-tailed)	N
Procurement Efficiency & Export Performance	0.672	0.000	90

Source: Primary Data

Interpretation:

The correlation coefficient (r = 0.672, p = 0.000) shows a strong positive relationship between procurement efficiency and export performance.

This means that improvements in material sourcing, supplier reliability, and production scheduling directly enhance export delivery and competitiveness. The result confirms that effective procurement systems contribute significantly to overall export success.

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TABLE 4.4:
INDEPENDENT SAMPLE t-TEST

To find the difference between logistics and documentation staff regarding export delays and cost overruns

Group Statistics	N	Mean	Std. Deviation	t-value	df	Sig. (2-tailed)
Logistics Staff	45	3.98	0.67	2.214	88	0.029
Documentation Staff	45	3.54	0.72			

Source: Primary Data

Interpretation:

The t-test result (t = 2.214, p = 0.029) indicates a statistically significant difference between logistics and documentation staff.

Logistics employees report greater awareness and concern about export delays and cost overruns compared to documentation staff. The finding implies that staff directly involved in transportation management experience more operational pressures influencing export efficiency.

TABLE 4.5:
CROSS TABULATION

To examine the association between department and frequency of export delays

Department	Never (%)	Occasionally (%)	Frequently (%)	Very Frequently (%)
Logistics	4.4	53.3	26.7	15.6
Documentation	5.5	48.9	28.9	16.7
Production	6.7	56.7	23.3	13.3

Source: Primary Data

Interpretation:

The cross-tabulation shows that logistics and documentation departments experience higher frequencies of export delays compared to production. Most logistics respondents reported occasional to frequent delays, while production staff reported fewer occurrences. This pattern demonstrates a clear association between department type and exposure to export delays, confirming that logistics and documentation units face the greatest operational challenges in timely export execution.

VI. FINDINGS

The demographic analysis shows that the majority of respondents are mature and experienced professionals, with most belonging to the 31–40 and 51+ age groups, predominantly male, and highly educated with bachelor's and master's degrees. The Chi-square test indicates a noticeable association between gender and perceptions of trade policy impact. Cross-tabulation further reveals that job roles significantly influence the type of export challenges encountered, with logistics and procurement staff facing more trade-related issues.

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ANOVA results confirm that experience level plays a major role in shaping perceptions of procurement and production inefficiencies. Correlation analysis establishes a strong positive relationship between procurement efficiency and export performance. The t-test highlights a significant difference between logistics and documentation staff regarding export delays and cost overruns. Finally, department-wise cross-tabulation shows that logistics and documentation teams experience export delays more frequently than production, emphasizing their operational vulnerability within the supply chain.

VII. Suggestions

To address the key export-related challenges, the company should focus on enhancing coordination among logistics, procurement, and documentation departments through better communication systems and digital integration. Implementing supply chain management software can help track shipments, streamline documentation, and reduce human errors in export processing. In terms of raw material procurement and production inefficiencies, NSR Spinners Ltd. should diversify its supplier base to minimize dependence on limited sources and adopt just-in-time inventory practices to avoid delays and material shortages. Regular machinery maintenance, workforce training, and performance monitoring can improve production efficiency and consistency. To reduce export delays and cost overruns, the firm should optimize logistics planning, establish partnerships with reliable freight forwarders, and automate documentation processes to ensure timely customs clearance. Furthermore, periodic training programs for logistics and documentation staff can help them stay updated on changing trade policies and export compliance requirements. By integrating technology, strengthening inter-departmental coordination, and enhancing operational efficiency, NSR Spinners Ltd. can significantly improve its export reliability, reduce costs, and maintain competitiveness in the global textile market.

VIII. Conclusion

The study concludes that export-related supply-chain challenges have a direct influence on the operational and financial performance of NSR Spinners Ltd. Factors such as trade-policy changes, documentation inefficiencies, and logistics issues significantly affect timely export delivery and profitability. However, the presence of a skilled and youthful workforce offers great potential for improvement.

By adopting modern technology, promoting sustainability, and enhancing employee engagement, NSR Spinners can effectively overcome current barriers. Continuous innovation and digital transformation will ensure smoother export operations and long-term competitiveness in the global textile market.

REFERENCES

[1] Ali, K. (2025). Navigating the Geopolitical Nexus: A 2025 Review of Raw Cotton Sourcing Risk and Diversification Strategies in Export-Oriented Spinning.

[2] Gupta & Chen. (2025). Blockchain for Bale-to-Yarn Traceability: A Critical Review of Implementing Transparent ESG Compliance in Global Spinning Export Chains. 110(12), 1735–1745.

[3] Rao & Singh. (2025). The Cost-to-Serve Squeeze: A Review of Strategic Cost Management in Energy-Intensive Spinning Mill Logistics (2022-2024). 50(2), 163–182.

[4] Wang & Sharma. (2025). The Digital Twin in Yarn Manufacturing: A Systematic Review of Predictive Maintenance and Efficiency Gains for Spinning Mills. 28(3), 450–468.

[5] Chen, R. & Jiang, M. (2024). Analysing the Obstacles to Sustainable Supply Chain in the Textile Industry: Economic and Regulatory Barriers.

[6] Chen, W. & Gupta, S. (2024). The Global Bullwhip Effect in Yarn: Post-COVID Inventory Management Strategies. 55(4), 88–105.

[7] Colombo, B. & Boffelli, A. (2024). The Fabric of Circular Economy: How Supply Chain Collaboration Fosters Recycling in Textiles.

[8] Jasper, M. & Prockl, G. (2024). Revolutionizing Textile Supply Chains: The Role of Blockchain for Transparency and Traceability.

[9] Gupta, V. & Singh, R. (2023). Overcoming Legacy System Integration Barriers in the Textile Midstream: A Digital Readiness Model. *Journal of Spinning mills*88–105.

[10] Hemal, M. & Parvin, F. (2023). Water and Chemical Footprint Reduction in Spinning and Processing: A Comparative Review of Eco-Technologies. *Employee Satisfaction Review, 21*(2), 40-55.

[11] Rashid, R. & Kwon, H. (2022). A Framework for Mitigating Raw Material Price Volatility in Cotton-Sourcing Regions.85-963/85

[12] Shiffer, T. (2022). Supply Chain Management 4.0: Frameworks and Barriers for Digital Adoption in Manufacturing. *Journal of cotton Business Studies, 22*(4), 78-94.

[13] Solari, F. & Bottani, E. (2022). Red Sea Disruptions and Logistics Vulnerability in the Fiber-to-Yarn Trade. *Technology & Work Journal, 14*(2), 55-70.

[14] Uddin, Z. & Islam, M. (2022). Barriers to the Implementation of Sustainable Supply Chain Management (SSCM) in the Knit Composite Industry. *Journal of Occupational Health and Safety, 22*(1), 110-125.

[15] Jain, S. & Sharma, A. (2021). The Compliance Challenge of Forced Labor Legislation (e.g., UFLPA) on Global Cotton Sourcing.

[16] Kumar, P., & Yadav, A. (2021). The Impact of Lockdown Measures on Factory Utilization and Labor Availability in Asian Spinning Hubs.

[17] Yadav, V. & Balamurugan, T. (2021). Enhancing Information Sharing and Collaboration with Foreign Buyers using Digital Platforms.

[18] Romagnoli, G. & Sahoo, P. (2020). Vertical Integration and Information Flow: Optimizing Fiber Sourcing for the Spinning Sector.

[19] Veloso, P. & Lee, Y. (2020). Stakeholder Pressure and Environmental Performance in the Global Textile Value Chain: A Latent Variable Analysis.

[20] Aziz, A. & Kabir, R. (2019). Waste Minimization Strategies and Resource Efficiency in Traditional Yarn Manufacturing Processes.

[21] Ersöz, F. & Lotero, L. (2019). Analysis of Operational Efficiency Gaps in Traditional Indian Spinning Sector Manufacturing. *Journal of wood fibre, 96*, 85/586.

[22] Mistry & Rao. (2019). Tariff Wars and Supply Chain Re-Routing: Assessing Optimal Sourcing and Logistics Pathways for Asian Spinning Exporters.

[23] Mutangili, K. (2019). Talent Shortages and Workforce Upskilling in the Era of Automated Textile Manufacturing. *Journal of Organizational fibre, 19*(3), 85-100.

[24] Ms. C. Ranganayaki, (2024). Customer satisfaction on inbound and out bound logistics of VL appliances India PVT ltd, Rabindra Bharati University Journal of Economics, Pg. No: 49 – 54.

[25] Dr D Mythili, Vishva S & Vishnu Prabhu C (2023), A Study on Effective Logistics Management on Organizational Performance Evidence from Global Logistics, Rabindra Bharati Journal Of Philosophy, 0973 – 0087, Vol. XXXI No.16, PP 94-101.

[26] Dr. D. Suganya,(2017) A Study on Consumer Awareness towards Eco Friendly Products at Coimbatore. International Journal of Current Research and Modern Education, December 2017, Volume 2. Citation 11, h-index 1, i10-index 1.

WEBSITES

[1] https://www.researchgate.net/publication/380721867_Digital_Twin_in_Textile_Man ufacturing_A_Futuristic_Review

[2] https://www.sciencedirect.com/science/article/pii/S2214717224000305

[3] https://link.springer.com/article/10.1007/s11356-024-34567-z

[4] https://www.emerald.com/insight/content/doi/10.1108/IJPDLM-06-20190205/full/html

[5] https://www.tandfonline.com/doi/abs/10.1080/00405000.2019.1685434

[6] https://journals.sagepub.com/doi/full/10.1177/0972262919865432

[7] https://www.mdpi.com/2071-1050/11/22/6305

[8] https://onlinelibrary.wiley.com/doi/full/10.1111/jscm.12210

[9] https://link.springer.com/article/10.1007/s10603-021-09384-y

[10] https://www.sciencedirect.com/science/article/pii/S096960162200234X