South India Journal of Social Sciences, March'25, Vol. 23 - No. 1
ISSN : 0972-8945 (Print) | 3048-6165 (Online)

FROM DATA TO DELIVERY: HOW AI IS STREAMLINING APPAREL SUPPLY CHAINS

Dr. M.Kowsalya * **Ms.V.Nandhini** * *

INTRODUCTION:

The apparel sector plays a crucial role in international trade, influenced by its capacity to respond to changing consumer preference and advancements in technology. In recent years, Artificial Intelligence (AI) has taken center stage as a transformative force in the industry, revolutionizing supply chain processes, optimizing inventory management, and enhancing overall operational efficiency. However, embracing AI comes with its own set of difficulties, particularly for exporters navigating complex supply chain networks. The primary motivation for this study is to identify and address the problems exporters face in integrating AI into the apparel industry's supply chain. These challenges encompass issues such as the lack of a governance framework, data privacy concerns, high implementation costs, and opposition to change within organizations. Through and examination of these challenges, this study seeks to offerpractical insights for stakeholders in the apparel sector.

OBJECTIVES OF THE STUDY:

¢ To explore how AI influences the effectiveness of supply chain operations.

¢ To examines thedifficultiesencountered by exporters inimplementing AI within the apparel sector.

STATEMENT OF THE PROBLEM:

The research seeks toinvestigate the difficulties faced by exporters when implementing Artificial Intelligence (AI) technologies in the apparel industry. As the industry grows, various hurdles such as industrial organization issues, raw material sourcing challenges, labor shortages, electricity deficits, export procedures, workforce management, government policies, and technological gaps hinder smooth adoption of AI. This research addresses these issues, providing insights into how AI can help alleviate some of these challenges while improving supply chain efficiency. The study further investigates how the incorporation of AI technologies influences the productivity and competitiveness of apparel exporters in both local and international markets.

* Assistant Professor, Department of Commerce with International Business, Dr.N.G.P. Arts and Science College, Coimbatore., India.

** M.Com (IB), Department of Commerce with International Business, Dr.N.G.P. Arts and Science College, Coimbatore., India.

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

RESEARCH METHODOLOGY:

The research utilized a simple random sampling method to collect data from 50 respondents. The obtained data were examined using simple percentage analysis, factor analysis and structural equation modelling.

REVIEW OF THE LITERATURE:

1. Sukhuir Singh (2024) examined in his study of artificial intelligence in the fashion and apparel industry and the goal of the study is advancement of AI in apparel and fashion industry in future. The paper focusing on variables such as Supply Chain Optimization, Predictive Analytics, AI-Driven Demand Forecasting, Supply Chain Efficiency and Sustainability, Consumer Insights and market trends. The study reveals AIs potential to enhance the consumer experience and concludes that AI should be integrated into the fashion and apparel sector.
2. DjarotHindarto (2024)The study analyzed "Building the Future of the Apparel Industry: The Digital Revolution in Enterprise Architecture," with objectives focused on achieving positive outcomes from AI adoption in the apparel industry. Using a qualitative methodology, the study found that AI adoption provides industry stakeholders with a strategic perspective for formulating adaptive business strategies. The study concluded that digital technologies are transforming the business landscape.
3. Moses Opoku, Dickson Adom, Sarah Baiden and Diana Oppong, with Pamela Isemikon and Cyril Eguare (2024)stated that the AI Technologies in Fashion: Garment Construction in Kumasi, Ghana, this study aims to Investigate AI's impact on Ghana's fashion industry through various AI applications. The methods used are Quantitative data: surveys, Qualitative data: interviews and the findings of the study is AI technologies enhance efficiency, productivity and quality in garment construction and concludes that AI transforms garment construction, blending modernity with heritage techniques.
4. Amara Adeikunle (2024) in study of Application of AI and Digital Technologies in Fashion Design and Innovation in Nigeria. The aim of the study is to Investigate AI and digital technology applications and the methodology used is desk methodology (secondary data collection) and the findings of the study is AI fosters efficiency, sustainability, customization and customer engagement in fashion industry and it concludes that AI and digital technologies signify a paradigm shift with profound implications.
5. Pooja Goel, Kala Mahadevan and Krunal K. Punjani (2023) explored augmented reality (AR) and virtual reality (VR) applications in the apparel industry and the study aims to extant literature on AR and VR in apparel industry using network visualization techniques and the study uses 239 research articles from Scopus database and the

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

study found that network visualization exercise also revealed significant collaboration between different countries and concludes that research examines trends in global research production in domain of AR and VR in apparel industry.

ANALYSIS AND INTERPRETATION:

Table 1: Profile of the Respondents

S.no	Particulars	Frequency	Percentage
Exporter's Type			
1	Merchant exporter	32	64.0
2	Manufacturing exporter	18	36.0
Size of organization			
1	Small	17	34.0
2	Medium	18	36.0
3	Large	15	30.0
Annual turnover			
1	Less than 5crores	12	24.0
2	100-200	15	30.0
3	201-300	11	22.0
4	Above 300	12	24.0
No of employees employed			
1	Less than 100	13	26.0
2	100-200	15	30.0
3	201-300	11	22.0
4	Above 300	11	22.0
Products produced			
1	Men's garments	13	26.0
2	Women's garments	16	32.0
3	Children's garments	9	18.0
4	Multiple garments	12	24.0
Exporting countries			
1	USA	9	18.0
2	Bangladesh	16	32.0
3	UAE	8	16.0
4	UK	12	24.0
5	Others	5	10.0

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

From the above table 64 percent of the respondent are merchant exporter, while 36percent of the respondents represents medium size organization, 30percent of the respondents have an annual turnover between 100-200 crores, 30percent of the organization employ 100-200 workers, 32percent of the organizations produce women's garments and 32percent of the respondents export their products to Bangladesh.

FACTOR ANALYSIS

Table 2:Total Variance

Initial Eigen values	Rotation Sums of Squared Loadings	Cumulative %
6.139	4.688	23.438
2.946	4.144	44.160
2.907	2.896	58.640
1.600	1.750	67.388
1.221	1.336	74.069

Table 3: Rotated Component Matrix

	Component				
	1	2	3	4	5
Incorporation of AI with existing system is challenging	.948				
Lack of AI governance framework industry is being challenging in the apparel supply chain	.846				
AI will be essential in shaping our future supply chain approach.	.841				
Our order processing and fulfillment times have decreased due to AI implementation	.825				
AI tools have reduced operational costs in our supply chain	.825				
Concern regarding Data security and privacy impede the adoption of AI in our supply chain	.744				
Our organization is aware of AI's potential in enhancing supply chain efficiency		.897			
Our organization plans to expand AI applications in the next 2-3 years		.884			
We possess well defined approach toincorporate AI into our supply chain processes		.840			
AI will improve the sustainability efforts of supply chain		.838			
AI replaces human designers in the apparel supply chain		.756			
AI has optimized inventory management processes			.907		
AI will enable your organisation to respond more quickly to changing market conditions			.868		
High implementation costs are an obstacle to the integration AI in the supply chain			.791		
There is resistance to adopting AI within our organization			.768		
Adequate resources (financial, technological, etc.) are allocated for AI deployment in supply chain management				.820	
AI generated designs enhance creativity in the apparel design				.683	
Our employees are trained or are being trained in using AI tools for supply chain activities				.520	
AI enhances real-time decision making within supply chain operations					.760
AI has improved demand forecasting accuracy in our supply chain					.672
KMO					.707

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

The supply chain efficiency in the apparel industry is grouped into five factors such as AI - Supply Chain Dynamics, AI - Driven Transformation, AI - Adoption challenges, AI -Enabled Preparedness and AI-Driven Decisioning

STRUCTURAL EQUATION MODELING:

The following variables in the structural equation model: Observed and endogenous variables.

Table 4: Summary of variables used for the analysis

Count of variables included in the model	8
Count of variables that observed	5
Count of variables that are not observed	3
Count of exogenous variables	5
Count of endogenous variables	3

Table 5: Regression Coefficients for structural equation modeling

	Estimate	S.E.	C.R.	P
AI – Supply Chain Dynamics <-->AI – Adoption challenges	.628	.153	4.102	***
AI – Supply Chain Dynamics <-->AI -Enabled Preparedness	.117	.140	.837	.402
AI – Driven Transformation <-->Supply Chain Dynamics	.318	.128	2.490	.013
AI – Driven Transformation <-->AI – Adoption challenges	.246	.159	1.548	.122
AI – Driven Transformation <-->AI -Enabled Preparedness	.785	.126	6.232	***
AI-Driven Decisioning <-->AI – Driven Transformation	.088	.164	.538	.590
AI-Driven Decisioning <-->AI – Adoption challenges	.797	.182	4.380	***
AI-Driven Decisioning <-->AI -Enabled Preparedness	.249	.203	1.225	.220

The SEM results indicate significant relationships where p-values are ≤ 0.05. Notably, AI - Supply Chain Dynamics is strongly linked to AI - Adoption Challenges (Estimate = 0.628, $p \leq 0.001$) and AI - Driven Transformation is significantly associated with AI -Enabled Preparedness (Estimate = 0.785, $p \leq 0.001$). However, weaker or non-significant relationships exist between variables like AI - Supply Chain Dynamics and AI -Enabled Preparedness ($p = 0.402$), as well as AI-Driven Decisioning with several constructs ($p > 0.05$), indicating variability in the influence of AI-related factors on supply chain processes.

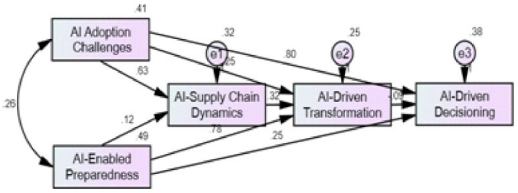

Figure1: Structural equation Modelling

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

FINDING OF THE STUDY:

¢ 64 percent of the respondent are merchant exporter

¢ 36 percent of the respondents represents medium size organization

¢ 30 percent of the respondents have an annual turnover between 100-200 crores

¢ 30% of the apparel industry have 100-200 employees working in the organization

¢ 30 percent of the organization employ 100-200 workers

¢ 32 percent of the organizations produce women's garments

¢ 32 percent of the respondents export their products to Bangladesh.

¢ The supply chain efficiency in the apparel industry are grouped into five factors such as AI - Supply Chain Dynamics, AI - Driven Transformation, AI - Adoption challenges, AI - Enabled Preparedness and AI-Driven Decisioning

SUGGESTIONS:

The study suggests that addressing barriers such as high implementation costs, data privacy concerns, and organizational resistance is critical for successful AI adoption in the apparel supply chain. Companies should focus on employee training, robust cybersecurity measures, and developing clear AI integration strategies. Expanding AI applications, particularly in women's and children's garments, and leveraging AI for inventory optimization and demand forecasting can enhance efficiency and competitiveness. In conclusion, embracing AI technologies is vital for overcoming industry challenges, adapting to market trends, and sustaining a competitive advantage in the global apparel industry.

CONCLUSION:

The study suggests that addressing barriers such as high implementation costs, data privacy concerns, and organizational resistance is critical for successful AI adoption in the apparel supply chain. Companies should focus on employee training, robust cybersecurity measures, and developing clear AI integration strategies. Expanding AI applications, particularly in women's and children's garments, and leveraging AI for inventory optimization and demand forecasting can enhance efficiency and competitiveness. In conclusion, embracing AI technologies is vital for overcoming industry challenges, adapting to market trends, and sustaining a competitive advantage in the global apparel industry.

REFERENCE:

1. Singh, S. (2024). Artificial intelligence in the fashion and apparel industry. Tekstilec, 67(3), 225-240.
2. Hindarto, D. (2024). Building the future of the apparel industry: The digital revolution in enterprise architecture. Sinkron: Jurnal dan Penelitian Teknik.
3. Opoku, M., Dickson, A., Baiden, S., Oppong, D., & Cyril-Egware, P. I. (2024). Exploring the application of artificial intelligence (AI) technologies in the fashion industry: A

ISSN : 0972-8945 (Print) | 3048-6165 (Online)

case of garment construction in Kumasi, Ghana. Sibatik Journal: JurnalIlmiahBidang Sosial, Ekonomi, Budaya, Teknologi, Dan Pendidikan, 3(8), 1015-1028.

4. Adekunle, A. (2024). Application of artificial intelligence and digital technologies in fashion design and innovation in Nigeria. International Journal of Fashion and Design, 3(1), 37-48.
5. Goel, P., Mahadevan, K., & Punjani, K. K. (2023). Augmented and virtual reality in the apparel industry: A bibliometric review and future research agenda. Foresight, 25(2), 167-184.