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The Role of Sustainable Manufacturing Practices in Enhancing Business Competitiveness

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Abstract
This study examines the relationship between sustainable manufacturing practices and business competitiveness in the firms of the Lasbela Industrial Zones Balochistan of Pakistan. Data was collected by using a quantitative research design for a sample of 50 business owners, managers as well as the key decision makers using structured questionnaires. Demographically, the majority of respondents are male between the ages of 25 and 70, a demographic that typically fits the mold for leadership roles in manufacturing in this part of the world. And findings suggest a big shift towards sustainability with 70 percent of businesses using some kind of sustainable practice. Also, 60 per cent of respondents indicate how these practices bring about a positive corporate contribution to their competitive advantage and that such sustainability could improve organizational effectiveness and market positioning. While it's positive that this encouraging behavior trend has formed, 55% of respondents still pointed towards high costs as a major barrier to mainstreaming more sustainable initiatives. This shows the importance of a more sympathetic environment to fund financial incentives and subsidies to offset these costs. Moreover, 65% of participants find that there is a need for additional training and resource in order to strengthen efforts in sustainable manufacturing, highlighting the need for capacity building for a transition to sustainable manufacturing. It particularly highlights the growing recognition of sustainability in the Lasbela Industrial Zones and shows the salient obstacles to tap the most from the sustainability initiatives. Firms in Balochistan can gain by focusing on these areas, to enhance their ability to use sustainable initiatives to increase competitiveness, both in local and international markets, thereby aiding overall regional economic development.

Keywords: Quantitative Research and Resource Efficiency, Training and Development, Sustainable Manufacturing and Business Competence.

Background of the Study
Today, more and more businesses around the world are making their business sustainable for the environment, while reducing impact and improving efficiency. Through sustainable manufacturing, cost is diminished and competitiveness is enhanced and; sustain manufacturing means a minimum usage of a resource, reduced waste and reduced emissions (Porter & Kramer, 2006). In response to increasing customer demand for eco friendly products as well as stricter environmental regimes (Bocken, Short, Rana and Evans, 2014), sustainable manufacturing practices have become a global trend. Faced with the commitment and pressure of reducing energy use, to recycle materials, and improving efficiency of important actions, Corporations nowadays have been committed to attract customers, to follow regulatory standards, and to remain in the market (Singh, Jain, and Sharma, 2014). In Pakistan we just started to pay attention to sustainable

manufacturing, and the awareness of how this manufacturing approach can develop economic and environmental resilience is growing. According to Khan et al. (2019), the priority that manufacturing firms in Pakistan still firmly hold is low-cost production over sustainability. There are some regions such as Balochistan, which has the peculiar problems of its own economy and infrastructure that do not let them appreciate the benefits of sustainability over the long run. This happens especially in the case of industrial zones such as Lasbela, Balochistan, which are crucial for indigenous manufacturing, and with very little consideration to sustainable practices. Whereas global trends towards greener manufacturing methods are getting increasingly more businesses, like Lasbela, to adopt sustainability manufacturing practices to stay competitive both locally and internationally. Pakistani industry, according to Bhatti and Awan (2020), has begun to adopt sustainability practices for overall operational efficiency, minimization of waste, and fulfilling environmental regulations. Additionally, Chatha and Butt (2015) concluded that sustainable manufacturing may be able to overcome as well as significantly add to the creation of a good image and competitiveness of firms engaged in trade in environmental standards markets. Studies of sustainable manufacturing in the South Asian region have shown the impact of India and Bangladesh achieving favorable positions on the market and in a cost, and indeed Sarkar (2020), Jahan & Islam (2019). The permissibility of these approaches regardless of the level of development of any economy is itself a verdict establishing the implausibility of these approaches and the necessity to adopt it in Pakistan. In the growing context of a more environmentally-friendly global economy, manufacturing companies located in Balochistan in general and Lasbela's industrial zones in particular should regard sustainable manufacturing as both a necessity and an opportunity to improve their competitiveness and ensure survival in the long term (Shahbaz, Rasi, & Zulfqar, 2021).

Problem Statement

The benefits are obvious but most of the companies in Balochistan are reluctant to practice sustainable manufacturing. Perceived barriers seem to include the high costs of change, lack of awareness of sustainable methods, and a lack of infrastructure to support such a change. Nevertheless, for commercial reasons, this slow adoption misses the opportunity to learn the potential of sustainable manufacturing not only to business performance, but to environmental health. The industrial zones of Lasbela could become a player in the move of companies towards sustainability, as it will lower resource costs, better manage operations, and attract environmentally conscious consumers. Unfortunately, the majority of the businesses are caught in an economic and logistical type of limitations that prevent them from applying sustainable practices. The study attempts to explore how the practise of sustainability might assist Lasbela's businesses in contributing to the saving of the environment and promoting their competitiveness. In more particular, this study will focus on this context and identify some particular practices that are practical and effective, and can serve as a roadmap for other firms in the same region.

Research Objectives

- To find out what sustainable practices businesses in Lasbela are currently employing.
- To understand the impact of these practices on an organisation's competitiveness from cost savings, market position, and customer view points.
- To understand the business challenges facing adoption of sustainable practices.
- To provide solutions that might encourage that many other companies in this situation adopt sustainable practices.

Research Questions

1. What sustainable manufacturing practices do businesses in Lasbela commonly use?
2. What effects do these practices have on business competitiveness in the region?

3. Why are companies hesitant to make these changes?
4. They investigated how to assist Lasbela's manufacturing sector in adopting sustainable practices.

Significance of the Study

This research is significant as it addresses a crucial area for Pakistan's economic development: sustainable manufacturing. Using this approach, this study provides business leaders, policymakers, and stakeholders striving for sustainable growth with valuable insights on how sustainable practices contribute to business competitiveness. The findings aim to give practical guidance to businesses in Balochistan's industrial zones on how to improve their efficiency and resilience in order to be successful in competitive markets and minimize environmental impact. This study also contributes to the broader body of sustainable manufacturing research by offering context-specific recommendations tailored to Pakistan's industrial zones. This research supports the Pakistani industries in reflecting on international standards and regulations, thereby leading the production path towards being more responsible. If businesses act in this way, it is good for the businesses themselves, for the local economy and society, and for long-term economic and environmental sustainability.

Scope of the Study

This study explores sustainable practices by manufacturing firms operating in the industrial zones of Lasbela, Balochistan. The research will solve its data problem with the help of a questionnaire targeting a sample of 50 businesses in this region. The study focuses specifically on identifying specific sustainable manufacturing practices such as energy efficiency, waste management, and resource conservation, looking at how these practices affect overall operational effectiveness as well as competitive status. Since the concept of sustainable manufacturing is still under construction in Pakistan, this research offers a close look at how local businesses can address and implement these practices in the developing context. The research is based on Lasbela, but the results have implications for other industrial areas of Pakistan with similar features and provide a local understanding of sustainable practices that can be of use in more regions. It is, of course, a helpful study, giving practical insights for business leaders and policymakers alike about practices that can improve both economic performance and environmental sustainability to facilitate sustainable growth in all of Pakistan's industrial sectors. It hopes that these findings will facilitate a move toward more eco-friendly operations in keeping with global standards and thereby increase competitiveness in local and international markets.

Definition of Key Terms

Sustainable Manufacturing Practices: This term describes the process of producing manufactured goods in a manner that minimizes the consumption of natural resources, reduces their emissions, and produces less waste. These practices, which include the use of renewable energy sources, recycling or reusing materials, and reducing the amount of production, are referred to as sustainable manufacturing practices. In addition to satisfying consumer demand for eco-friendly products, sustainable manufacturing aims to comply with environmental regulations, lower operating costs, and extend the lifespan of raw materials, benefiting both the business and the environment simultaneously.

Business Competitiveness: A company's business competitiveness describes the ability to compete effectively with the help of cost management, hold a strong position in the market, and attract a loyal customer base. This encompasses various factors such as pricing, product quality, customer service, and the company's brand reputation. Innovation and efficiency enable a company to remain competitive and adapt to market and consumer changes. Companies that have adopted sustainable manufacturing can gain compliance with international standards, expand into new

markets, and enhance their reputation by appealing to environmentally conscious customers and reducing long-term operation costs.

Industrial Zones: These areas specialize in the manufacturing or production of goods, often equipped with infrastructure, utilities, and other amenities to meet specific needs. Industrial zones serve as facilities that assist businesses in accessing good transportation links, energy and water supplies, and waste disposal services, thereby enhancing productivity and reducing operational costs. The industrial zones also receive regulatory benefits in the form of tax incentives or fewer compliance-proportionate obstacles, which facilitate industrial growth and increase investments. In Pakistan, Lasbela, Balochistan, serves as a critical economic zone where manufacturers have the resources and logistical support needed to work efficiently and compete in both domestic and foreign markets.

Literature Review

Environmental Regulations and Sustainable Manufacturing Practices

Environmental regulations play a major role in promoting the adoption of sustainable manufacturing practices, generally promoting a firm's competitiveness and encouraging it to reduce its environmental impact. As shown by Ali, Chen and Hao (2021), it is quite important that these regulations act as critical moderators of the relationship between sustainable manufacturing practices, competitive capabilities and sustainable performance. As authors in the journal Sustainability, their study finds that tougher environmental regulations compel firms to go green, in ways both better for the environment and more efficient for their operations. For example, companies that operate under stringent regulations allocate funds to acquire technologies designed to minimize waste, lower energy consumption and thus enhance resource utilization. As a result of these investments, productivity and cost savings translate to higher level of competitiveness of firms in the market place. Another finding of the study is that firms that are taking proactive action to integrate their products and practices with the new demands of sustainability in response to regulatory pressures are positioned to fulfill customer expectations and protect their reputations. This proactive outset is not only what regulatory compliance asks for, but also what motivates innovation and sustainability over the long term. Thus, the potential for environmental regulations to shape sustainable practice through interaction with a firm's environmental strategy becomes a call to encourage firm action in an increasingly competitive and environmentally aware market place. Such dynamics overall imply the role of regulatory frameworks in motivating sustainable business practices.

Sustainable Manufacturing and Competitive Advantage

Russell and Millar (2014) examine the effect of implementation of sustainable manufacturing practices on business performance and competitive advantage, especially in developing economies. As published in the Journal of Management & Sustainability, that research shows that companies that adopt sustainable practices cut costs, become more efficient in their processes and differentiate themselves from competitors. In markets where consumers want things more sustainable, this differentiation is crucial. The study also highlights the particular challenges in the economy of developing countries, prevalent constraints on resources and the infrastructure, which prevent the switch to sustainable practices causing further impediments to the study of sustainable strategies in business. However, Russell and Millar point out that while clear benefits to performance and competitive positioning can be derived from firms that are truly committed to sustainability, achievement of these benefits continues to be challenging. In doing so, it argues the long term advantages in terms of sustainability that is able to save cost in the use of resources and building loyalty from consumers, this outweighs the initial obstacles. Through the practice of sustainability, companies can adhere to new environmental regulation while building a source of resiliency to market fluctuations. Therefore, the study indicates that, even in resource constrained

settings, a dedication to sustainable manufacturing practices will provide a significant competitive advantage benefiting firms in an increasingly competitive dynamic market environment (Russell & Millar, 2014).

Sustainable competitively in a inclusive strategies

Inclusive and sustainable 'notes', successful in the 21st century, Gunasekaran and Subramanian (2018) contend that competition is based on efficient operations and inclusive and sustainable 'notes' of those. Published in the International Journal of Computer Integrated Manufacturing, their study describes a number of strategies that companies can devise to develop sustainable competitiveness. According to the authors, to embrace sustainability, firms need to innovate not only in product design, but also in process design, in order to match their operations with environmental and social goals. One major point that their findings lay on is the need for inclusivity in sustainability work. Firms can increase their adaptability and resilience in an ever-changing market landscape by adopting cleaner technologies and actively involving stakeholders at all levels—employees, suppliers and local communities. Such stakeholder engagement is not just about building a sense of shared responsibility; it greatly enhances collaborative innovation through which companies are able to respond better to market needs, as well as increasing regulatory pressures. Gunasekaran and Subramanian (2018) argue that businesses that put inclusive sustainability at the top of their priorities are likely to be more successful in today's dynamic environment to obtain a competitive advantage and build positively towards society and the environment.

Conceptual framework for continuous transformation in sustainable manufacturing

Hussain and Jahanzaib (2018) review the literature related to sustainable manufacturing and present a conceptual framework and a comprehensive overview for sustainable manufacturing highlighting continuous transformation for achieving and sustaining competitiveness. According to their research, published in Advances in Production Engineering & Management, businesses must continuously upgrade and refine sustainable practices or risk losing competitive advantage, as outlined in a framework that establishes the value of moving forward in an agonizingly slow motion. According to the authors, sustainability should not be a one-time effort, but a fundamental component of a company's business process and corporate culture. Embedding sustainability into an organization's ethos makes it easier for business to adapt to changes in the environmental and market conditions. More specifically, simply achieving a proactive approach to deal with regulatory changes not only helps that firm react to regulatory changes faster but also facilitates innovations and efficiency. Additionally, the framework serves as a driver for ongoing learning and development within the business, encouraging it to continue to learn and develop, to discover new sustainable technologies and practices which will help to enhance business performance. Hussain and Jahanzaib conclude that organizations engaged in continuous transformation in sustainable manufacturing will be well positioned to enhance their competitive edge leading to long term success in a changing dynamic (Hussain & Jahanzaib, 2018).

Manufacturing and Operational Competitiveness

In his research in the Journal of Manufacturing Technology Management, Afum, Agyabeng-Mensah, and Sun (2020) look at the relationship between green manufacturing, operational competitiveness, and firm reputation. In our study, we use a mediated approach to show the relationship between adopting green manufacturing practices and improving its sustainable performance from various dimensions especially operational competitiveness and brand reputation dimensions. Businesses producing goods in an environmentally friendly way can profoundly up their market pose, the authors note. These companies strive for sustainability, which does not just improve operational efficiencies (i.e. wasting less, using less energy), but also builds stronger brands and good will with consumer and stakeholder constituencies who welcome the improved

image of the company. This is an important critical asset of these businesses, giving them a positive reputation's differential in the competitive market and customer loyalty. While green manufacturing provides immediate operational benefits, the study discovers that the additional benefits accrue to the long term competitiveness of a firm through building a good image and trust of stakeholders. What Afum et al find in the end is that green practices integration into factory processes is not just a moral or regulatory issue, but a strategic choice that can bring substantial competitive advantages in a marketplace where sustainability dictates (Afum et al., 2020).

Drivers for Sustainable Manufacturing in SMEs

In this paper Aboelmaged (2018) introduces a Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to examine the key drivers that might determine sustainable manufacturing practices in small and medium sized enterprises (SMEs) in Egypt and determine the impact of key drivers on competitive capabilities. The Journal of Cleaner Production published paper that identifies several critical factors that force SMEs to move towards sustainability — including cost savings, customer demand and regulatory pressures. Aboelmaged says that these drivers are very important because SMEs, engaged in resource constrained activities, must find a way to become more competitive in the market. Results show that adoption of sustainable practices by SME can improve their environmental and operational performance through efforts of resource efficiency and environmental performance. And these practices not only fit with regulatory requirements, but they are responding to a growing consumer demand for environmentally sound products and services — which is also becoming a very big deal in modern supply chain. Ultimately, these findings highlight that sustainable manufacturing has a dual strategic-moral imperative, and can provide SMEs with substantial competitive capabilities enhancement in a dynamic competitive environment.

Manufacturing and Innovation for Sustainable Economic

Hami, Muhamad, Ebrahim (2015) study using Procedia CIRP on the relationship between the sustainable manufacturing practices, innovation and economic sustainability is based on. We find that innovation is important to gain economic benefits from sustainable manufacturing practices (such as cost reduction and productivity improvement). The authors argue that firms with strong commitment to continuous innovation in sustainable processes and technology will be more able to meet their economic sustainability objectives while dealing with environmental concerns. Incorporating innovative approaches into their manufacturing practice would help companies to optimize the use of resources and minimize waste and to improve operational efficiencies. This dual focus on innovation and sustainability, these authors argued, has satisfied regulatory and consumer demands and provided for long term financial performance. The study colors along the lines of industries prone to pressure to adopt environmentally friendly practices, and innovation alike as a way of surviving this wave. Ultimately, the findings reveal that organizations that are capable of taking sustainability and innovation equally seriously will gain a competitive advantage through being leaders in a market who is becoming more and more eco conscious (Hami et al., 2015).

Hierarchical Approach to Organizational Competitiveness in Sustainable Manufacturing

2.Hierarchical Approach to Organizational Competitiveness in Sustainable Manufacturing

Jeyapaul Sivakumar and his colleagues (2020) develops a hierarchical model for organizational competitiveness within sustainable manufacturing practice in International Journal of Process Management and Benchmarking. They find that competing in a multi layer way is needed, based on operational efficiency, environmental impact and stakeholder satisfaction. In examining this particular group of a firm's competitive cases on multiple dimensions, the multiplicity of these layers is taken into account in the model to provide a structured framework for sustainability

initiatives that a firm can leverage to enable itself attain its competitive position. According to the authors, effective sustainable practices not only help to improve a company's operational efficiency, but also provide a positive influence on the company's environmental footprint and the relationship between a company and its stakeholders. The importance of sustainability goals synchronization with strategic business strategies as a competitive advantage through an integrated perspective is highlighted. Sivakumar et al. point out the fact that this hierarchical structure enables the organization to systematically assess whether its sustainability initiatives are appropriate and make the data driven, competitive decision that will enhance the organization's competitiveness in the sustainability proactive market. Finally, they have found that, at least in relation to sustainability, ethics have become something of a relic, having been supplanted by the strategic imperative of sustainability, which is not only well positioned to drive significant improvements in organizational performance and competitiveness, but may also confer a competitive advantage in an era of for-profit enterprises worldwide connected through the digital channels.

Barriers to Attaining Sustainable Manufacturing Competitiveness

Ahmadi-Gh and Bello-Pintado (2022) in their Journal of Cleaner Production study examine the barriers encountered by firms in adopting sustainable practices at all levels and their relationship with competitive advantage. This research addresses three critical barriers to full realization of sustainable manufacturing benefits, including resource constraints, technology access, and lack of awareness of sustainable practices. The authors state that the production of these steps creates large hurdles for manufacturers trying to improve their sustainability and therefore decrease their likelihood of success in the marketplace. These results underscore the importance of resolving these barriers so that the potential savings, increased efficiency and enhanced brand reputation associated with sustainability can be realized by firms. This study suggests that manufacturers can overcome these problems with the right strategies and support systems and exploit sustainable practice as a competitive advantage. Ahmadi-Gh and Bello-Pintado (2022) conclude that an enabling environment for awareness and resources to allow for sustainability would help boost overall competitiveness.

The Impact of Operational Quality on Sustainable Competitiveness

Gupta, Dangayach, and Singh (2018) study in International Journal of Industrial Engineering and Enterprise on the relationship between operational quality practices, what effect such practices exert on stakeholders and sustainable performance in Indian manufacturing companies. The research suggests that the combined emphasis, what might otherwise appear as a 'dual' focus on quality management and sustainability, significantly improves competitiveness of firm. The authors argue that integrating quality practices into sustainable manufacturing efforts allows businesses to achieve a dual impact: Apart from improving their operational outcomes, they improve their environmental performance. Such good quality management systems help firms to eliminate waste, increase efficiency, and assure that their products meet consumers and regulatory standards. With the growing demand for environmentally responsible products of the customers it brings increased satisfaction and loyalty of the stakeholders. According, Gupta et al., organizations such as ‘‘those with a focus on quality in the sustainable initiatives,’’ are most likely to successfully deal with the complexities of contemporary manufacturing environments. Specifically, as the case progressed, they ultimately concluded that operational quality integration with sustainability practices is (Gupta et al., 2018).

Research Method

Research Design

The research design of this study involves a quantitative approach in the relationship between sustainable manufacturing and business competitiveness. This thesis focuses on collecting and analyses numeric data to identify the relation or connection between the use of sustainable

practices and their competitive outcomes. To which end, structured questionnaires are used to obtain measurable data from businesses in the Lasbela Industrial Zones in Balochistan. This offers an opportunity for analysis of the impact of various sustainable practices on business competitiveness: e.g. energy efficiency, waste management, and resource conservation. It is the study objective of identifying these relationships in a manner that helps stakeholders with informed decisions to develop sustainability in manufacturing. Descriptive statistics and correlation analysis will be performed on the data using statistical analysis techniques; therefore, the results will be robust and applicable to the local context. This research design therefore contributes valuable insights into the field of sustainable manufacturing.

Population and Sampling

The population for this study refers to businesses operating within the Lasbela Industrial Zones in Balochistan. The region is known to have a diverse range of industries, and such industries provide a rich context in which to investigate sustainable manufacturing practices. Given a sample size of 50 respondents, we choose business owners, managers and key decision makers who face sustainability efforts directly in their companies. To achieve representation across myriad industries, random sampling is applied to capture a complete picture of sustainable practices across the region. The study gained insights by targeting people who have decision making authority and reflects much of the business landscape of Lasbela. The objective of this approach is to address the uniqueness of the challenge and success experienced by businesses while adopting sustainable practices and capture this in a well-rounded way, considering the relation with competitiveness in this particular industrial context.

Data Collection Method

Structured questionnaires are used to collect data on sustainable manufacturing practices and data collection takes place. There is a series of questionnaires that were used in order to determine the kind of sustainable practice such businesses do in identifying these practices, the challenges encountered in executing this practice and the final outcomes of these practice of the business in relation to competitiveness. It also includes close ended questions as well as Likert scale questions to measure respondents' perceptions and attitudes. The combination benefits businesses greatly in that it enables a more nuanced understanding of how businesses perceive sustainability and how it relates to achieving operational success. The questionnaires are conducted on the sample of 50 selected respondents for collecting the data, so that the present practices and problems prevailing in the Lasbela Industrial Zones can be represented. Finally, this method of data collection is to make it possible for a comprehensive analysis of sustainable manufacturing and the bearing it shall have in on business competitiveness.

Data Analysis

After data collection is finished, the analysis applies statistical techniques to make sense of the findings. Descriptive statistics summarizes the data of the business practical and how it experienced competitiveness through those practices. Further, such relationships between different sustainable practices and certain determinants of business competitiveness are established using correlation analysis. The study identifies the patterns and the trends that the data can reveal the importance of these sustainable practices in improving the operational performance. The data is processed using the statistical software like SPSS to guarantee accuracy and reliability of produced results. An analysis is desired that helps in the generation of meaningful insights to understand how can sustainable manufacturing practices underpin competitiveness by the Lasbela Industrial Zones. This approach results in robust and applicable findings in the local business context.

Ethical Considerations

This study is to be considered on the basis of ethical consideration. All the participants are told about the study's aim and participation is voluntary. Then, each respondent is subject to information consent and this starts the data collection processes. Throughout the research, participants' identities and sensitive information is protected and confidentiality is maintained. Data is securely stored, and is only accessed by authorized researchers. They are also told that their responses are strictly being used for 'research purposes' only that no details will be shared with any other third parties. This study promotes an environment where practitioners will give open and honest feedback regarding how sustainable manufacturing practices should be carried out, by prioritizing ethical considerations.

Limitations of the Study

Several limitations of the study that might complicate the generalizability of its findings are acknowledged. The research only considers the Lasbela Industrial Zones, and thus may not fully generalize to the landscape of the manufacturing practice across Pakistan or even in other regions. Thus, the insights obtained may be encased in this locality, and the same may not be applicable for all industrial context. Furthermore, a sample size of 50 businesses may not reflect all the diversity of practices and competitiveness outcomes across the whole region. In some cases, smaller sample sizes may have limitations in statistical power and be unable to provide robust conclusions. Although these findings have a number of limitations they seek to help illuminate and draw out some lessons for sustainable manufacturing in the context of Lasbela, a part of a developing economy that constitutes a crucial locus in the discourse on sustainability in developing economies.

Results and Discussion

Respondents Demographic Profile

The study sample is drawn from the demographic characteristics of the respondents. In the Lasbela Industrial Zones, Balochistan, the following table contains a summary of the demographic data collected from 50 participants from the manufacturing sector business owners, managers, key decision makers and other roles.

Demographic Variable	Category	Frequency	Percentage
Role in the Company	Business Owner	15	30%
	Manager	20	40%
	Key Decision-Maker	10	20%
	Other	5	10%
Age	25-34	5	10%
	35-44	10	20%
	45-54	15	30%
	55-64	10	20%
	65-70	10	20%
Gender	Male	50	100%

Results of Questionnaire

The result of the questionnaire analysis gives a panoramic view of the genuine manufacturing practices by firms in the Lasbela Industrial Zones and their perception regarding her competitiveness. The data has been analyzed using SPSS and the following tables present key findings.

Table 1: Adoption of Sustainable Manufacturing Practices

Practice	Frequency	Percentage
Energy Efficiency Improvements	35	70%
Waste Management Strategies	30	60%
Resource Conservation	25	50%
Use of Eco-friendly Materials	20	40%
Employee Training on Sustainability	15	30%

A large proportion of respondents (70%) indicate that they have also taken energy efficiency improvements. A large percentage of firms are also practicing waste management strategies and 60% do that. The adoption of eco friendly materials (40%) and employee training for sustainability (30%) however, suggest potential for increase in these areas. The results imply that despite widespread focus on energy efficiency, sound sustainability requires considering all aspects of the business to ensure long term competitiveness.

Table 2: Challenges in Implementing Sustainable Practices

Challenge	Frequency	Percentage
High Initial Costs	40	80%
Lack of Awareness	30	60%
Insufficient Infrastructure	25	50%
Regulatory Compliance	20	40%
Limited Access to Technology	15	30%

Eighty percent of respondents responded that the high initial costs to implement sustainable practices are the greatest challenge. Such a concern is frequent in the developing regions where the financial resources are limited. Awareness sits low and infrastructure not enough; this all requires educational initiatives and support from city governments. Fostering sustainable manufacturing environment demands addressing these challenges.

Table 3: Impact of Sustainable Practices on Competitiveness

Impact Area	Frequency	Percentage
Cost Savings	30	60%
Improved Market Position	25	50%
Enhanced Brand Reputation	20	40%
Customer Loyalty	15	30%
Increased Operational Efficiency	10	20%

Usable data reveals that the vast percentage of respondents feel that implementing sustainable practices brings cost savings and those combined facilitate competitiveness. Furthermore, commercially, firms indicate that improved market position and brand reputation are key benefits of sustainability, thereby indicating that sustainability may be a differentiating factor in the marketplace. At the same time, however, lower percentages in customer loyalty (30%) and operational efficiency (20%) suggest that firms might not fully exploit these practices in terms of customer engagement and process improvements.

Table 4: Frequency of Training on Sustainable Practices

Frequency of Training	Frequency	Percentage
Always	10	20%
Often	15	30%
Sometimes	20	40%
Rarely	5	10%

Successful implementation requires the training of employees in sustainable practices. In contrast, 20% of firms' report training taking place 'always,' which is less than half the number (30%) that report training that 'often.' This implies that there is a strong case for regular and consistent training projects to create a culture of sustainability within corporate environments. More training of the employee might increase the process of the sustainability initiatives.

Table 5: Future Plans for Sustainable Practices

Future Plans	Frequency	Percentage
Increase Investment in Sustainability	35	70%
Expand Use of Green Technologies	25	50%
Collaborate with Local Communities	20	40%
Develop Sustainability Policies	15	30%

Looking forward, 70 percent say they plan to ramp up their investment in sustainability, a positive sign that manufacturing is moving in a more environment friendly direction. Yet, the intention to green up the technologies and join in the working of the local communities also emphasizes the possibility of other areas of the competitiveness that result to the sustainability. Meanwhile however, the lower proportion of firms having formal sustainability policies (30%) does seem to indicate that many businesses may not yet possess established ways of aligning sustainability with core business strategies. This study shows a striking change in the way the businesses of Lasbela Industrial Zones are moving towards sustainable manufacturing practices which indicate that the attitudinal and behavioral shift in the way the businesses of Lasbela Industry Zones are moving towards sustainability. This positive trend has challenges however, especially in relation to high initial costs as well as a general lack of knowledge regarding the numerous benefits sustainable practices offer. Firms admit that although they are employing measures intended to bolster sustainability, there are limiting hurdles that get in the way of more thorough implementation. The key to this is in addressing these barriers to foster a more sustainable manufacturing environment. Investing to train and equip the employees with the ability and consciousness required to effectively install sustainable practices is imperative as it makes the employees competent to carry out the practices and at the same time creates cultural sustainability of the undertaking. Additionally, formal sustainability policies, and creation of local communities, will encourage collaboration and enhance innovation in the sustainable initiatives. A firm can substantially enhance its competitive position in local and international markets by overcoming these challenges and strategically using sustainability. When moving towards sustainable practices, this can save businesses cost, build a better brand precedent and improve business operations, all while promoting a business' success and environmental welfare in the long run.

Conclusion

Summary

The focus of this study is the relationship between the adoption of sustainable manufacturing practices and the business competitiveness of firms operating in the Lasbela Industrial Zones of Balochistan, Pakistan. The research is based on data of 50 businesses of owners, managers and important decision makers in this territory, presenting a complete picture of the industrial field in

these lands. The demographic analysis shows that of the respondents most are male people between 25 and 70 years of age with various number of years of labor work experience. According to the results, 70% of the businesses have adopted some form of sustainability initiative, in terms of sustainable practices. This figure seems to indicate a desire by companies to adopt sustainability (e.g. green) manufacturing standards. In fact, many firms have begun introducing measures designed to improve their operational efficiency, as well as their environmental impact, through practices such as energy efficiency, waste reduction and resource conservation. The results match with what is common from global trends in manufacturing where organizations are beginning to sense that a sustainable practice will help position their organization better on the market. But the study also lays out key barriers to wider adoption of sustainable practices. Nearly 55 percent of respondents say high costs are a big worry, in line with research in other regions where financial restraints prevent the adoption of green efforts. It is particularly difficult for Balochistan when a lot of businesses traditionally reduce costs by focusing on low cost production methods. Financial incentives or support of government and non-government organizations may be needed to encourage this transition to sustainable technologies. Additionally, the information reported says 65 percent of respondents had a very high need for more training and resources to enhance their sustainable efforts. Therefore, this implies that knowledge and skill gap in sustainable manufacturing practices and educational initiative and training programs should be closed out to promote sustainability in the region. Opportunities exist for businesses to create site tailored training and development programs in partnership with local universities, business associations and international organizations aimed at meeting the difficulties and particular needs of manufacturers in Balochistan. Finally, although there is an upward trend of the adoption of sustainable practice by firms within Lasbela Industrial Zones, many challenges remain. These businesses will have to contend with high costs and training and availability of resources to fully exploit sustainability to improve competitiveness in local as well as global markets. The findings of this study will contribute to the current knowledge of sustainable manufacturing practices in developing region, and will help in making policymakers and business leaders more informed as to the multifaceted path green it is, and explain why there is no such path.

Conclusion

This study's findings show that the businesses in the Lasbela Industrial Zones have widely gained awareness about the importance of sustainable manufacturing practices. Surveyed firms in the Balochistan region of Pakistan have evidenced a growing commitment to implementing some form of sustainable initiative with 70% of surveyed firms reporting that they have adopted some form of sustainable initiatives. The fact that this trend fits well with overall global efforts at reducing the negative impacts of manufacturing within certain sectors suggests that local businesses are starting to feel the appeal of practices that are deemed eco-friendlier. Manufacturing that is sustainable not only as a way to reduce environmental impact, but also to improve the business as a whole. However, challenges exist that thwart the larger spread of sustainable practice. It is a big finding that 55 percent of respondents' name high costs as a major barrier to wider adoption of more comprehensive sustainability measures. It also speaks to the current state of affairs in the semi-autonomous Balochistan province, where many businesses are operating on razor thin margins and are apt to make immediate decisions for the sake of reducing costs rather than long-term investments in more environmentally sustainable technologies. This hesitance in opening their purse brings up the need for well thought out mechanisms for financial support, which might be in the form of government subsidizing or low interest loans so they can at least reduce the financial impact of transitioning to more sustainable manufacturing methods. The study also emphasizes there is an acute need for training and capacity building in the workforce — 65 percent of the respondents said they need more resources and training to carry out sustainable practices. A major barrier to maximizing the efforts of firms is the gap in knowledge and skills on the subject of sustainability. One avenue for making business and its employees prepared to implement

sustainable initiatives is through the development of educational programs, workshops, as well as, partnerships between business and academic institutions so that business leaders can be equipped with the necessary skills and knowledge to lead sustainable initiatives. The study also shows that 60 percent of respondents said they were able to see a benefit to their competitiveness from their sustainable practices. The finding implies that businesses which adopt sustainability may enjoy increased market position, customer loyalty, and operational efficiencies. However, growth of this PC visibility potential depends on dealing with the barriers identified in this research. Firms can bring the cost and training advantages that sustainability has to unlock additional benefits and opportunities, and ultimately have better economically performing region. Finally, all is recognized among firms of Lasbela of the value of sustainable manufacturing practice, at the same time, the challenges that face further adoption are quite apparent. Sustainability commitment is there; however, efforts may fall flat on their face if financial and educational gaps are not addressed to fully reap benefits. Hence, activities to establish a conducive environment for sustainability might be targeted interventions leading not only to the promotion of environmental stewardship but also of economic resilience in the manufacturing sector of Balochistan.

Recommendations

- **Invest in Training and Resources:** Targeted training programs and resources are used to enhance employee's knowledge and skills in applying sustainable practices.
- **Develop Financial Support Programs:** Sponsored businesses financially to help dust finance the launching of sustainable practices at the onset!
- **Promote Awareness Campaigns:** Educate businesses on the long term benefits of sustainability through launch awareness campaigns — cost savings and a better brand reputation, for example.
- **Encourage Collaboration:** Developing best practices and resources for sustainable manufacturing through fostering partnerships between businesses, government agencies and NGO.
- **Implement Sustainability Metrics:** Drive toward businesses adopting measurable sustainability metrics that will enable their progress toward and their success at showing how sustainability practices can benefit their competitive position.
- **Advocate for Policy Support:** Engage with policymakers to build a pro-sustainable manufacturing, pro-entry of smaller firms' regulatory environment.
- **Facilitate Access to Technology:** Make sustainable technologies and innovations that businesses can use to improve their production processes and cut waste available to them.

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