From Rivals to Champions: Evaluating Pakistan's Denim Industry Competitiveness through the GEM Model

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Abstract

The textile industry is the linchpin of Pakistan's economy, constituting 58% of total exports and employing 45% of the workforce. Despite its significance, textile exports have plateaued, urging strategic interventions to unlock untapped potential. This research focuses on the denim sector, a vital yet underexplored niche. Leveraging the Analytic Hierarchy Process (AHP) and the Grounding, Enterprises, and Markets (GEM) model, the study assesses the competitiveness of Pakistan's denim industry. Findings from structured questionnaires targeting industry professionals and experts reveal a GEM Score of 377, surpassing the national average and indicating national competitive advantages. The results highlight strengths in resources, infrastructure, and external markets while emphasizing the need to bolster local market engagement. The study not only underscores the current state of the denim industry but also charts a course for strategic initiatives, fostering growth and competitiveness on the global stage. Future research avenues explore causality, broaden the geographical scope, and adapt the GEM model for diverse textile sectors. This research offers practical insights for industry stakeholders, governments, and researchers to navigate the dynamic landscape of Pakistan's denim industry.

Keywords: Textile policy, Competitiveness, Denim industry, GEM model.

1 Introduction

The textile industry is pivotal in shaping Pakistan's economic landscape, which predominantly relies on exports. The textile sector is a cornerstone of Pakistan's economic structure, accounting for 58% of total exports, contributing 5.8% to the GDP, and providing employment for 45% of the

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workforce (Tasneem & Khan, 2024). Despite its significance, textile exports have stagnated at $14 billion over the past decade, highlighting the need for strategic interventions to unlock untapped potential. According to the International Trade Center, Pakistan possesses a substantial untapped export potential of $12.2 billion, with $7.0 billion attributed to textile and garment exports (Abbas & Bhutto, 2022). Diversifying markets and enhancing the branding of Pakistani manufactured products are crucial steps towards unleashing this untapped potential. Currently, Pakistan is a significant exporter of raw materials, with Cotton (HS code 52) being the primary export. The global market for articles made from cotton amounts to $55 billion, with Pakistan ranking as the second-largest exporter of denim fabric, reaching $3.25 billion. Noteworthy export destinations for Pakistani denim fabric include Bangladesh, Turkey, Italy, and India (Frederick et al., 2019).

In the realm of denim garments, Pakistan contributes 1.5% to the total global export volume of $21.5 billion, holding the 14th position worldwide. In contrast, Bangladesh leads the pack with $4.8 billion and a 22% share, followed by China at $3.3 billion and a 15% share. Bangladesh's consistent increase in denim exports, especially to the European Union, highlights the competitive challenges faced by Pakistan (Surjit et al., 2024). Pakistan's denim export figures to the European Union lag, with 105.6 million pairs in 2023, representing a mere 2% increase over three years (Surjit et al., 2024). There exists a considerable gap in the export numbers between Pakistan and Bangladesh, emphasizing the urgent need to explore and exploit the export potential of the Pakistani denim industry in the international market. This research endeavors to investigate and uncover this potential, aiming to enhance the competitiveness of the Pakistani denim industry.

To assess the export potential, the researcher employs the Analytic Hierarchy Process (AHP), complemented by the “Grounding, Enterprises and Markets” (GEM) model to evaluate competitiveness. Competitiveness, derived from the Latin word "competitor," pertains to participating in commercial competition across various firms and markets. At the firm level, competitiveness signifies the ability to produce goods and services at optimal value, surpassing both local and global competitors (Akhuand & Abbas, 2023). This research seeks to address the existing gap in the literature on the textile industry in Pakistan and position it competitively on the global stage, considering the rich resources in cotton. Despite Pakistan's vast cotton resources, it lags in global market share, holding less than 1%, while regional competitors, including India, Bangladesh, China, South Korea, Malaysia, and Thailand, dominate the international textile markets. The study recognizes the need for Pakistan to enhance its competitiveness in the global textile industry, acknowledging the significant labor-intensive nature of the textile business. Historically, major textile-producing nations like China, India, Pakistan, and Bangladesh have integrated into the global economy since the 1980s, with Pakistan emerging as a primary supplier of textile goods globally. The internal demand for textile items and denim within Pakistan is expanding, potentially contributing to increased income sources (Frederick et al., 2019).

The denim sector in Pakistan is the subject of this study, which has the potential to increase denim exports to foreign markets. Pakistan's competitiveness position was quite depressed compared to new rising nations, which resulted in poor performance on the international markets by Pakistani denim industry specialists. The competitiveness of the denim industry in Pakistan has not been studied or published. Therefore, the goal of this study is to use the GEM Model to evaluate the present competitiveness of the Pakistani denim sector. To gather comprehensive insights, the researcher designed a structured questionnaire with two stages. In the first stage, data was collected from marketing professionals with a minimum of 5 years of experience in the Pakistani denim industry, utilizing a 10-point Likert scale. The second stage involved the distribution of a questionnaire among experts and scholars, utilizing a 7-point Likert scale to assess the importance of various factors. The cumulative score from the GEM model reached 377, indicating that the denim garments industry in Pakistan is outperforming the national average and possesses national competitive advantages. This research aims to catalyze strategic initiatives, fostering growth and
competing in the Pakistani denim industry on the global stage.

2 Literature Review

Pakistan has quickly risen to prominence in the denim industry, becoming a regional hub and a major provider of high-quality denim fabric to well-known clothing companies throughout the globe. The denim business has spent about 40 billion rupees in the denim sector, is generating jobs, and contributes significantly to exports. Among Asia's denim makers, Pakistan is now among the top five. Pakistan's denim business achieved an impressive level of success, with exports of denim fabric reaching Rs 47 billion. Denim is often a thick fabric that is crafted from one hundred percent cotton using a coarse indigo-dyed warp and a gray un-dyed weft thread. Durable, high-density textiles with a lot of mass per square inch are what traditional denim is made of. Jeans were a cultural phenomenon in the twentieth century. Wearing blue jeans was a common costume in Western cowboy films. In the 1950s, the fabric was all the rage among teenagers. Embroidery, patchwork, and new colors were some of the inventive designs that manufacturers took use of. Bell bottoms and hip-hugger designs were all the rage in the 1960s and 1970s (Memon, 2016). Denim first caught the eye of fashion designers in the 1980s. Famous models sported the new, glitzy styles that were all the rage in the ad industry. It was all the rage to wear baggy trousers, have puffy shoulder pads, and have puffy hair. It soared to prominence in the '90s as a very desirable item of clothing. Denim producers created a plethora of new and creative uses for the material, such as poodle skirts, hats, purses, and more. Denim sales were through the roof during that period. Every American has seven or eight pairs of jeans, according to a US fashion study. Denim was named the preferred apparel of around 86% of women aged 16–55. Denim is the future, according to 84% of fashion designers and consumers (Memon, 2016).

Porter first proposed the most contentious and much-contested definition of competitiveness. Based on recent developments in trade theory, he laid forth a plan for how a nation may strategically benefit from trade. With Porter's emphasis on developing creative or comparative advantages via upgrading to sustain greater market shares, the Ricardian idea of comparative advantage took on a new dimension. It was for this reason that the idea of productivity may lead to increased competitiveness (Porter, 1990). When evaluating a company's competitiveness, productivity-based indices are often used. When it comes to global competitiveness, productivity is the most important idea, says Porter. Given that 60% of Pakistan's total exports of $21.39 billion in the previous fiscal year came from the textile industry, it's clear that this sector is the most lucrative for the nation. The trade war between the US and China has reduced commerce between the two countries, which has benefited South Asian countries like Vietnam, Bangladesh, India, and Pakistan since US buyers have turned to these countries instead. Had Pakistan successfully addressed the long-standing structural issues plaguing its textile industry, it would have been better positioned to capitalize on Western buyers' preference for the area. Fabric manufacture, including spinning, weaving, and processing of cotton and synthetic fibers, is the mainstay of Pakistan's textile industry. This is why, despite suffering significant setbacks in its ability to compete with regional rivals after seceding from Pakistan, Bangladesh is now the world's second-largest supplier of JMU, after only China. Per usual, things are looking well for Pakistan's textile exporters (Shahid et al., 2023).

2.1 Leading exporters of denim fabric worldwide in 2024 (in million USD)

The export value of denim fabric globally in 2020, by top nations is shown in figure 1. Around $436.94 million was exported from China in that year, making it the world's top exporter of denim fabric.
2.2 Cotton Denim Fabric: Pakistan as a major player in the world

Just like the textile and garment industries are highly fragmented, so is the denim sector. Denim jeans have also proven that they can be worn by people of all ages and sexual orientations. Denim sales based on styles and fits are largely reliant on street fashion and celebrity fashion trends. After China, Pakistan is the world's second-largest supplier of denim textiles. Pakistan's denim industry has over 40 key firms. Specialized textile products such as the Pakistani denim cotton fabric supply exhibit a rise in many application sectors such as jeans, fancy and stylish clothing, curtains and bed sheets, canvas, and uniforms for all seasons of the year and people of any age. China exported more denim fabric than any other nation in 2021, while Bangladesh imported more denim fabric than any other country. Denim demand is expected to rise by 5 to 6 percent, while supply is expected to rise by about 8 percent, indicating a buyer's market for the product. Denim jeans are most popular in the United States, where an estimated 450 million pairs are worn annually. Chinese, Turkish, Italian, Pakistani, Indian, Spanish, and Brazilian denim fabric exports are in the world's top ten (Shahid et al., 2023).

2.3 Export of cotton denim fabrics from Pakistan

Pakistan has a rich textile history and a plentiful cotton crop, which have contributed to the country's thriving textile sector. Perhaps the most important part of Pakistan's textile industry is denim. The value of Pakistan's exports of cotton denim fabrics jumped 37% from $462 million in 2016 to $498 million in 2019, reaching 521 million square meters. However, COVID-19 hampered this increase adversely by dropping the export value to $388 Million, which is an all-time low in the recent decade. Denim fabric exports from Pakistan mostly go to Bangladesh, Turkey, Egypt, Sri Lanka, and Vietnam. Cotton denim fabric exports to Bangladesh dropped from $253 million in 2019 to $201 million in 2020. Pakistan relies on this market.

Despite the small size of the Turkish denim market (around 85 million square meters in 2019), it is a promising indicator of the sector's potential and suggests that it will grow in importance in the next years, making Turkey an increasingly important market for Pakistani cotton denim textiles. Textiles from all over the globe are finding their way into Turkey's garment industry, thanks to the country's more aggressive marketing efforts. Pakistan, along with India, Pakistan, and Italy, is
quickly becoming a vital supplier to Turkey's export market. Denim textile manufacturers in Pakistan will be hard-pressed to find new markets if supplies to Turkey dwindle. A contributing reason to the competitiveness of Pakistan's industry is the country's permanently decreasing currency, although this cannot be depended upon indefinitely. Some mills in Pakistan have made a concentrated effort to spend substantially on product development and innovation, and this is most likely the best method to ensure the industry's long-term existence (Shahid, 2023).

Denim has undergone several reimagining over the previous few decades, with each repetition essential to the market's continued growth. Newer designs, styles, and fits are being prioritized by manufacturers in response to shifting customer tastes and fashion trends. The hottest styles now in fashion are jeggings and faded denim. While Jeggings, a combination of a legging and a jean, have become popular among female clients, particularly among the younger demographic. Similarly, distressed denim which may be faded, shredded, tea-dyed, splashed with paint, and acid-washed to give the jeans a well-aged look is also popular among men and women. The rising popularity of premium denim jeans is also predicted to offer fuel to further the market expansion. Market share belongs to Europe, which is the world's largest region (Shahid et al., 2023). Markets in the United States and Europe are mature, but they nevertheless account for a large portion of the global market. During the analyzed period, the Asia-Pacific market is projected to grow at the quickest rate of 9.4 percent. Increasing disposable income, rising GDP, an increase in the number of women working, fast urbanization, a westernization of lifestyles, and growing fashion consciousness are driving this steady expansion in the area. According to the country's top denim exporters, denim exports to the United States decreased by 3.3% in 2016. Other exports to the European Union and Scandinavian nations are not rising. The Chinese government offered three years of free power to new units to their producers, and India did the same. A lot of nations were offering zero-rated services to their exporters, while in Pakistan, tax officials were imposing a variety of taxes such as export development surcharge and withholding tax. Global denim players are absorbing price hikes from denim fabric manufacturers throughout the globe since current market conditions do not allow them to raise consumer pricing. Due to Pakistani denim producers' cheap pricing and in-house improvements, the country has become a major supplier of this in-demand fabric.

2.4 GEM Model Factors of Competitive Advantages

The GEM model affects the competitiveness of the business and the industry as a whole via its six classes (figure 2). All of the following components make it up: "resources," "infrastructure," "supply & related industries," "enterprise structure, strategy, and rivalry," "local market," and "external market." (Safeer et al., 2018a).

The six classes are organized into three major groups:

Factor pair I, which consists of groundings, is infrastructure and resources.

Factor II includes suppliers and related industries, firm structure and strategy, and competition, as well as enterprises.

Similarly, factor pair III, consists of markets that include external and internal markets.

2.6.1 Groundings Factor Pair I

Groundings consist of resources and infrastructure, which are supposed to provide raw materials to organizations. The following are the details of these factors.

Resources

Resources are developed in the country naturally, instinctively, or established. Normal resources include land, forests, labour supply, patents, expertise, stock exchanges, financial markets, and the state's intended environmental posture (Khan et al., 2024).
Infrastructure
Infrastructure encompasses physical buildings as well as administrative arrangements that aid in speeding up resource mobilization, support, and efficiency. Corporal infrastructure consists mostly of highways, airports, seaports, and communication infrastructure. Moreover, incorporeal infrastructure consists of R&D laboratories and institutions, vocational training institutes for labor, business associations like APTMA, business marketplaces, tax collection bodies, financial markets, and laws-implementing institutions (Shafiee, 2024).

2.6.2 Enterprises Factor Pair II
Organizational structure, strategy, and rivalry are the internal and external physical and nonphysical elements that impact the cluster’s production efficiency; enterprises include suppliers and associated industries.

Supplier and related industries (SRI)
Products and services utilized by other industries in the country are included in the supplier and related industries. Factors contributing to the success of companies’ operations and the growth of linked businesses include the quality of connections between buyers and suppliers, the pricing of goods and services, and the performance of products. (Marwah & Ramanayake, 2024).

Firm structure, strategy, and rivalry (FSSR)
Firm structure, strategy, and competition refer to a firm's hierarchical levels, strategies in different fields, product and service production arrangements among companies, management style, and proprietary rights structure, as well as the sizes of businesses and numbers in the government's cluster. The competitive tactics and strategy routes throughout the entire company cluster are influenced by the firm's structures (Castro-Gonzáles et al., 2024). The size of the company and excellent production management may make a cluster's value chain agile. As a result, the overall management style, and the proprietary rights structure of companies in a specific cluster have a considerable influence on whether enterprises have prospered due to cost savings, differentiation, and so on. These positive attributes are far too encouraging to represent the organization's planning and strategy for operating well in home and international marketplaces (Castro-Gonzáles et al., 2024).

2.6.3 Markets Factor Pair III
The product and service demand circumstances in domestic and worldwide marketplaces of companies in the clusters are referred to as a market.

Local Markets
National markets are also referred to as local markets. Region markets, district markets, and national markets are local markets. Local markets vary by province and city across the country. Internal and international markets differ in that international markets are extensive; however, local markets are limited to a single state. Among the many local market indicators that should be considered when assessing the level of national sourcing customers, product quality standards, and the distinctiveness of national demand within the native cluster of an industry market size, growth, share, and prospects. (Jin et al., 2020).

External Markets
External markets differ from domestic markets. (Porter, 1990) emphasizes the need to distinguish internal markets or clusters that are primarily export-focused. The external market method is highly careful from the exterior buyers for additional clusters (Holmes & Sharp, 1989). Different areas face a consistent structure of outside business sectors, except for local marketplaces. Different areas have distinct approaches to targeting overseas markets. It covered market size, market share globally for a certain cluster, market intimacy, market size, market growth rate, market entrance hurdles, and other trade obstacles for other businesses and organizations (Wang, 2021).
3 Research Methodology

To conduct this research, researchers applied a quantitative approach to find the GEM score. Two structured questionnaires were used to collect the data (Safeer et al., 2019). Questionnaire 1 is used to test the score of each determinant in the Pakistani market and Questionnaire 2 is used to test the importance of each determinant in Pakistan and the global market. First, the Pakistani denim industry is evaluated using the Analytic Hierarchy Process (AHP). Then, the GEM model is used to determine the sector's competitiveness. Following the revolutionary work of two Canadian researchers (Padmore & Gibson, 1998b) a team of researchers developed the GEM model and beautifully explained its results using Porter’s diamond model (Porter, 1990). In this model, the competitiveness is checked by Groundings, Enterprises, and Markets. These three factors are further divided into six determinants (Padmore & Gibson, 1998b). Previously GEM model has been tested in other developed countries like Canada and the UK (Aiginger, 1998; Levie & Autio, 2008; Padmore & Gibson, 1998a). This model helps the denim industry to test their competitiveness by applying the fuzzy AHP technique and analyzing results that show the path to make good decisions to strengthen the denim industry in local and international markets. In this research, researchers used the Convenience sampling technique to collect data from real respondents working in well-known denim industries.

Questionnaire 1 consists of a 10-point Likert scale to test the score of different determinants under study (Safeer et al., 2018a). The questionnaire was distributed among 150 experienced professionals with at least bachelor's degrees, working for more than 5 years, and having diverse production and marketing experience for denim garments from small-scale, medium-scale, and big-scale industries in Pakistan. Researchers collected data by visiting the respondents physically, sharing the link of Google Docs, and using email sources depending upon the feasibility of respondents. Researchers eventually got 99 usable responses from legitimate and actual respondents after putting in a lot of work.
Questionnaire 2 consists of a 7-point Likert scale to test the importance of each determinant in Pakistan and the global market (Safeer et al., 2018a). This questionnaire was designed for industry professionals, researchers, and consultants across Pakistan and collected primary data. To complete this research, the research team approached approximately 25 industry experts, researchers, and consultants to collect data and after much effort, with an average response rate of roughly 84 percent, researchers were able to collect 21 completed structured surveys from legitimate and authentic respondents. Responses to structured questionnaires are scored and weighted by the actual state of the problems in the sector. The process of scoring entails a subjective evaluation of actual replies based on the presumption that they have a thorough comprehension of the topic (Wang et al., 2005).

3.1 Validity

Validity is defined as the degree to which the investigation is based on measurement, and if the conclusions of the investigation are, by all accounts, what they appear to be. Fundamentally, validity refers to the accuracy of a judgment. The researcher had a lot of problems with the authenticity of the exploration. The subjective scoring system is like the major test. If the information provider's responders are unconcerned about the strength of the speculations/ideas, they may provide inaccurate data, which might deceive the results. As a result, it was focused on how difficult it was for respondents to think about their thoughts or how best to complete structured questionnaires based on reliable input on Pakistan’s denim sector.

3.2 Reliability

The reliability quality refers to how research considers the net outcomes of the entire study and to what extent these outcomes are suitable and dependable for the intended benefit. Whether findings are provided routinely or not, reliability is a concern. If the conclusion is not based on objective data, it is critical to review the entire research study for consistency. To obtain great and genuine inputs from respondents, researchers first perpetual the competitiveness components by organizing structured questionnaires, and then settle on the denim garment industry to obtain similar information from analysts, specialists, advisors, and in addition industry experts. This can provide the most reliable and best results for all research challenges.

3.3 Analytic hierarchy process (AHP):

Three well-defined steps make up the Analytic Hierarchy Process.

1) Hierarchy structure
2) Comparative assessments
3) Prioritizing tasks or constructing a list of priorities with full ranking.

Researchers, professionals, and denim sector participants from Pakistan were surveyed to collect primary data, which was primarily analyzed using an AHP score matrix. After its inception by (Saaty, 1986), the Analytic Hierarchy Process (AHP) has grown into one of the most popular decision-making systems based on several indicators. When it comes to research and decision-making, AHP is second to none.

The term "Analytic Hierarchy Process" refers to a system of measures that includes two assessments, and it also relies on the expert’s judgment in selecting the priority gauges. Analytic Hierarchy Process (AHP) offers a variety of hierarchical ranking characteristics, allowing governments and corporate experts to concentrate on the most important issues. All evaluations are created by applying a scale that explains how one aspect affects another compared to its primary factors. AHP not only supports specialists in making sensible decisions but also coordinates a fair justification for the decision-makers.
4 Results

This quantitative research comprises three stages. The first stage entailed calculating subjective scores for sub-factors that influence denim industry competitiveness. According to the GEM model, all factors are assessed on a Likert scale from 1 to 10.

The factors, which ranged from 1 to 10, are itemized as follows:
- 10 = Extremely Excellent indicates the position of 1st or 2nd in competitiveness at the international level.
- 9 = Excellent indicates the position of at least the top five with good competitiveness at the international level.
- 8 = Very good, which indicates that it is at an exclusive level of competitive advantage all around the country.
- 7 = Good indicates that it has a competitive advantage in the country.
- 6 = Not bad, which indicates that it has no competitive advantage but surpasses the country at an average level.
- 5 = Mean level indicates that it has an average level of strength at the national level.
- 4 = Limited level indicates that this number has a slightly low average strength at the national level.
- 3 = Minimal level indicates that different gaps concerning national average strength impacted the denim industry's competitiveness.
- 2 = Poor refers to significant gaps that influence the competitiveness of the garments industry.
- 1 = Extremely poor refers to a significant strength deficit concerning the national average, which has hampered the denim industry's development.

In this research, an analysis is performed using the AHP technique.

The GEM Model provided the basis for a comprehensive study that made use of the AHP approach and a quantification procedure. Moreover, the relevance of each sub-factor about its conforming components must be determined. In the second section, each component is grouped into a series from 1 to 7 that illustrates the relative relevance of its sub-factors to its core factors. In the second stage to calculate results and convert them to factor pairs a quantification process is started. Some specific formulas are used adopted from the study of Safeer et al., (2018) for the required calculations:

According to the principle of the GEM model, two components could be replaced with each other. For example, in certain industrial clusters, well-developed infrastructures could make up for missing resources, and vice versa. Step three involves computing the (LCS) Linear Cluster Scores for each component pairing to arrive at the final competitiveness score for Pakistan's denim sector.

To find out this score the formulas are extracted from the study of (Safeer et al., 2018a). Multiple factors, such as combining all three-factor pairings, can be derived from the linear cluster score (LCS). This indicates that each was significantly impacted by those circumstances. For instance, if one or both factors in a factor pair have low scores, the cluster may go to its least competitive level. One or two-factor pairs with high scores indicate that they may advance to the most competitive level within a cluster.

In practice, the total score would be greatest for factor pairs such as supplier and related industry, firm structures, strategy and competition, local markets, and overseas markets, and lowest for factor pairings such as resources and infrastructure. The denim cluster couldn't have an advantage in any market since its resources and infrastructure scored lower than its competitors in that sector. All these factor pairs would have balanced competitive advantages for the best possible use of the potential of the denim sector.
Table 2: Statistical Results and Calculations

<table>
<thead>
<tr>
<th>Factor</th>
<th>No.</th>
<th>Sub Factor</th>
<th>Avg. Score (1-10)</th>
<th>Weights</th>
<th>Importance Score (1-7)</th>
<th>(Average Score) * (Weight) = Final Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources (R)</td>
<td>R-1</td>
<td>Availability of Labor force resources in the denim sector</td>
<td>7.565</td>
<td>0.3447</td>
<td>6.3218</td>
<td>2.6077</td>
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<tr>
<td></td>
<td>R-2</td>
<td>Talent Resources Availability</td>
<td>5.181</td>
<td>0.3286</td>
<td>5.5942</td>
<td>1.7029</td>
</tr>
<tr>
<td></td>
<td>R-3</td>
<td>Geographic Location of Pakistan</td>
<td>7.979</td>
<td>0.3267</td>
<td>5.8409</td>
<td>2.6070</td>
</tr>
<tr>
<td></td>
<td>I-1</td>
<td>Infrastructure of Transportation</td>
<td>4.939</td>
<td>0.1365</td>
<td>6.1832</td>
<td>0.5948</td>
</tr>
<tr>
<td></td>
<td>I-2</td>
<td>Communication infrastructure</td>
<td>7.969</td>
<td>0.1543</td>
<td>6.6824</td>
<td>0.9901</td>
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<tr>
<td></td>
<td>I-3</td>
<td>Infrastructure of Market Infrastructure</td>
<td>6.404</td>
<td>0.0889</td>
<td>5.9241</td>
<td>0.6363</td>
</tr>
<tr>
<td></td>
<td>I-4</td>
<td>Trade’s Associations</td>
<td>4.343</td>
<td>0.0951</td>
<td>4.9167</td>
<td>0.3972</td>
</tr>
<tr>
<td></td>
<td>I-5</td>
<td>Environment of Doing Business</td>
<td>6.515</td>
<td>0.1453</td>
<td>5.5908</td>
<td>0.7292</td>
</tr>
<tr>
<td></td>
<td>I-6</td>
<td>Associated laws and rules</td>
<td>4.494</td>
<td>0.1653</td>
<td>6.1832</td>
<td>0.5413</td>
</tr>
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<td></td>
<td>I-7</td>
<td>Financial Market of Pakistan</td>
<td>6.252</td>
<td>0.1741</td>
<td>5.6824</td>
<td>0.6537</td>
</tr>
<tr>
<td></td>
<td>I-8</td>
<td>Research &amp; Development Institutions</td>
<td>4.393</td>
<td>0.1224</td>
<td>5.8409</td>
<td>0.6363</td>
</tr>
<tr>
<td>Infrastructure (I)</td>
<td>I-9</td>
<td>Impact of Vocational Training</td>
<td>4.616</td>
<td>0.1635</td>
<td>5.3417</td>
<td>0.5074</td>
</tr>
<tr>
<td>Supplier &amp;</td>
<td>SRI-1</td>
<td>Availability of Denim related Raw material</td>
<td>7.757</td>
<td>0.3555</td>
<td>6.8325</td>
<td>2.7578</td>
</tr>
<tr>
<td>Related</td>
<td>SRI-2</td>
<td>supplier service</td>
<td>6.575</td>
<td>0.3367</td>
<td>6.5091</td>
<td>2.2144</td>
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<tr>
<td>Industries (SRI)</td>
<td>SRI-3</td>
<td>Development of related industries</td>
<td>5.686</td>
<td>0.3078</td>
<td>5.7667</td>
<td>1.7502</td>
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<tr>
<td>Firm Structure,</td>
<td>FSSR-1</td>
<td>Skills of Managers</td>
<td>7.010</td>
<td>0.1629</td>
<td>5.8409</td>
<td>1.1422</td>
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<tr>
<td>Strategy &amp;</td>
<td>FSSR-2</td>
<td>Clarity in the rights of property</td>
<td>4.596</td>
<td>0.1400</td>
<td>5.2590</td>
<td>0.6433</td>
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<tr>
<td>Rivalry (FSSR)</td>
<td>FSSR-3</td>
<td>Value addition level</td>
<td>6.232</td>
<td>0.1737</td>
<td>6.7582</td>
<td>1.0826</td>
</tr>
<tr>
<td></td>
<td>FSSR-4</td>
<td>Brand name worth</td>
<td>6.798</td>
<td>0.1610</td>
<td>5.1758</td>
<td>1.0946</td>
</tr>
<tr>
<td></td>
<td>FSSR-5</td>
<td>Equipment related to Production</td>
<td>7.030</td>
<td>0.1751</td>
<td>6.4424</td>
<td>1.2310</td>
</tr>
<tr>
<td></td>
<td>FSSR-6</td>
<td>Product Quality of denim</td>
<td>8.131</td>
<td>0.1873</td>
<td>6.9167</td>
<td>1.5226</td>
</tr>
<tr>
<td>Local Markets (LM)</td>
<td>LM-1</td>
<td>Local market distinctiveness</td>
<td>4.171</td>
<td>0.3299</td>
<td>5.7582</td>
<td>1.4136</td>
</tr>
<tr>
<td></td>
<td>LM-2</td>
<td>Local market share</td>
<td>4.262</td>
<td>0.3257</td>
<td>4.4259</td>
<td>1.3430</td>
</tr>
<tr>
<td></td>
<td>LM-3</td>
<td>The potential of Pakistani market</td>
<td>5.373</td>
<td>0.3963</td>
<td>5.6824</td>
<td>1.8598</td>
</tr>
<tr>
<td>External Markets (EM)</td>
<td>EM-1</td>
<td>Features related to foreign consumers</td>
<td>6.393</td>
<td>0.2444</td>
<td>5.7676</td>
<td>1.5624</td>
</tr>
<tr>
<td></td>
<td>EM-2</td>
<td>Barriers in trade</td>
<td>5.697</td>
<td>0.2526</td>
<td>5.1758</td>
<td>1.4392</td>
</tr>
<tr>
<td></td>
<td>EM-3</td>
<td>Share in the global market</td>
<td>6.232</td>
<td>0.2422</td>
<td>5.0916</td>
<td>1.5096</td>
</tr>
<tr>
<td></td>
<td>EM-4</td>
<td>Relations with the Foreign market</td>
<td>7.383</td>
<td>0.2608</td>
<td>6.6740</td>
<td>1.9257</td>
</tr>
</tbody>
</table>

4.1 Collected Primary Data’s Statistical Calculations

Table 2 explains that the scores of all six determinants of the denim industry were calculated using the formulas from the study of (Safeer et al., 2018a):

R = 6.9176
I = 5.5673
SRI = 6.7223
FSSR = 6.7164
LM = 4.6164
EM = 6.4369
Avg Score = 6.1628
The component pair score (PS) is determined after all the other variables have been computed.

(PS) 1 = (6.9176 + 5.5673) / 2 = 6.2424
(PS) 2 = (6.7223 + 6.7164) / 2 = 6.7194
(PS) 3 = (4.6164 + 6.4369) / 2 = 5.5266

Finally, The Linear Cluster Score (LCS) was used to assess the degree of competition in the denim clothing industry:

\[
\text{LCS} = 6.1628 \text{ (Avg Score)}
\]

\[
\text{GEM} = 2.5 \times \prod_{i=1,3} (D2i - 1 + D2i) ^ {2/3}
\]

After completing all other calculations, the GEM Score of Pakistan's denim garments sector, which is 377, was computed using the formula below:

\[
\text{GEM} = 2.5 \times \left\{ (6.9176 + 5.5673) \times (6.7223 + 6.7164) \times (4.6164 + 6.4369) \right\} ^ {2/3}
\]

\[
\text{GEM} = 2.5 \times \left\{ (12.4849) \times (13.4387) \times (11.0533) \right\} ^ {2/3}
\]

\[
\text{GEM} = 2.5 \times 150.9464
\]

\[
\text{GEM SCORE} = 377
\]

Based on primary data collected from the small to large-scale denim industry, the Pakistani denim garments industry has a GEM Score of 377. Because denim manufacturing firms in Pakistan enjoy the same facilities and benefits and face the same issues as the other industries of Pakistan, this study might be applied to the entire country. As a result, this research may classify as Pakistan's whole denim industry. As the GEM Score 377 lies between 250 and 640 (table 3), the denim garments industry in Pakistan is outperforming the national average and has national competitive advantages. The following GEM Model shows the true factor scores of the GEM determinants:

<table>
<thead>
<tr>
<th>Score range</th>
<th>Score explainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 249</td>
<td>Below the national average level</td>
</tr>
<tr>
<td>250 – 639</td>
<td>Above the national average level</td>
</tr>
<tr>
<td>640 - 1000</td>
<td>Extremely good position</td>
</tr>
</tbody>
</table>

### 4.2 Graphical Representation

Figure 3 shows two lines, outward lines (red) indicate the true average scores of the Pakistani denim industry, while inward lines (blue) represent the traditional 5 scores, with outward lines signifying more than 5 scores and inward lines representing less than 5 scores.

Denim industry primary data shows that Resources has an average score of 6.9176 and Infrastructure has an average score of 6.5673, both of which are decent but not great. It shows that denim is doing better than before, with several benefits over competitors nationwide. There is a sizable pool of potential workers and skilled workers in Pakistan's denim sector, so new business ideas may take root and grow. Nevertheless, to guarantee that businesses have access to qualified workers, the denim industry should prioritize the development of staff training programs. The sector in Pakistan benefits from a well-developed network of roads, transportation options, and communication systems, all of which contribute to increased exports. New and innovative technologies, such as Skype, mobile phones, Vibor, and WhatsApp, make it easier to communicate with overseas consumers quickly and at a reasonable cost. Many textile groups in Pakistan are trying to support the growing denim sector.

The average score for suppliers and related sectors, as well as enterprise structure strategy and
rivalry, is 6.7223 and 6.7164, respectively, which isn't bad but not great. It shows that the denim industry is improving, with national strength above average across the board. Several spinning mills in Pakistan offer high-quality yarns and good customer service at reasonable prices. Beyond the spinning business, Pakistan's denim industry is supported by a variety of other sectors like accessories, packaging, and so on.

**Figure 3:** The average score of all determinants in the actual GEM model (Padmore & Gibson, 1998b)

Local Markets' average score is 4.6164, which indicates that the Pakistani denim sector is weaker than the national average and is transitioning to a mean level, which refers to moving to the national average length across the country. Pakistan's denim sector is mostly export-oriented, with little attention paid to local markets and little exposure to them. Because the denim industry has not concentrated on local markets, local markets have received a low grade. The denim sector should focus on new product development since new and innovative clothes will appeal to local purchasers, who will demand more of the same, which will aid in the creation of long-term commercial connections with clients. The external markets have an adequate and increasing average score of 6.4369. It shows that Pakistan's denim exports are becoming better and that the nation is gaining a competitive edge. GSP Plus also facilitates the denim industry's growth in exporting to global markets. However, the government must also aid industry in developing and exploring new markets across the world.
Table 1: Ranking based on strongest to weakest average score.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-Factor</th>
<th>Avg. Score (1-10)</th>
<th>Standard Deviation</th>
<th>Avg. Importance Score (1-7)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSSR-6</td>
<td>Product Quality of denim</td>
<td>8.131</td>
<td>0.1873</td>
<td>6.9167</td>
<td>1.5226</td>
</tr>
<tr>
<td>R-3</td>
<td>Geographic Location of Pakistan</td>
<td>7.979</td>
<td>0.3267</td>
<td>5.8409</td>
<td>2.6070</td>
</tr>
<tr>
<td>I-2</td>
<td>Communication infrastructure</td>
<td>7.969</td>
<td>0.1242</td>
<td>6.6824</td>
<td>0.9901</td>
</tr>
<tr>
<td>SRI-1</td>
<td>Availability of Denim related Raw material</td>
<td>7.757</td>
<td>0.3555</td>
<td>6.8325</td>
<td>2.7578</td>
</tr>
<tr>
<td>R-1</td>
<td>Availability of Labour force resources in the denim sector</td>
<td>7.565</td>
<td>0.3447</td>
<td>6.3218</td>
<td>2.6077</td>
</tr>
<tr>
<td>FSSR-5</td>
<td>Equipment related to Production</td>
<td>7.030</td>
<td>0.1751</td>
<td>6.4424</td>
<td>1.2310</td>
</tr>
<tr>
<td>FSSR-1</td>
<td>Managerial skills</td>
<td>7.010</td>
<td>0.1629</td>
<td>5.8409</td>
<td>1.1422</td>
</tr>
<tr>
<td>EM-4</td>
<td>Relations with the Foreign market</td>
<td>7.383</td>
<td>0.2608</td>
<td>6.6740</td>
<td>1.9257</td>
</tr>
<tr>
<td>FSSR-4</td>
<td>Brand name worth</td>
<td>6.798</td>
<td>0.1610</td>
<td>5.1758</td>
<td>1.0946</td>
</tr>
<tr>
<td>SRI-2</td>
<td>supplier service</td>
<td>6.575</td>
<td>0.3367</td>
<td>6.5091</td>
<td>2.2144</td>
</tr>
<tr>
<td>I-5</td>
<td>Environment of Doing Business</td>
<td>6.515</td>
<td>0.1119</td>
<td>5.5908</td>
<td>0.7292</td>
</tr>
<tr>
<td>I-3</td>
<td>Infrastructure of Market</td>
<td>6.404</td>
<td>0.0994</td>
<td>5.9241</td>
<td>0.6363</td>
</tr>
<tr>
<td>EM-1</td>
<td>Features related to foreign consumers</td>
<td>6.393</td>
<td>0.2444</td>
<td>5.7676</td>
<td>1.5624</td>
</tr>
<tr>
<td>I-7</td>
<td>Financial Market of Pakistan</td>
<td>6.252</td>
<td>0.1045</td>
<td>5.6824</td>
<td>0.6537</td>
</tr>
<tr>
<td>FSSR-3</td>
<td>Value addition level</td>
<td>6.232</td>
<td>0.1737</td>
<td>6.7582</td>
<td>1.0826</td>
</tr>
<tr>
<td>EM-3</td>
<td>Share in the global market</td>
<td>6.232</td>
<td>0.2422</td>
<td>5.9016</td>
<td>1.5096</td>
</tr>
<tr>
<td>EM-2</td>
<td>Barriers in trade</td>
<td>5.697</td>
<td>0.2526</td>
<td>5.1758</td>
<td>1.4392</td>
</tr>
<tr>
<td>SRI-3</td>
<td>Development of related industries</td>
<td>5.686</td>
<td>0.3078</td>
<td>5.7667</td>
<td>1.7502</td>
</tr>
<tr>
<td>LM-3</td>
<td>The potential of Pakistani market</td>
<td>5.373</td>
<td>0.3461</td>
<td>5.6824</td>
<td>1.8598</td>
</tr>
<tr>
<td>R-2</td>
<td>Availability of Talented Resource</td>
<td>5.181</td>
<td>0.3286</td>
<td>5.5942</td>
<td>1.7029</td>
</tr>
<tr>
<td>I-1</td>
<td>Infrastructure of Transportation</td>
<td>4.939</td>
<td>0.1204</td>
<td>6.1832</td>
<td>0.5948</td>
</tr>
<tr>
<td>I-9</td>
<td>Impact of Vocational Training</td>
<td>4.616</td>
<td>0.1099</td>
<td>5.3417</td>
<td>0.5074</td>
</tr>
<tr>
<td>FSSR-2</td>
<td>Clarity in the rights of property</td>
<td>4.596</td>
<td>0.1400</td>
<td>5.2590</td>
<td>0.6433</td>
</tr>
<tr>
<td>I-6</td>
<td>Associated laws and rules</td>
<td>4.494</td>
<td>0.1204</td>
<td>6.1832</td>
<td>0.5413</td>
</tr>
<tr>
<td>I-8</td>
<td>Research &amp; Development Institutions</td>
<td>4.393</td>
<td>0.1177</td>
<td>6.2590</td>
<td>0.5173</td>
</tr>
<tr>
<td>I-4</td>
<td>Trade Association</td>
<td>4.343</td>
<td>0.0915</td>
<td>4.9167</td>
<td>0.3972</td>
</tr>
<tr>
<td>LM-2</td>
<td>Pakistani internal market share</td>
<td>4.262</td>
<td>0.3151</td>
<td>4.4259</td>
<td>1.3430</td>
</tr>
<tr>
<td>LM-1</td>
<td>Local market distinctiveness</td>
<td>4.171</td>
<td>0.3388</td>
<td>5.7582</td>
<td>1.4136</td>
</tr>
</tbody>
</table>

As shown in Table 1, given the importance of quality to customers on a global scale, the product quality sub-factor achieved the highest score of 8.131. Customers are prepared to pay a premium for Pakistani apparel simply because of its exceptional quality, which is a result of the country's excellent cotton dyeing skills. Regardless of how cheap or bad the clothes is, no one will purchase it.

In contrast, the local market's distinctiveness scored the lowest of all the sub-factors at 4.171, suggesting that the Pakistani denim industry is too concerned with exports and neglects or under-exposes local markets. The dispersion of all sub-factors concerning the average score of the factor is shown by its standard deviation. With a population of over 220 million, Pakistan is a great place for textile firms to focus on local markets offering unique products.

5 Discussion Conclusion

The denim industry is a much-diversified sector that produces commonly used products. Pakistani denim manufacturing sector is good in multiple factors, but this sector is reported weak in their local market. The count of denim industries is very low on this low capacity they are selling their products in a few international markets. Whereas a lot of export potential is untapped by Pakistani manufacturers/exporters in the world. Recently, competitiveness has been a very hot issue. For example, Japan is competing in the electronics industry and Japanese manufacturers/exporters are at a top position in the world. Due to this reason Japanese economy is one of the top economies in the world. Similarly, Bangladesh's denim industry is one of the top manufacturing industries in the
international market. All Pakistani denim manufacturers should focus on the dynamics of competitive advantages to enhance their business volume. Numerous consultants and scholars have already investigated competitiveness on several scales, including industry, national, and, more narrowly, company. The GEM model has been extensively used for cluster analysis and industry benchmarking in this study, both domestically and internationally. After a thorough examination, this model was used to analyze and explain the advantages and disadvantages of the Pakistani denim sector. This research shows that Pakistan's denim business is thriving in every important way right now. However, certain major issues may be resolved to help the sector grow both locally and internationally. Although Pakistan has a large pool of available laborers, some of them are inexperienced or just partially skilled. However, labor costs are still lower than in other nations, therefore these variables may help a country to compete in international markets. Infrastructural improvements in communication and transportation have benefited Pakistan's denim industry. To communicate, up-to-date technology is accessible to approach customers all around the globe, and strong integration lowers the cost of manufacturing. In Pakistan, indigenous businesses mostly own privately held denim enterprises and are eager to grow and explore the denim industry by employing various tactics by the state of the local and international markets' level of competition. There is a strong chance that local demand will be met in Pakistan because most local businesses are devoted to exporting denim to other parts of the world and working with different brands to produce clothing that meets their specifications. The modern consumer purchases goods and services not just to have them but also to express his personality, brand, and even social standing. Today, the brand provides all these added benefits for the product (Popa & Pelau, 2016).

Companies in the denim industry must try to establish their brands in both home and foreign markets and grow their businesses appropriately. This would promote fresh innovation in both the new and existing denim products, as well as manage consumer demand appropriately. With more than 220 million people, Pakistan is the sixth most populated country in the world, providing a sizable opportunity for local manufacturers to seize and develop their businesses in home marketplaces. According to the analysis, Pakistan's denim sector has a GEM Score of 377, which is based on primary data collection. Our 377 indicates that the denim sector is doing better than normal and has a competitive edge on a national scale since this score typically falls between 250 and 640. All the denim industry's determinants have an average score factor of 6.070. Except for local markets, all three factors—groundings, enterprises, and markets—have nearly identical scores. This is because the denim sector of Pakistan is mostly focused on exports. However, considering the research's findings, the Pakistani denim sector should concentrate on regional markets to grow its share in those markets as well. Competitive advantages would be helpful in this circumstance to become viable in both domestic and foreign markets. Additionally, the importance of foundations and companies for the best usage of available resources needs to be emphasized (Safeer et al., 2018b).

5.1 Future research scope

The competitiveness of Pakistan's denim sector in international markets has been evaluated by the GEM Model. It would be worthwhile to assess this model further. This study report has primarily examined practically all the variables influencing Pakistan's denim industry's competitiveness. Therefore, it would be interesting to investigate the connections between various factors and the competitiveness of Pakistan's denim sector. For example, the link between salaries and competitiveness, and the association between clusters and competitiveness It is also feasible to apply the existing GEM model of competitiveness to other areas of textiles, such as spinning and weaving, as well as knitted garments, to discover additional characteristics that impact cluster-level industrial competitiveness. For benchmarking purposes, the GEM model has seen heavy application in analyzing clusters both at home and abroad. Once all of the relevant factors have
been considered, the GEM model can evaluate the textile industry in Pakistan and identify its strengths and weaknesses.

5.2 Practical implications

In terms of evaluating the competitiveness of the denim sector, this study's findings will have far-reaching practical implications for denim associations, regional governments, denim companies, and research and development centers. The model helps the organization assess its relative strengths and weaknesses about the level of competition, which aids in decision-making. This study effort also offers advice to industry managers, consultants, researchers, and specialists on how to manage many issues like talent force resource availability, geographical location, communication infrastructure, adoption of technology and operational management tools, strategies for export, compliance management, supporting the small and medium (SME’s) industries to improve the denim sector's competitiveness.

5.3 Limitations of this study

Although this study is very valuable providing the competitiveness of the Pakistani denim industry. Even then it is mandatory to acknowledge certain limitations to enhance the robustness of this study. Firstly, the sample size for both questionnaires seems relatively small. A larger and more diverse sample could provide a more comprehensive understanding. Moreover, the use of convenience sampling may introduce bias into the results. Those who voluntarily participated may have different perspectives compared to those who did not participate. A more random and representative sampling method could strengthen the external validity of your findings. Furthermore, while the study concentrates on the denim sector only, it might be beneficial to acknowledge that the competitiveness of the broader textile industry could impact the denim industry. Consider discussing how findings might generalize or differ in the context of the overall textile industry. Additionally, The GEM model has been applied to assess competitiveness, but the generalizability of this model to other textile sectors or industries in different countries might be limited. Discuss the external validity and potential adaptations needed for applying the model in diverse contexts. Lastly, relying solely on the AHP and GEM model might limit the comprehensiveness of your study. Consider incorporating multiple research methods or triangulation to provide a more holistic view of the competitiveness of the Pakistani denim industry.

5.4 Policy Recommendations

To address the multifaceted challenges facing Pakistan's denim industry, a comprehensive policy approach is imperative. The factor of talent resource availability got a low average score (5). This sector needs to be improved at the government and industry level to support it financially and technically. The new industrial estates with the necessary infrastructure will boost industry expansion, particularly the garment industry. The government should assist in establishing new industrial estates where land should be rented, and leases should be terminated if the organization renting the space cannot continue for any reason. Moreover, Pakistani denim organizations are trying to export all types of denim. Most denim organizations cannot decide their core competency and area of specialization in the jeans category. If Pakistan wants to make a specialized image in customer's mind, we must determine our core competency at the country level as well as at the firm level. Furthermore, to ensure the long-term growth and sustainability of the textile industry, policymakers must implement measures that promote exchange rate stability and reduce uncertainty for exporters. So, the frequent and significant depreciation of the Pakistan rupee harms the textile sector. The stability of the government and its policies is mandatory. Also, It is recommended that Pakistan takes a closer look at its denim industry to help address the deficiency in related sectors such as the chemical industry and allied accessories like packing tapes, rivets, buttons, and more. By investing in this sector, Pakistan can reduce its reliance on imports from
countries like China, which can significantly reduce lead times and increase the importance of Pakistani denim garments.

Despite the limited availability of denim brands in the local market in Pakistan, it is crucial to note that the current use and perception of denim in the country is hindering its potential for export competitiveness. The existing challenges include the hot climate, cultural preferences, and dislikes of the Pakistani people, especially the rural population, where denim is not favored. Therefore, it is essential to create designs that cater to the local market while also addressing the existing barriers. Moreover, some international brands are also selling their products in the Pakistan Market. In Pakistan, SMEs contribute more than 30 percent of GDP and generate 25 percent of its exports. To realize SMEs' full potential, we must implement policies that empower them. Access to financing, subsidized credit, and cheaper interest rates on loans should be provided. Providing low-interest loans to buy and import machinery, training skills, and development programs should be launched to improve small businesses' exports.

The collaborative approach among stakeholders, facilitated by the government and Textile Association, can foster innovation and address industry-wide challenges collectively. Finally, implementing traceability mechanisms in cotton supply chains and promoting cooperative farming is essential for sustainable cotton production, requiring concerted efforts from the government, the cotton industry, and farmers' associations. By implementing these recommendations holistically, Pakistan can unlock the full potential of its denim industry, driving growth, sustainability, and global competitiveness.

Cotton, popularly known as "white gold," is a valuable cash crop. More than 20 percent of the world's fiber consumption is made up of cotton, and it provides livelihood to more than 250 million people. In Pakistan, the government's attention is not playing an active role in the uplift cotton crisis. In addition, environmental factors such as climate change, a lack of proper research by local research institutes, the absence of any cotton policy, and the shift of cotton zones from traditional areas to new zones are aggravating the situation. Therefore, efforts must be concentrated on techniques that will allow more and better-quality cotton production. Solutions of this problem could be the following. New cotton varieties resistant to climatic and natural hazards should be developed. A facility of good quality certified seed tracked and traced should be provided to the growers. Pink Bollworm, White Flies, Locust, etc., should be controlled by taking appropriate measures. There is a need to explore opportunities for cotton production in Baluchistan and Khyber Pakhtunkhwa, where pest pressure is minimal, and cotton yields are supposedly better than in typical cotton-growing areas in Punjab and Sindh. It is also recommended that organic cotton production should be produced and used. Issuance of subsidies for pesticides, seeds, and fertilizers. The sugar industries have played an essential role in Pakistan in increasing sugarcane area and production, hence tackling the sugarcane. So, the textile sector should also take the initiative with the government to get rid of the cotton crisis in Pakistan. The blockchain should be assured to national and international purchasers to solve the problem of sustainability of the cotton supply chain and increase consumer and retailer transparency. Using blockchain technology, businesses can trace a cotton bale from its origins on a truck to its destination—a retailer—by following its journey from the field to the gin, thread, fabric, and beyond. Each of these occurrences may be documented on the blockchain as a transaction, allowing for audibility and traceability across the supply chain. Sustainability and the capacity to track cotton's origins go hand in hand. The government should formulate a policy to increase the traceability of cotton.

6 References

From Rivals to Champions: Evaluating Pakistan's Denim Industry Competitiveness through the GEM Model

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