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# Addressing Critical Supply Chain Challenges in Bangladesh's Textile Industry: Insights from a Delphi-AHP Study

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## Abstract

The textile industry, a cornerstone of global manufacturing, faces numerous challenges in optimizing supply chain management (SCM), particularly in inventory and warehouse operations. The barriers hindering SCM implementation in the Bangladesh textile sector were identified and ranked using AHP and Delphi methods in this study. Sixteen barriers grouped in the categories of Inventory Control, Quality Control, Transportation, and Raw Material Sourcing were analyzed and validated through the Delphi method and subsequently, through the AHP method, barrier ranking was undertaken in an attempt to measure which barrier was more critical than another. The results portray that among all categories, Inventory Management was the most dominant barrier along with deficiencies in setting optimal inventory levels, forecasting demand, and errors associated with human factors. These findings present a comprehensive methodology for tackling the challenges posed by poor SCM practices, providing relevant information for practitioners in the industry on how to improve profitability, minimize expenses, and strengthen operational agility. This study presents the opportunities that data driven methodology offer to improve SCM operations within the textile sector.

## Keywords
Supply chain management, inventory management, delphi method, analytical hierarchy process and Bangladesh textile industry.

## 1. Introduction
Supply chain management is of paramount importance in the world of industry today, serving the function of creating a smooth network for the circulation of materials, information, and resources in a value chain. The textile industry is a core example of global supply chain because it encompasses a large degree of product market variety, the efficiency of resource use, and for meeting time deadlines. In addition, for developing nations such as Bangladesh, which has a strong textile industry, there is a greater need for increasing supply chain efficiency alongside the operational requirement because there is a lack of competitiveness on the global stage.

Even with the deep reliance and promise the textile industry shows, it still lacks proper supply chain management. This lack of proper management stems primarily from inventory management and warehouse operations. The mismanagement of these areas leads to problems such as stockouts and overproduction which directly lead to lower profits and higher operational costs. These problems highlight the barriers that come with the lack of proper data driven strategies for supply chain management.

According to available literature, a variety of frameworks exist for assessing and ranking supply chain obstacles and the methodologies of AHP and Delphi are widely used to aid decision making. Even if these techniques have been used in different industries, their application within the textile sector is still limited, especially in developing nations such as Bangladesh. The lack of in-depth studies on this issue demonstrates the need for more focused research that integrates theories and practices.

The purpose of this research is to fill the gap by developing a systematic approach to classify the most important SCM obstacles faced by the textile industry in Bangladesh. This study is expected to be beneficial for industry practitioners by combining the qualitative approach of the Delphi with the quantitative approach of the AHP. Inventory and warehousing have been identified as the key management issues for this study, the aim is to develop a comprehensive framework for enhancing the supply chain performance.

### 1.1. Objectives

The primary focus of this study is in the textile industry in Bangladesh with particular emphasis on inventory management, quality assurance, transportation, and raw material sourcing.

- To identify and categorize the primary barriers to SCM adoption
- To prioritize these barriers based on their relative importance
- To propose actionable strategies for mitigating their impact

## 2. Literature Review

In order to meet customer needs, silicate industry supply chains tend to be exceedingly intricate and dynamic. Coordination of inventory, production, and logistics for SCM as pertain to silicate industry is to outline constraints and recommend workable solutions to improve operational performance.

In recent years, the textile sector has shown interest in the use of the Analytic Hierarchy Process (AHP). In order to choose the best maintenance plan for the textile sector, (Shyjith et al., 2008) and (Ilangkumaran & Kumanan, 2009) employed AHP and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). According to these research, an effective ranking of options for maintenance plan selection may be accomplished by prioritising assessment criteria and combining AHP with TOPSIS. AHP has been used in several sectors of the textile industry in addition to maintenance techniques. (*(Majumdar, 2010)*, n.d.) highlighted the multi-criteria decision-making aspect of the process by using fuzzy AHP to choose raw materials for the textile spinning industry. With a focus on sustainability and environmental concerns, (Tong et al., 2012) suggested an AHP-based water-conservation and waste-reduction indicator system for cleaner manufacturing in China's textile printing sector. Research has also focused on the textile industry's supplier selection. Using fuzzy multiple attribute decision making (MADM) techniques, (Mokhtari et al., 2013) created a model for supplier selection and used the suggested approach to determine which vendors were the best. In a similar vein, (Bathrinath et al., 2021) used AHP-TOPSIS to do risk analysis in the textile industry, emphasising the significance of risk management in the sector. Additionally, the textile sector has employed AHP in strategic decision-making. In order to create a sustainable development plan for the textile sector in Uzbekistan, (Kim & Park, 2019) carried out a SWOT-AHP study, offering specific guidelines for future expansion. The significance of developing resilience in the face of difficulties was brought to attention by (Piprani et al., 2020) which gave resilient capacity aspects top priority for handling supply chain interruptions in Pakistan's textile sector. Altogether, the literature demonstrates that AHP is useful in making decisions with regard to maintenance approaches, raw material choices, sustainability, supplier selection, risk assessment, and strategical development within the textile industry. The use of AHP in conjunction with other techniques like TOPSIS, fuzzy set theory are as well has been beneficial in achieving desirable results in decision making in the textile industries.

The Delphi technique has been used in many industries for making forecasts, assessing risks, selecting suppliers and making decisions. risk assessment has even been one of the many researched areas in the textile industry (Reinhold & Kiivet, 2006) . The authors developed a simple risk assessment method for investigating working conditions in textile and wood processing industries. This method, starting with a two-stage model that could be expanded, aimed to enhance workplace safety and improve overall risk management practices within these industries. Energy conservation and efficiency have been key concerns in the textile industry, as evidenced by (Kapre S et al., n.d.).

An integrated approach combining AHP and the Delphi method provides a comprehensive procedure for analyzing barriers in supply chains. Prior research has shown that AHP may be effectively employed to rank SCM factors in all industries, which can then be used by decision makers at all levels to concentrate on what is important (Wang et al., 2012). The same has been done to validate and refine some critical issues by Delphi method through the expert consensus approach for given research to ensure relevancy and usability of the findings (Khan et al., 2022). Further, the combination of Delphi and AHP methods has been carried out in the context of academic integrity in e-learning in Saudi Arabia (Muhammad et al., 2020). In this study, the major factors that affect academic integrity were sought by the Delphi method, while their degree of importance was measured by the AHP method, which testifies to the versatility of these methods in various cultures and educational settings. On the field of transportation, with combination of quantitative and qualitative aspects, a hybrid Delphi - AHP approach has been utilized to evaluate consequences of innovations in railway signaling systems (Aoun et al., 2021). Furthermore, a supporting model was created for focusing on the regulated safety inspections prioritization, with the incorporation of Delphi, AHP and Double-Hierarchical methodologies (Zytoon, 2020). Risk factors in textile industries, inventory management optimization, and logistics performance improvement have utilized these frameworks. The integration of AHP and Delphi gets used in the study of reverse logistics and ERP system integration (Chauhan et al., 2021).

### Research Gaps and Opportunities

While existing literature provides SCM challenges and decision making systems, several gaps persist. First, the development application of Delphi and AHP combined methods in the textile industry remains minimal, particularly in developing economies. Second, many studies tend to focus on a barrier. Rather, a holistic approach should be taken to examine and evaluate the interdependency of inventory with quality, logistics and sourcing. Last, practical frameworks focusing on unique regional contexts, for example, the Bangladesh's textile industries are limited.

This study addresses these gaps by integrating Delphi and AHP methods in a systematic manner to identify the barriers and prioritize them in terms of weightage in the textile industry. This study fills in the gaps arising by having the experts identify and prioritize the critical barriers and sub-barriers in SCM systems.

## 3. Methodology

The Delphi methodology and the Analytic Hierarchy Process (AHP) were combined for both barrier identification and validation and for the ranking of the barriers in relation to the SCM practices in the textile industry of Bangladesh for this study. The methodology ensures both qualitative depth and quantitative rigor, enabling a comprehensive evaluation of the challenges and their relative significance.

### Research Design

The research methodology is structured into two phases:

1. Barrier Identification and Validation using the Delphi method.
2. Barrier Prioritization through the Analytic Hierarchy Process (AHP).

### Phase 1: Delphi Method

The approach of the Delphi technique was used to generate a consensus among experts on the most crucial obstacles related to SCM adoption in the textile industry. The experts as a group had an assortment of approaches covering the whole supply chain culture. The experts were requested to review it, recommend changes to it, and add any other barriers they could think of. The final version consisted of twenty obstructions that were finally categorized into: Inventory Management, Quality Assurance, Transportation, and Raw Material Sourcing. The barriers were modified and refined to ensure practicality to align with modern movements within the industry. Thus, as a result of the Delphi technique, the detailed and structured list of validated obstacles were successfully yielded and now could be prioritized.

### Phase 2: Analytic Hierarchy Process (AHP)

A Google form was distributed to 20 industry experts, capturing their assessments for pairwise comparisons. The primary objective was to evaluate and prioritize critical SCM barriers to enhance the adoption of SCM practices in the textile industry (Table 1).

Table 1. Barriers and sub barriers

| **Inventory Management (M)** | **Quality Assurance (R)** | **Transportation (G)** | **Raw Material Sourcing (S)** |
|---|---|---|---|
| Optimal inventory levels (M1) | Quality control (R1) | Transportation costs (G1) | Sourcing raw materials (S1) |
| Accurate demand forecasting (M2) | Supplier quality (R2) | Transportation mode (G2) | Obtaining raw materials at a lower cost (S2) |
| Cost of carrying inventory (M3) | Employee training and skill (R3) | Route optimization (G3) | Supplier reliability and consistency (S3) |
| Minimum order quantities (M4) | Use of technology and tools (R4) | Warehouse and storage location (G4) | Material lead time (S4) |

The methodology follows a systematic approach to prioritize criteria and alternatives, ultimately providing a rational basis for decision-making. The key steps involved in AHP are outlined below:

### Step 1: Defining the Problem and Establish the Hierarchy

The first step in AHP involved clearly defining the decision-making problem and identifying the goal, criteria, sub-criteria (if any), and alternatives. These components are structured hierarchically with 3 levels, level 1: Overall goal or objective, level 2: Criteria for evaluation, level 3: Sub-criteria (optional) and alternatives.

### Step 2: Constructing the Pairwise Comparison Matrix

For each level of the hierarchy, pairwise comparisons are conducted among the criteria (or alternatives) based on their relative importance. The comparisons are performed using a scale of relative importance ranging from 1 to 9, where:

| Equal importance | Moderate importance | Strong importance | Very strong importance | Extreme importance | Intermediate values |
|---|---|---|---|---|---|
| 1 | 3 | 5 | 7 | 9 | 2, 4, 6, 8 |

The comparison matrix A for n criteria is of size n × n and is structured as (Table 2):

| A = | | | | |
|---|---|---|---|---|
| [1 | a_12 | a_13 | ... | a_1n |
| 1/a_12 | 1 | a_23 | ... | a_2n |
| 1/a_13 | 1/a_23 | 1 | ... | a_3n |
| ... | ... | ... | ... | ... |
| 1/a_1n | 1/a_2n | 1/a_3n | ... | 1] |

Table 2. Pairwise comparison matrix

| | **INVENTORY MANAGEMENT(M)** | **QUALITY ASSURANCE(R)** | **TRANSPORTATION(G)** | **RAW MATERIAL SOURCING(S)** |
|---|---|---|---|---|
| | M | R | G | S |
| M | 1.000 | 3.000 | 1.000 | 5.000 |
| R | 0.333 | 1.000 | 5.000 | 1.000 |
| G | 0.143 | 0.200 | 1.000 | 1.000 |
| S | 0.200 | 1.000 | 1.000 | 1.000 |
| **Sum** | **1.676** | **5.200** | **8.000** | **8.000** |

Pairwise comparison matrix for main barriers were calculated and ranked accordingly as follows. This table shows the pairwise comparison matrix derived from the Analytic Hierarchy Process (AHP) methodology, where Inventory Management (M), Quality Assurance (R), Transportation (G), and Raw Material Sourcing (S) were evaluated. The matrix values were calculated as the averages obtained from expert opinions, reflecting the relative importance of one category compared to another. For instance, when M was compared to R, the importance ratio was determined to be 3:1, while the reciprocal value of 0.333 was shown when R was compared to M. The other values were calculated like the same way, and the sum was calculated for each column.

### Step 3: Calculating the Priority Vector (Eigenvector)

To derive the relative weights of the criteria:

1. Pairwise comparison matrix was normalized by dividing each element in a column by the column sum.

2. The average of each row was computed in the normalized matrix. This yielded the priority vector (the eigenvector), representing the relative weights of the criteria (Table 3).

Table 3. The average computed weight

| | **INVENTORY MANAGEMENT(M)** | **QUALITY ASSURANCE(R)** | **TRANSPORTATION(G)** | **RAW MATERIAL SOURCING(S)** | **Average** |
|---|---|---|---|---|---|
| | M | R | G | S | Criteria Weight |
| M | 0.597 | 0.577 | 0.125 | 0.625 | **0.481** |
| R | 0.199 | 0.192 | 0.625 | 0.125 | **0.285** |
| G | 0.085 | 0.038 | 0.125 | 0.125 | **0.093** |
| S | 0.119 | 0.192 | 0.125 | 0.125 | **0.140** |

**Step 4: Summarize results and ranking the alternatives**

The final step involved summarizing the results and then ranking the alternatives based on their computed scores. The alternative with the highest score was considered the most favorable solution to the decision-making problem. Overall Score of Alternative = Σ (Weight of Criterion × Score of Alternative under Criterion) (Table 4).

Table 4. From the weighted sum Rank was measured

| | **INVENTORY MANAGEMENT(M)** | **QUALITY ASSURANCE(R)** | **TRANSPORTATI ON(G)** | **RAW MATERIAL SOURCING(S)** | | |
|---|---|---|---|---|---|---|
| | M | R | G | S | | |
| | Calculating The consistency | | | | Weighted Sum Value | RANK |
| M | 0.481 | 0.856 | 0.093 | 0.702 | 2.132 | 1 |
| R | 0.160 | 0.285 | 0.467 | 0.140 | 1.053 | 2 |
| G | 0.069 | 0.057 | 0.093 | 0.140 | 0.360 | 4 |
| S | 0.096 | 0.285 | 0.093 | 0.140 | 0.615 | 3 |

**Step 5: Checking for Consistency**

1. **Computing the Consistency Index (CI):**

CI = $(\lambda_{max} - n) / (n - 1)$, Where $\lambda_{max}$ is the largest eigenvalue of the comparison matrix, and n is the number of criteria. Here, CI= (4.089 – 4 )/(4-1) = 0.029 (Table 5)

Table 5. Consistency Index Calculation

| | **INVENTORY MANAGEMENT (M)** | **QUALITY ASSURANCE (R)** | **TRANSPOR TATION(G)** | **RAW MATERIA L SOURCIN G(S)** | | | |
|---|---|---|---|---|---|---|---|
| | M | R | G | S | | | |
| | **Calculating The consistency** | | | | **Weighte d Sum Value** | **Criteria Weight** | **Weighted Criteria** |
| M | 0.481 | 0.856 | 0.093 | 0.702 | 2.132 | 0.48087 8497 | 4.433992 274 |
| R | 0.160 | 0.285 | 0.467 | 0.140 | 1.053 | 0.28529 2832 | 3.691306 013 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| G | 0.069 | 0.057 | 0.093 | 0.140 | 0.360 | 0.093422203 | 3.849022556 |
| S | 0.096 | 0.285 | 0.093 | 0.140 | 0.615 | 0.140406469 | 4.382256809 |
| | | | | | | $\lambda_{max}$ | **4.089144413** |

AHP incorporates a mechanism to check the consistency of the pairwise comparisons using the Consistency Ratio (CR):

2. **Calculating the Consistency Ratio (CR):**

CR = CI / RI. Here, RI is the Random Index, a standard value based on the size of the matrix. Here RI for n factor is 0.9. So, CR = 0.029/0.9 = 0.03. A CR < 0.1 indicates an acceptable level of consistency; otherwise, the comparisons need revision. As we can that CR is 0.03 which is less than 0,1, so the comparison was accurate.
The pairwise comparison matrix for sub barriers were done and ranked in the similar way. The pair wise comparisons for sub barriers under each category and their corresponding relative weights were calculated.

## 4. Data Collection

In the process of data collection, a focus group of five top industry experts is formed for gathering data through Delphi method. After finalizing the expert panel, the next task was to gather their valuable suggestion in categorizing out the barriers and sub barriers. In the second stage which is AHP implementation, a google form was created to gather expert consensus in ranking the barriers. Another 20 industry experts with relevant job experience participated in the survey. A Google form was distributed to 20 industry experts, capturing their assessments for pairwise comparisons. They gave their personal responses and the data which were collected and used further in implementing the Analytic Hierarchy Process. This approach facilitates iterative refinement of the research focus while quantifying the relative importance of each barrier to SCM adoption.

## 5. Results and Discussion

The Delphi method identified inventory management, quality assurance, raw material sourcing and transportation as key barriers, with inventory management receiving the highest relative weight in the AHP analysis. In Bangladesh, most textile companies are export-oriented and rely heavily on imported raw materials, particularly from China, Thailand and many more. However, when there is a shortage of raw materials, these companies face significant delays due to the lengthy importation process. Without the necessary materials, fulfilling orders on time becomes impossible. Inaccurate forecasting, expired goods, defective materials, and lot mismatch during the issue timeframe are the common causes of raw material shortages. Forecasting depends on historical data but with time, customer demand has become harder to predict. This is coupled with smaller order sizes due to the emergence of online orders, makes forecasting a more complicated process. One critical challenge that businesses experience is overstocking of inventory. When forecasts fail to match actual demand, it results in excess stock of raw materials that are not needed, leading to space constraints and inefficiencies. In addition, there are a lot of textile industries in Bangladesh that do not have an effective Warehouse Management System (WMS). As there are a lot of stock-keeping units (SKUs), it is very difficult to maintain inventory with no WMS. Many companies struggle to effectively manage their inventory, further exacerbating supply chain and production issues. These findings emphasize the critical need for improvements in inventory management to optimize overall supply chain performance and reduce associated costs in the Bangladesh textile industries.

### 5.1. Numeric Results

Using the Analytic Hierarchy Process (AHP), the relative importance of these barriers was quantified, revealing that inventory management emerged as the most critical challenge. The weight assigned to inventory management was 0.481, indicating it is the area that requires the most urgent attention compared to other identified issues and consecutively the quality assurance is 0.285, raw material sourcing 0.14 and transportation 0.093.

Table 6 highlights the global weights and ranks of the barriers that affect the textile industries in Bangladesh. Within this category, maintaining optimal inventory levels (M1) is the most impactful sub-barrier, with a global weight of 0.23473 and a rank of 1st. This ensures efficient operations, better cash flow, and enhanced customer satisfaction, giving businesses a competitive edge. Accurate demand forecasting (M2) follows, with a global weight of 0.16498 and a rank of 2nd. It helps to minimize costs, reduce stockouts or overstocking, and ensures timely delivery, enhancing operational efficiency and customer satisfaction. Other sub-barriers, such as the cost of carrying inventory (M3) and minimum order quantities (M4), have lower global weights of 0.03608 and 0.04521, corresponding to ranks of 8th and 7th, respectively. Quality assurance (R) holds the second-highest priority as a barrier category. Among its sub-barriers, quality control (R1) is the most significant, with a global weight of 0.16302 and a rank of 3rd. It helps reduce defects, minimize costs associated with rework or recalls, and maintain a strong reputation, ultimately driving business success. Supplier quality (R2) has a moderate impact, with a global weight of 0.06099 and a rank of 5th. High-quality suppliers help reduce defects, minimize production delays, and enhance customer satisfaction, contributing to operational efficiency and long-term business success. Other sub-barriers, such as employee training and skills (R3) and use of technology and tools (R4), carry weights of 0.02793 and 0.03306, ranking 11th and 9th, respectively. Transportation (G) ranks as the third most influential barrier category. Transportation costs (G1) dominate this category, holding a global weight of 0.05348 and a rank of 6th. It affects a company's overall logistics expenses and product pricing. Other sub-barriers, such as transportation mode (G2), route optimization (G3), and warehouse and storage location (G4), have lower weights of 0.02027, 0.00744, and 0.01181 and ranks of 12th, 16th, and 14th, respectively, reflecting their comparatively smaller influence. Finally, raw material sourcing (S) has a global weight of 0.0805, ranking fourth. It ensures a steady supply of quality inputs necessary for production, enabling businesses to meet customer demand. The sub-barrier of sourcing raw materials (S1) is the most critical, with a global weight of 0.0805 and a rank of 4th. Obtaining raw materials at a lower cost (S2), supplier reliability and consistency (S3), and material lead time (S4) have lower global weights of 0.03052, 0.0112, and 0.01778, ranking 10th, 15th, and 13th, respectively, indicating their relatively lesser impact (Table 6).

Table 6. Barriers with relative weights and global rank

| Categories of Barriers | Relative weights | Specific Barrier | Relative weights | Relative rank | Global weights | Global rank |
|---|---|---|---|---|---|---|
| INVENTORY MANAGEMENT(M) | 0.481 | M1 | 0.488 | 1 | 0.23473 | 1 |
| | | M2 | 0.343 | 2 | 0.16498 | 2 |
| | | M3 | 0.075 | 4 | 0.03608 | 8 |
| | | M4 | 0.094 | 3 | 0.04521 | 7 |
| QUALITY ASSURANCE(R) | 0.285 | R1 | 0.572 | 1 | 0.16302 | 3 |
| | | R2 | 0.214 | 2 | 0.06099 | 5 |
| | | R3 | 0.098 | 4 | 0.02793 | 11 |
| | | R4 | 0.116 | 3 | 0.03306 | 9 |
| TRANSPORTATION(G) | 0.093 | G1 | 0.575 | 1 | 0.05348 | 6 |
| | | G2 | 0.218 | 2 | 0.02027 | 12 |
| | | G3 | 0.08 | 4 | 0.00744 | 16 |
| | | G4 | 0.127 | 3 | 0.01181 | 14 |
| RAW MATERIAL SOURCING(S) | 0.14 | S1 | 0.575 | 1 | 0.0805 | 4 |
| | | S2 | 0.218 | 2 | 0.03052 | 10 |
| | | S3 | 0.08 | 4 | 0.0112 | 15 |
| | | S4 | 0.127 | 3 | 0.01778 | 13 |

## 5.2. Graphical Results

The pie chart illustrates the relative weights of supply chain barriers, with Inventory Management (48%) being the most critical (Figure 1).

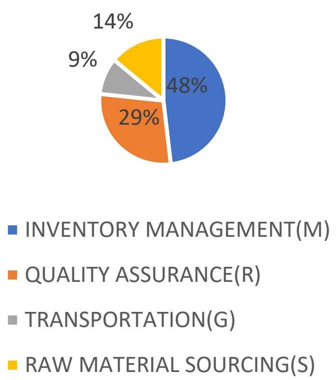


Figure 1. Global Weights by Categories of Barriers

It means inventory management has been assessed as contributing to nearly 48% of overall importance when evaluating barriers in the supply chain of textile industry in Bangladesh. And followed by Quality Assurance (29%) which highlights the importance of ensuring consistent product quality and its substantial impact on supply chain efficiency. Raw Material Sourcing contributes (14%) of the overall importance when evaluating barriers in the textile industry's supply chain. Bangladesh textile sector face numerous difficulties such as delays, cost variability, or supplier reliability that reduces supply chain efficiencies. Transportation is found to be the least important barrier in the Bangladesh textile industries having 9% importance. These results highlight the prominence of inventory-related challenges in the textile industry, requiring immediate attention. The weights provide a clear prioritization for addressing key supply chain inefficiencies.

### 5.3. Proposed Improvements

Based on expert consultations and the identification of inventory management as the top priority, several improvements are proposed:

- **Implementation of a 5S Warehouse System:** A well-designed, organized, and maintained warehouse can reduce inventory management inefficiencies. Adopting a 5S approach will streamline inventory storage, reduce handling time, and improve accuracy in stock tracking.
- **Enhanced Inventory Control Practices:** The addition of inventory management systems such as VMI (vendor managed inventory) or demand forecasting models can also lead to decreased excess inventory and greater stockout avoidance.
- **Collaboration with Suppliers:** Strengthening partnerships with suppliers to ensure timely and efficient raw material sourcing can further alleviate supply chain disruptions.

### 5.4. Validation

Industry specialists confirmed the findings and proposed improvements about how inventory management is the most daunting challenge pinching the textile industries in Bangladesh. The results of the AHP analysis confirmed these hunches and made sure that the prioritization of inventory management was realistic. The corroboration of the study's framework with real-world conditions confirms its validity. Future works might entail conducting a thorough case study in one of the major textile industries in Bangladesh to ascertain how improving inventory management can enhance overall efficiency in the supply chain.

## 6. Conclusion

The research presents an orderly approach to tackling supply chain management barriers in the garment sector of Bangladesh, with a focus on coordinating work related to inventory and warehouse management, which is now a key area for improvement. This study integrates the Delphi and AHP methods to identify and collect both qualitative and quantitative insights from industry practitioners.

The findings conclude that stock control issues, especially those regarding the amount of optimum stock to have on hand, and demand forecasting are the most significant barriers to effective SCM adoption. Other obstacles such as Quality assurance, transportation and raw material sourcing emerged as important when considering the barriers within the supply chain. The prioritization of these barriers offers actionable insights, empowering organizations to develop targeted interventions that enhance efficiency, reduce costs, and improve operational resilience.

From an academic perspective, this study bridges key gaps in the literature by applying a dual-method approach tailored to the specific context of a developing economy. Practically, it provides a blueprint for industry stakeholders to streamline supply chain processes, ensuring alignment with strategic objectives.

Future research could explore the integration of quality assurance and logistics optimization into a unified framework, addressing the broader complexities of supply chain networks. Additionally, replicating this study in different operational contexts would help validate the robustness of the proposed framework and uncover region-specific insights.

As the textile industry continues to evolve amidst global competition and shifting market dynamics, this study underscores the transformative potential of data-driven methodologies in shaping resilient and sustainable supply chains. By prioritizing high impact barriers and foster a culture of continuous improvement, the industry can achieve long-term growth and remain competitive in the global market.

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## Biographies

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**Amir Mohammad Mazed** holds a Bachelor of Science degree in Industrial and Production Engineering from Khulna University of Engineering & Technology. His research interests span various domains, including Industrial Engineering, Supply Chain Management, and Demand Planning. He is particularly focused on areas such as Sourcing and Procurement, Optimization, Supplier Selection, Inventory Management and Production Scheduling, aiming to enhance operational performance. Additionally, his focus extends to Multi-Criteria Decision Making and Manufacturing, where he strives to apply analytical approaches to address complex industrial challenges.