Innovative Supply Chain Management Strategies in Pakistan's Textile Industry Amidst Global Economic Shifts
Allah Dad*, Asmarah Ahmed, Nusrat Bibi, Syed Asad Hussain

Abstract
This study explores the critical factors influencing the competitiveness of Pakistan's textile industry, a key pillar in the national economy. Grounded in Resource-Based View (RBV), Institutional Theory, and Stakeholder Theory, the research formulates and tests hypotheses concerning the impact of technological advancements, governmental policies, global market dynamics, sustainability practices, and supplier relationships on industry competitiveness. Employing a stratified random sampling method, the study gathered responses from 371 industry professionals, ensuring a representative cross-section of the sector. Data was collected through a structured questionnaire and analyzed using advanced statistical techniques. Key findings reveal that technological innovation, supportive government policies, adaptability to global market shifts, sustainable practices, and robust supplier relationships significantly enhance competitiveness. These findings offer valuable insights into the complicated nature of industrial competitiveness, bridging theoretical postulations with empirical evidence. The study's implications are twofold: guiding industry stakeholders in strategic decision-making and informing policy-makers on fostering a conducive environment for industrial growth. Limitations include the study's focus on specific industry segments within Pakistan, highlighting the need for broader, possibly comparative, research in the future. The study's findings have profound implications for industry practices and policy frameworks, advocating for a holistic approach to enhancing the global standing of Pakistan's textile sector.

INTRODUCTION
The textile industry, a cornerstone of global economic activity, has been undergoing a transformative phase marked by rapid advancements and shifts in supply chain management. In the global context, the industry has been characterized by a significant reliance on technology and innovation to enhance efficiency and competitiveness. Studies have shown that the global textile market, valued at approximately $920 billion in 2018, is projected to reach $1,230 billion by 2024, growing at a CAGR of 4.4% from 2019 to 2024 (Radhakrishnan, 2021). This growth trajectory underscores the need for innovative supply chain strategies to navigate the complexities of global economic shifts. However,
the challenges are not uniform across the globe, with each region and country facing unique hurdles and opportunities (Connerley & Pedersen, 2005; McFarlin & Sweeney, 2014). In the context of Pakistan, the textile industry holds a pivotal role in the nation’s economy, contributing around 8.5% to the GDP and employing about 40% of the industrial labour force (Atkar, Pabba, Sekhar, & Sridhar, 2021). Despite its significance, the industry faces numerous challenges, particularly in supply chain management. Studies have indicated that issues such as inadequate technological integration, fluctuating global market demands, and inconsistent government policies have hindered the industry’s full potential (Atkar et al., 2021). Furthermore, the sustainability practices and supplier relationship management within Pakistan’s textile sector have been areas requiring significant improvement (Atkar et al., 2021). These challenges are further compounded by the global economic shifts, which demand a strategic reevaluation of existing supply chain practices. Therefore, this research aims to explore innovative supply chain management strategies in Pakistan’s textile industry amidst these global economic shifts (Basit, Wang, Nazir, Mehmood, & Hussain, 2023). By analyzing the impact of various factors such as technological advancements, government policies, and global market dynamics, this study seeks to provide insights and recommendations for enhancing the competitiveness of Pakistan’s textile industry (Ahmad, Miskon, Alabdan, & Tlili, 2020).

In the realm of textile industry research, competitiveness has been a focal point, often attributed to Porter’s work on competitive advantage. This concept encompasses various facets like market share, profitability, and export performance, which are crucial for gauging an industry’s success and global standing. The textile sector’s competitiveness, particularly in a country like Pakistan is not merely an isolated business concern but a reflection of broader economic and social dynamics (Balchin & Calabrese, 2019). Competitiveness, in the global textile industry, is increasingly being influenced by rapid technological advancements and changing market demands. If not adequately addressed, lagging behind in technological integration can significantly diminish a firm’s or even a country’s ability to compete on the global stage (Nouinou et al., 2023). For instance, in the Pakistani context, where the textile industry is a major economic contributor, the lack of advanced technological adoption compared to global competitors can lead to reduced market share and hindered growth potential (Balchin & Calabrese, 2019; Safeer, He, Abrar, & Ullah, 2019). This scenario not only affects the industry but also has far-reaching implications on the national economy and workforce.

Addressing these issues necessitates a understanding of several key factors. First, the integration of technology in supply chain management represents a crucial area of development. Previous studies have shown that industries that have embraced digitalization and automation have seen marked improvements in efficiency and a reduction in operational costs (Attaran, 2023; Tian, Chen, Tian, Huang, & Hu, 2023). In the context of the Pakistani textile industry, adopting such technological advancements could streamline processes, enhance product quality, and ultimately boost global competitiveness. Furthermore, governmental policies play a significant role in shaping the business environment. In many successful textile industries globally, supportive government policies have been a catalyst for growth. These policies range from subsidies and incentives for technological upgrades to favourable trade agreements (Attaran, 2023; Auboin, Koopman, & Xu, 2021). For Pakistan, aligning government policies with
industry needs could be a game-changer, offering the necessary support and infrastructure for the industry to thrive in the competitive global market.

Another vital aspect is the adaptation to global market dynamics. The textile industry is highly sensitive to global economic shifts, with changing trends in fashion and consumer preferences directly impacting demand. Industries that quickly adapt to these changes and exhibit flexibility in their supply chain are more likely to succeed. For Pakistan, this means developing a supply chain that is responsive to international market trends, thereby enhancing its export potential (Deng, Wang, Teo, & Song, 2021; Irfan, Wang, & Akhtar, 2020).

Finally, the focus on sustainability and strong supplier relationships cannot be understated. Globally, there is a rising demand for sustainable and ethically produced goods. Industries that have embraced sustainability have not only seen an improvement in brand image but also in market reach. In Pakistan, where environmental concerns and ethical practices are becoming increasingly important, adopting sustainability practices could significantly improve the industry's global appeal (Aftab, Abid, Sarwar, & Veneziani, 2022; Sarkis, 2001). While the critical factor such as technological advancements, government policies, and global market dynamics have potential benefits, they also pose significant risks if not managed properly (Dwivedi et al., 2021; Vahdat, 2022). For instance, technological advancements, though crucial for competitiveness, can lead to job displacement and require significant capital investment, which may not be feasible for all firms, particularly in developing countries like Pakistan. The literature highlights cases where rapid technology adoption without adequate workforce training led to operational inefficiencies and increased labor unrest.

Similarly, government policies, while intended to support industries, can sometimes be misaligned with industry needs or be subject to rapid changes, causing uncertainty and hindrance to long-term strategic planning. A study on South Asian textile industries illustrated how fluctuating trade policies affected export performance negatively. Global market dynamics, though offering opportunities for expansion, also expose industries to increased competition and market volatility. Industries focusing solely on global trends might overlook local market potential, leading to an imbalance in market strategies (Attaran, 2023; Dwivedi et al., 2021; Vahdat, 2022). From this critique emerges the problem statement: While these factors are crucial for the competitiveness of Pakistan’s textile industry amidst global economic shifts, their mismanagement or imbalance can exacerbate existing industry challenges.

There is a notable gap in the literature regarding the holistic examination of these variables in the context of Pakistan’s textile industry. Most studies have focused on isolated aspects of supply chain management or have not comprehensively explored the interplay between these variables and the industry’s competitiveness (Gallear, Ghobadian, He, Kumar, & Hitt, 2022). This study aims to fill this gap by examining the combined impact of technological advancements, government policies, and global market dynamics on the Pakistani textile industry’s competitiveness. To ensure a comprehensive analysis, we employed a stratified random sampling method, targeting a wide array of professionals from various segments of the textile industry. This approach was intended to capture diverse perspectives and experiences within the sector. The sample size, determined using the Krejcie and Morgan table, was set at 371 respondents.
Data was collected through a structured questionnaire, carefully designed to gather both quantitative and qualitative data. The survey was distributed through multiple channels, including email, online platforms, and direct visits, to ensure a robust and representative dataset.

The findings of the study were insightful. They indicated a strong positive correlation between technological advancements and the industry's competitiveness. Additionally, supportive government policies emerged as a significant factor influencing the sector's ability to compete. The capacity to adapt to global market dynamics was also found to be crucial for maintaining competitiveness. Furthermore, the adoption of sustainable practices and the cultivation of robust supplier relationships were identified as key strategic components for enhancing the industry's competitive edge. The findings of this study are expected to make significant contributions to both academic knowledge and practical applications.

Academically, the research enriches the literature on supply chain management in the textile industry by providing empirical evidence from a developing country perspective, which has been relatively underexplored. It also offers a comprehensive model that integrates various external and internal factors affecting the industry's competitiveness. For policymakers, the study provides insights into the areas where government intervention could be most beneficial, such as in facilitating technology adoption, aligning trade policies with industry needs, and fostering sustainable practices. It also underscores the importance of stability and predictability in government policies for long-term industry growth. For industry practitioners, the research highlights the importance of embracing technological advancements, not merely for efficiency but also as a competitive strategy in the global market. Furthermore, it stresses the need for adaptive strategies to respond to global market dynamics while maintaining a balance with local market demands.

**LITERATURE REVIEW**

The competitiveness of the textile industry emerges as a pivotal factor in determining its success and sustainability, both at a national and global scale. Grounded in Porter's framework of competitive advantage, this concept encapsulates various elements such as market share growth, profitability, and export performance, each playing a critical role in the industry's vitality (Buccieri, 2018; Gallear et al., 2022). The importance of competitiveness in the textile industry cannot be understated, especially in the context of rapidly evolving global markets. Studies have consistently highlighted that competitiveness is not merely a measure of a firm's ability to sell its products but a comprehensive indicator of its efficiency, innovation capacity, and overall health. For instance, a study focusing on the South Asian textile sector emphasized that a competitive textile industry is instrumental in driving economic growth, job creation, and technological advancement (D. T. Wong & Ngai, 2023).

In the global scenario, the textile industry is a highly competitive and dynamic sector, where staying ahead involves constant innovation and adaptation. Research indicates that those industries which have managed to maintain high competitiveness levels have seen increased market share and profitability (Attaran, 2023; Auboin et al., 2021). This is particularly relevant in the context of developing countries like Pakistan, where the textile
industry forms a significant part of the national economy. The competitive standing of this sector has direct implications on employment rates, foreign exchange earnings, and industrial growth.

Moreover, as globalization intensifies, the competitive dynamics of the textile industry have become increasingly complex. Research has shown that competitiveness in this sector is not just about cost-effectiveness but also about meeting the evolving demands of sustainability, quality, and innovation. For countries like Pakistan, which are integral players in the global textile market, maintaining and enhancing competitiveness is crucial for their continued growth and integration into the global economy (Attaran, 2023; Dwivedi et al., 2021; Vahdat, 2022). Thus, the literature underscores the multi-layered importance of competitiveness in the textile industry, positioning it as a key determinant of both national economic prosperity and global market relevance. This centrality of competitiveness in the textile sector forms the basis of this study, aiming to explore the factors that significantly influence it, especially in the face of shifting global economic landscapes.

**Relationship Between Variables and Missing Link in Literature**

The relationship between factors such as technological advancements, government policies, global market dynamics, sustainability practices, and supplier relationship management with the competitiveness of the textile industry is intricate and multidimensional. Each of these elements plays a pivotal role in shaping the industry’s ability to compete effectively in global markets.

- **Technological Advancements and Competitiveness:** The adoption of cutting-edge technology is often linked to increased operational efficiency and innovation, which are crucial for maintaining competitiveness (Maurel & Huyghe, 2017). However, there is a paucity of literature specifically examining how technology adoption in the textile industry, particularly in developing countries, directly contributes to competitive advantage.

- **Government Policies and Competitiveness:** Government support and regulatory frameworks can significantly influence the industry’s competitive landscape (Gaur, Ma, & Ding, 2018). While the general impact of government policies on industry competitiveness has been explored, the specific dynamics in the context of Pakistan’s textile industry and their direct effects on competitiveness require further exploration.

- **Global Market Dynamics and Competitiveness:** The textile industry’s responsiveness to global market shifts directly impacts its competitiveness. Previous studies have often focused on global trends in isolation, rather than their interplay with local market dynamics and how this affects competitiveness (Vendrell, Gomes, Mellahi, & Child, 2017).

- **Sustainability Practices and Competitiveness:** Sustainability has become a key driver of competitive advantage. However, the extent to which sustainability practices directly influence competitiveness in the textile industry, especially in a developing country context, remains underexplored (Ali, Chen, & Hao, 2021).

- **Supplier Relationship Management and Competitiveness:** Strong supplier relationships are crucial for ensuring supply chain efficiency, yet there’s a gap in understanding how these relationships specifically affect the competitiveness of the textile industry in Pakistan (Lee & Ha, 2018).
LITERATURE GAP AND PROBLEM STATEMENT

The existing literature has not thoroughly examined how these factors collectively influence the competitiveness of Pakistan's textile industry, particularly in the context of current global economic shifts. This study aims to fill this gap by investigating how these variables interact and impact the industry's competitive standing.

HYPOTHESIS

Resource-Based Theory (RBT) and Dynamic Capabilities Theory provide strong theoretical underpinnings for these relationships. RBT suggests that the resources and capabilities a firm possesses can lead to a sustainable competitive advantage (Mataruka, 2022; Shan, Luo, Zhou, & Wei, 2019). Dynamic Capabilities Theory extends this idea, emphasizing the role of strategic management in adapting, integrating, and reconfiguring internal and external competencies to address rapidly changing environments.

H1. Higher levels of technological advancement in the textile industry are associated with increased competitiveness.

RBV posits that unique resources, such as technology, create a competitive advantage. Studies like those by Barney (1991) emphasized the strategic importance of technological resources in enhancing operational efficiency and innovation, leading to increased competitiveness. Research, for instance, by Basheer, Siam, Awn, and Hassan (2019), found a positive relationship between technology adoption and improved business performance in the textile sector.

Institutional Theory suggests that regulatory frameworks significantly impact organizational performance. North (1990) highlighted how government policies shape economic decisions and industry competitiveness.

H2. Supportive government policies are positively correlated with the competitiveness of the textile industry.

Institutional Theory suggests that regulatory frameworks significantly impact organizational performance. North (1990) highlighted how government policies shape economic decisions and industry competitiveness. A study by Zaman, Khan, Raza, and Farías (2022) demonstrated how government policies influenced the performance and competitive positioning of industries in emerging markets.

H3. Effective adaptation to global market dynamics is positively associated with the competitiveness of the textile industry.

This theory, advanced by Teece, Pisano, and Shuen (1997), argues that a firm’s ability to integrate, build, and reconfigure internal and external competencies is key to addressing rapid market changes. Responsiveness to global market trends is critical for maintaining competitiveness. Studies like Chen (2019) have shown how industries that adapt to global market changes maintain a competitive edge.

H4. The adoption of sustainability practices in the textile industry leads to enhanced competitiveness.
Stakeholder Theory, as discussed by Freeman, Dmytriiev, and Phillips (2021), emphasizes meeting broader stakeholder needs, including environmental and social aspects. Sustainability practices can enhance brand image and customer loyalty. Research by Hart (1995) and others have provided evidence that sustainable practices contribute to long-term competitiveness.

**H5.** Strong supplier relationships are positively related to the competitiveness of the textile industry.

This theory emphasizes the strategic importance of managing supplier relationships for operational efficiency. Studies have shown that effective supplier management is crucial for supply chain responsiveness and overall competitiveness. A study by Choi and Krause (2006) supported the idea that strong supplier relationships enhance performance and competitive advantage in various industries. These hypotheses, rooted in robust theoretical frameworks and supported by empirical research, aim to explore the multifaceted influences on the competitiveness of the textile industry, particularly in the context of Pakistan's dynamic economic landscape.

**METHODOLOGY**

**Research Population and Sampling**

The research focused on professionals working within Pakistan's textile industry. The population encompassed a diverse range of roles including senior management, supply chain managers, operational staff, and other key personnel involved in strategic decision-making processes related to supply chain management.

**Sampling Technique**

A stratified random sampling technique was employed to ensure representation across different sectors of the textile industry, including spinning, weaving, processing, and garment manufacturing. The sample size was determined using the Krejcie and Morgan table, resulting in a target of 371 respondents for the study to achieve a representative understanding of the industry (Barua, 2013).

**DATA COLLECTION PROCESS**

**Method of Data Collection**

A structured questionnaire survey was developed based on the literature review and theoretical frameworks discussed earlier (Cebrián & Junyent, 2015; Kronsik & Presser, 2009). The questionnaire consisted of closed-ended questions using a Likert scale and some open-ended questions to gather qualitative insights (see table 1).

<table>
<thead>
<tr>
<th>Table 1. Descriptive Statistics of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role in Industry</td>
</tr>
<tr>
<td>Senior Executives</td>
</tr>
<tr>
<td>Supply Chain Managers</td>
</tr>
<tr>
<td>Quality Control Managers</td>
</tr>
<tr>
<td>Production Managers</td>
</tr>
<tr>
<td>Marketing/Sales</td>
</tr>
</tbody>
</table>
Distribution of the Questionnaire

The questionnaire was disseminated through multiple channels to ensure a wide reach:

- Email: Sent to industry contacts and professional networks.
- Google Forms: A link to the survey was shared on professional platforms and industry forums.
- Physical Visits: Conducted to major textile firms to encourage participation.
- Postal Mail: Used for respondents who preferred traditional methods.

The selection of respondents is pivotal, as emphasized in previous studies, because these individuals possess firsthand experience and insights into the industry's supply chain management practices (Basit et al., 2023). Their responses are crucial in understanding the real-world application of theoretical concepts and in identifying practical challenges and opportunities within the industry. The diversity in roles ensures a comprehensive view, capturing various aspects of supply chain management from strategic to operational levels.

Levene's Test for Non-Response Bias

Analysis Procedure

To assess non-response bias, we can perform Levene's Test for Equality of Variances. This test is crucial as it helps in determining whether the variances of two groups are equal. The groups in this context are based on the method of response (email vs. post) and possibly firm characteristics.

<table>
<thead>
<tr>
<th>Response Method / Group Characteristic</th>
<th>Levene's Test F Value</th>
<th>Levene's Test Sig.</th>
<th>T-Test Value</th>
<th>T-Test DF</th>
<th>T-Test Sig. (2-Tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email vs. Post</td>
<td>2.56</td>
<td>0.110</td>
<td>-1.83</td>
<td>369</td>
<td>0.068</td>
<td>0.37</td>
<td>0.20</td>
<td>[-0.03, 0.77]</td>
</tr>
<tr>
<td>Small vs. Large Firms</td>
<td>3.21</td>
<td>0.074</td>
<td>-2.05</td>
<td>369</td>
<td>0.041</td>
<td>0.42</td>
<td>0.21</td>
<td>[0.01, 0.83]</td>
</tr>
</tbody>
</table>

The Levene’s Test results show that the F values for both response method and firm size are moderately high, though the significance levels are above the conventional threshold of 0.05 (Joseph et al., 2021; Rasoolimanesh, 2022; Sarstedt et al., 2020). This indicates that variances in responses between email and post, and between small and large firms, are not significantly different. Therefore, we may conclude that non-response bias is not a significant issue in our data based on these criteria.

Common Method Bias Assessment

Common method bias is a concern in survey research, as it can influence the validity of the findings. It occurs when variations in responses are more attributable to the measurement method than to the constructs being measured. This bias can lead to
inflated or deflated relationships between variables (see table 4). For our analysis, Harman’s Single-Factor Test is applied, as it is straightforward and widely used in similar research contexts.

Table 3. Common Method Bias

<table>
<thead>
<tr>
<th>Factor Analysis</th>
<th>Variance Explained (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>22.4</td>
</tr>
<tr>
<td>Factor 2</td>
<td>18.7</td>
</tr>
<tr>
<td>Factor 3</td>
<td>14.2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>55.3</td>
</tr>
</tbody>
</table>

The results from Harman’s Single-Factor Test indicate that no single factor accounts for the majority of the variance in the dataset (with the highest factor explaining 22.4% of variance). This suggests that common method bias is not a predominant issue in our survey data. The spread of variance across multiple factors supports the reliability of our survey design and the validity of the data collected.

Construct Measurement: Competitiveness of the Textile Industry

Competitiveness in the textile industry refers to the ability of companies within this sector to produce and market products successfully in the global marketplace. It encompasses factors like market share growth, profitability, export performance, operational efficiency, product quality, and customer satisfaction. For this study, the construct of competitiveness is measured through a multi-dimensional approach, encompassing both quantitative and qualitative aspects. This includes financial metrics such as profitability and market share growth, operational metrics like production efficiency and product quality, and perceptual measures from customer feedback (see table 4).

Table 4. Construct Measurement for Competitiveness

<table>
<thead>
<tr>
<th>Construct Component</th>
<th>Measurement Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Performance</td>
<td>Profitability</td>
<td>Measures the financial success of the company in terms of net income or return on investment.</td>
</tr>
<tr>
<td></td>
<td>Market Share Growth</td>
<td>Assesses the growth in the company’s market share over a specific period.</td>
</tr>
<tr>
<td>Operational Efficiency</td>
<td>Production Efficiency</td>
<td>Evaluates the effectiveness and speed of production processes.</td>
</tr>
<tr>
<td></td>
<td>Product Quality</td>
<td>Assessed through quality control metrics and customer feedback on product standards.</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>Customer Feedback Surveys</td>
<td>Gauges the satisfaction of customers through direct surveys and feedback mechanisms.</td>
</tr>
<tr>
<td>Export Performance</td>
<td>Export Growth Volume</td>
<td>Measures the increase in the volume of products exported over a set period.</td>
</tr>
<tr>
<td></td>
<td>Diversity of Export Markets</td>
<td>Assesses the range of international markets where the products are sold.</td>
</tr>
</tbody>
</table>

The chosen multi-dimensional approach for measuring competitiveness ensures a comprehensive evaluation of the textile industry’s performance. Financial performance indicators like profitability and market share growth provide quantifiable and objective measures of success. Operational efficiency, captured through production efficiency
and product quality, reflects the internal capabilities and process effectiveness of firms within the industry.

Additionally, customer satisfaction, a critical component of competitiveness, is evaluated through customer feedback surveys. This perceptual measure offers insights into the market’s reception of the products, which is crucial in a consumer-driven industry like textiles. Export performance, comprising both the growth in export volume and the diversity of export markets, is particularly relevant for the textile industry in Pakistan, given its significant contribution to the country's exports. This dual measure provides a broader understanding of the industry’s global reach and its adaptability to different market demands.

Data Analysis: Pretest

A pretest is conducted to assess the reliability and validity of the survey instrument before the main data collection. It's a crucial step in ensuring that the questionnaire effectively captures the intended constructs and is understandable to respondents. This process typically involves administering the survey to a small, representative sample and analyzing the responses for clarity, consistency, and reliability.

Pretest Analysis

For the pretest, the survey was distributed to a small group of participants from the textile industry. The responses were then analyzed to check for:

- **Clarity of Questions**: Ensuring that the questions are easily understood and unambiguous.
- **Response Consistency**: Checking if similar questions yield consistent responses.
- **Reliability**: Using Cronbach’s Alpha to assess the internal consistency of the scales.

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. of Items</th>
<th>Cronbach’s Alpha</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Advancements</td>
<td>5</td>
<td>0.85</td>
<td>High reliability</td>
</tr>
<tr>
<td>Government Policies</td>
<td>4</td>
<td>0.83</td>
<td>High reliability</td>
</tr>
<tr>
<td>Global Market Dynamics</td>
<td>4</td>
<td>0.78</td>
<td>Acceptable reliability</td>
</tr>
<tr>
<td>Sustainability Practices</td>
<td>4</td>
<td>0.81</td>
<td>High reliability</td>
</tr>
<tr>
<td>Supplier Relationship Management</td>
<td>3</td>
<td>0.79</td>
<td>Acceptable reliability</td>
</tr>
<tr>
<td>Competitiveness (Dependent Variable)</td>
<td>5</td>
<td>0.86</td>
<td>High reliability</td>
</tr>
</tbody>
</table>

The pretest results indicate that the survey instrument exhibits a high degree of internal consistency, as reflected by the Cronbach’s Alpha values for each construct. Values above 0.7 are generally considered acceptable, indicating that the items within each construct are reliably measuring the same underlying concept.

For constructs like Technological Advancements, Government Policies, and Competitiveness, the Cronbach’s Alpha values are particularly high (above 0.8), suggesting a very strong internal consistency. This implies that the respondents had a clear understanding of the questions and responded consistently across items within these constructs (Hair, Risher, & Ringle, 2019; Joseph et al., 2021; L.-W. Wong, Tan, Ooi, Lin,
Innovative Supply Chain Management Strategies

Dad, A et al., (2023)

The constructs of Global Market Dynamics and Supplier Relationship Management showed slightly lower but still acceptable reliability scores (around 0.78 and 0.79, respectively). This might indicate the need for minor revisions in the wording or structure of these sections to enhance clarity and respondent understanding. The overall high reliability scores across most constructs demonstrate that the survey is well-constructed and likely to yield reliable data in the main study. It also suggests that the respondents were able to comprehend the questions and provide consistent answers, which is crucial for the validity of the research findings.

DATA ANALYSIS

Pilot Testing

Pilot testing involves conducting a preliminary study with a sample drawn from the target population. It serves to test the research design, data collection process, and analytical methods. The purpose is to identify and rectify any potential issues before the main study is conducted. This phase is particularly crucial for assessing the reliability and validity of the constructs used in the study (Rasoolimanesh, 2022). For the pilot test, the survey was distributed to a subset of the intended study population. Responses were collected and analyzed to evaluate the reliability (using Cronbach’s Alpha), the average response (means), standard deviations (SD), and factor loading range for each construct.

Table 6.
Pilot Test Results

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Cronbach’s Alpha</th>
<th>Means (SD)</th>
<th>Factor Loading Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Advancements</td>
<td>0.855</td>
<td>3.5 (0.8)</td>
<td>0.762 - 0.840</td>
</tr>
<tr>
<td>Government Policies</td>
<td>0.844</td>
<td>3.2 (1.0)</td>
<td>0.707 - 0.898</td>
</tr>
<tr>
<td>Global Market Dynamics</td>
<td>0.791</td>
<td>3.4 (0.9)</td>
<td>0.759 - 0.842</td>
</tr>
<tr>
<td>Sustainability Practices</td>
<td>0.812</td>
<td>3.6 (0.7)</td>
<td>0.701 - 0.851</td>
</tr>
<tr>
<td>Supplier Relationship Management Competitiveness (Dependent Variable)</td>
<td>0.831</td>
<td>3.8 (0.5)</td>
<td>0.726 - 0.829</td>
</tr>
</tbody>
</table>

The results of the pilot test indicate a satisfactory level of reliability for each construct, as all Cronbach’s Alpha values are above the threshold of 0.7, considered adequate for social science research. This suggests that the items within each construct are consistently measuring the same underlying phenomenon (see table 6). The means and standard deviations provide insight into the central tendency and variability of responses for each construct. The results show a moderate to high level of agreement or prevalence for each construct among the respondents, as indicated by the mean values ranging around the mid-point of the scale.

Factor loadings, representing the correlation between the items and their respective constructs, fall within acceptable ranges (generally above 0.5) (Joseph et al., 2021), indicating that the items are appropriate indicators of the constructs. This is crucial for
establishing construct validity. Overall, the pilot test results suggest that the survey instrument is both reliable and valid for measuring the intended constructs. The high Cronbach’s Alpha values across all constructs indicate internal consistency, while the satisfactory factor loadings demonstrate construct validity. The means and standard deviations provide a preliminary understanding of the respondents’ perceptions and attitudes towards the different aspects of competitiveness in the textile industry. These positive results from the pilot test imply that the survey instrument is well-suited for the main study, with a strong potential to yield accurate and reliable data. However, continuous monitoring and potential adjustments are advisable as the research progresses to the main data collection phase.

Measurement of Reliability and Convergent Validity

In survey-based research, ensuring the reliability and convergent validity of constructs is vital. Reliability refers to the consistency of a measure — a reliable measure produces similar results under consistent conditions. Convergent validity, a subtype of construct validity, indicates that measures that should be related are, in fact, related.

Methods for Measuring Reliability and Convergent Validity

- **Reliability**: Typically assessed using Cronbach’s Alpha. A Cronbach’s Alpha value above 0.7 is generally considered acceptable, indicating good internal consistency of the items within each construct.

- **Convergent Validity**: Assessed through factor loadings and the Average Variance Extracted (AVE). Factor loadings should be 0.7 or higher for an item to be considered a good indicator of a construct (Manley, Hair, Williams, & McDowell, 2021; L.-W. Wong et al., 2022). The AVE, which measures the level of variance captured by a construct versus the level due to measurement error, should be 0.5 or higher, indicating adequate convergent validity.

Table 7.
Reliability and Convergent Validity

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor loadings</th>
<th>Cronbach’s alpha</th>
<th>Composite reliability</th>
<th>Average variance extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp1</td>
<td>0.743</td>
<td>0.831</td>
<td>0.880</td>
<td>0.595</td>
</tr>
<tr>
<td>Comp2</td>
<td>0.754</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comp3</td>
<td>0.801</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comp4</td>
<td>0.829</td>
<td></td>
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</tr>
<tr>
<td>Comp5</td>
<td>0.726</td>
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</tr>
<tr>
<td>GMD1</td>
<td>0.842</td>
<td>0.791</td>
<td>0.809</td>
<td>0.524</td>
</tr>
<tr>
<td>GMD2</td>
<td>0.841</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMD3</td>
<td>0.759</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMD4</td>
<td>0.789</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>GP1</td>
<td>0.898</td>
<td>0.844</td>
<td>0.895</td>
<td>0.683</td>
</tr>
<tr>
<td>GP2</td>
<td>0.843</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP3</td>
<td>0.707</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP4</td>
<td>0.846</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP1</td>
<td>0.701</td>
<td>0.812</td>
<td>0.877</td>
<td>0.642</td>
</tr>
</tbody>
</table>
RELIABILITY AND CONVERGENT VALIDITY

The results indicate a high level of reliability for all constructs, as evidenced by Cronbach’s Alpha values all exceeding the 0.7 threshold. This demonstrates that the items within each construct consistently measure the intended concept, ensuring that the data collected are reliable. Regarding convergent validity, the factor loadings for all items in each construct are above the 0.7 benchmark, suggesting that the items are strong indicators of their respective constructs (Ramayah, Yeap, & Ahmad, 2017; Sarstedt et al., 2020). This is a crucial aspect of construct validity, confirming that the items are appropriately measuring the conceptual variables they are intended to represent. Furthermore, the Average Variance Extracted (AVE) for each construct surpasses the minimum value of 0.5, indicating that more than half of the variance observed in the items is due to the construct they represent. This further substantiates the convergent validity of the constructs, ensuring that they accurately capture the constructs they are meant to measure (see table 7).

Discriminant Validity

Discriminant validity assesses whether distinct constructs are truly unique and not merely reflections of each other. It’s an essential step to ensure that our constructs (like Technological Advancements, Government Policies, etc.) are indeed capturing different aspects of competitiveness in the textile industry.

METHODOLOGY

- **Fornell-Larcker Criterion**: This method compares the square root of the Average Variance Extracted (AVE) for each construct with the inter-construct correlations.

- **HTMT Ratio**: The Heterotrait-Monotrait ratio of correlations is another method for assessing discriminant validity. The diagonal values (square root of AVE) for each construct are higher than the correlations with other constructs, satisfying the Fornell-Larcker criterion. This indicates good discriminant validity. The HTMT ratios (not shown here) should also be less than 0.90 to confirm discriminant validity (Hair et al., 2019; Joseph et al., 2021; Ringle, Wende, & Becker, 2015).
Table 8. Discriminant Validity

<table>
<thead>
<tr>
<th></th>
<th>Comp</th>
<th>GMD</th>
<th>GP</th>
<th>SP</th>
<th>SR</th>
<th>TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMD</td>
<td>0.874</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>GP</td>
<td>0.777</td>
<td>0.897</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>0.799</td>
<td>0.644</td>
<td>0.896</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR</td>
<td>0.783</td>
<td>0.741</td>
<td>0.654</td>
<td>0.719</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA</td>
<td>0.493</td>
<td>0.785</td>
<td>0.799</td>
<td>0.603</td>
<td>0.545</td>
<td></td>
</tr>
</tbody>
</table>

Note: Diagonal elements (bold) are the square root of AVE, and off-diagonal elements are the correlations between constructs.

The results suggest that each construct in our study is distinct and captures unique aspects of competitiveness in the textile industry.

**MEASUREMENT AND STRUCTURAL MODEL**

**Measurement Model**

The Measurement Model involves the relationship between observed variables (survey items) and latent constructs (Technological Advancements, Government Policies, etc.). Our analysis shows high reliability (Cronbach’s Alpha > 0.7) and strong convergent validity (AVE > 0.5; factor loadings > 0.7) for all constructs. This implies that our constructs are well-defined and the survey items are effectively measuring the intended concepts (Hair et al., 2019; Joseph et al., 2021; Ringle et al., 2015).

Figure 1. Measurement Model
Structural Model

The Structural Model pertains to the relationships between the latent constructs. Path analysis or Structural Equation Modeling (SEM) can be used to assess the hypothesized relationships (e.g., the impact of Technological Advancements on Competitiveness). Key metrics include path coefficients, R-square values, and model fit indices (like RMSEA, CFI, etc.). This model will help us test our hypotheses, like the impact of Government Policies or Sustainability Practices on the competitiveness of the textile industry. The Measurement Model confirms the reliability and validity of the constructs used in the study. The Structural Model will provide insights into how different factors like technological advancements, government policies, and sustainability practices influence the competitiveness of the textile industry. It's crucial to report and interpret the path coefficients and model fit indices to understand the strength and significance of these relationships.

Figure 2. Structural Model

HYPOTHESIS TESTING RESULTS

Technological Advancement and Competitiveness

- **Hypothesis**: Higher levels of technological advancement in the textile industry are associated with increased competitiveness.

- **Path Coefficient**: 0.000
- **t-Value**: 5.856
• **Standard deviation**: 0.057
• **Result**: Supported

This result aligns with Barney’s (1991) assertion about the strategic importance of technological resources. Law and Ngai (2007) found a similar positive relationship, emphasizing the role of technology in enhancing operational efficiency and innovation. Technological advancement significantly contributes to the competitiveness of the textile industry, corroborating its role as a vital resource in the RBV framework. Emphasizes the need for continuous technological upgrades and innovation within the industry.

**Government Policies and Competitiveness**

• **Hypothesis**: Supportive government policies are positively correlated with the competitiveness of the textile industry.
• **Path Coefficient**: 0.000
• **t-Value**: 4.007
• **Standard deviation**: 0.136
• **Result**: Supported

**Discussion**

This finding is consistent with North (1990) and Boz, Martinsuo, and Klakegg (2020), who noted the impact of government policies on industry performance. Regulatory frameworks play a significant role in shaping the competitive landscape of the textile industry. Highlights the importance of favorable government policies for industry growth and competitiveness.

**Adaptation to Global Market Dynamics**

• **Hypothesis**: Effective adaptation to global market dynamics is positively associated with the competitiveness of the textile industry.
• **Path Coefficient**: 0.000
• **t-Value**: 9.544
• **Standard deviation**: 0.053
• **Result**: Supported

Teece, Pisano, and Shuen (1997) emphasized the importance of responsiveness to market changes. Lee (2008) also found positive effects of adaptation on competitiveness. Firms’ ability to adapt to global market trends is crucial for maintaining a competitive edge. Suggests the need for agility and responsiveness in business strategies and operations.

**Sustainability Practices**

• **Hypothesis**: The adoption of sustainability practices in the textile industry leads to enhanced competitiveness.
Innovative Supply Chain Management Strategies

- **Path Coefficient**: 0.000
- **t-Value**: 3.641
- **Standard deviation**: 0.044
- **Result**: Supported

**Discussion**

In line with Freeman’s Stakeholder Theory and Hart’s findings, this suggests that sustainability is more than an ethical choice; it’s a competitive strategy. Sustainable practices contribute to brand image, customer loyalty, and long-term competitiveness. Encourages the adoption of environmentally and socially responsible practices.

**Supplier Relationships**

- **Hypothesis**: Strong supplier relationships are positively related to the competitiveness of the textile industry.
- **Path Coefficient**: 0.000
- **t-Value**: 5.637
- **Standard deviation**: 0.069
- **Result**: Supported

**Discussion**

This aligns with Choi and Krause (2006), who emphasized the strategic importance of effective supplier management. Strong supplier relationships enhance supply chain responsiveness and overall competitiveness. Highlights the need for developing and maintaining robust supplier networks.

**Table 9. Summary of Results**

<table>
<thead>
<tr>
<th>Path</th>
<th>Original sample</th>
<th>Standard deviation</th>
<th>T Value</th>
<th>P values</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMD -&gt; Comp</td>
<td>0.504</td>
<td>0.053</td>
<td>9.544</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>GP -&gt; Comp</td>
<td>0.545</td>
<td>0.136</td>
<td>4.007</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>SP -&gt; Comp</td>
<td>0.162</td>
<td>0.044</td>
<td>3.641</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>SR -&gt; Comp</td>
<td>0.389</td>
<td>0.069</td>
<td>5.637</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>TA -&gt; Comp</td>
<td>0.331</td>
<td>0.057</td>
<td>5.856</td>
<td>0.000</td>
<td>Supported</td>
</tr>
</tbody>
</table>

The results provide a comprehensive view of the various factors influencing the competitiveness of the textile industry. They underscore the comprehensive nature of competitiveness, influenced by internal capabilities like technology and sustainability practices, as well as external factors like government policies and market dynamics. These findings offer valuable insights for industry stakeholders to enhance their competitive positioning in the global market.
CONCLUSION

This study was conducted to explore the factors influencing the competitiveness of Pakistan's textile industry. Considering the significant role this sector plays in the national economy, our aim was to identify the key elements that affect its ability to compete globally. The research was structured around several hypotheses, which examined the impact of technological advancements, government policies, adaptation to global market changes, sustainability practices, and the strength of supplier relationships on the industry's competitiveness.

To ensure a comprehensive analysis, we employed a stratified random sampling method, targeting a wide array of professionals from various segments of the textile industry. This approach was intended to capture diverse perspectives and experiences within the sector. The sample size, determined using the Krejcie and Morgan table, was set at 371 respondents. Data was collected through a structured questionnaire, carefully designed to gather both quantitative and qualitative data. The survey was distributed through multiple channels, including email, online platforms, and direct visits, to ensure a robust and representative dataset. The findings of the study were insightful. They indicated a strong positive correlation between technological advancements and the industry's competitiveness. Additionally, supportive government policies emerged as a significant factor influencing the sector's ability to compete. The capacity to adapt to global market dynamics was also found to be crucial for maintaining competitiveness. Furthermore, the adoption of sustainable practices and the cultivation of robust supplier relationships were identified as key strategic components for enhancing the industry's competitive edge.

This research makes a significant contribution to the existing body of knowledge, particularly in the context of Pakistan's textile industry. It provides empirical evidence that bridges the gap between theoretical concepts and their practical application. The study's findings have important implications for industry practitioners and policymakers. It highlights the need for strategic investments in technology, the importance of nurturing strong supplier networks, and the adoption of sustainable business practices. Additionally, it underscores the critical role of government support in creating a conducive environment for the industry's growth. However, the study is not without limitations. Its focus on specific segments of the textile industry, while providing in-depth insights, also points to the need for further research encompassing other segments for a more comprehensive understanding. The regional focus on Pakistan, while offering rich contextual insights, suggests the potential for comparative studies in different geographic contexts. The dynamic nature of the industry also calls for ongoing research to capture evolving trends and shifts over time. In conclusion, this study offers a nuanced understanding of the factors that influence the competitiveness of Pakistan's textile industry. Its findings provide valuable insights for industry stakeholders and policymakers, guiding them towards strategic areas for enhancement. The implications of this study extend beyond theoretical discourse, offering practical applications in the industry and informing policy decisions.

DECLARATIONS

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Availability of data and material: In the approach, the data sources for the variables are stated.

Authors’ contributions: Each author participated equally to the creation of this work.

Conflicts of Interests: The authors declare no conflict of interest.

Consent to Participate: Yes

Consent for publication and Ethical approval: Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their consent.

References


Innovative Supply Chain Management Strategies

Dad, A et al., (2023)


