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Green Practices and Economic Performance: Mediating Role of Green Innovation in Pakistan's Leather, Textile, and Garment Industries: An integrated PLS-SEM Analysis

Danish Ahmed[1], Sheikh Muhammad Fakhar E Alam Siddiqui [2]

[1] Research Scholar, Karachi University Business School, University of Karachi, Pakistan.
Email: danishahmed_26@yahoo.com
[2] Assistant Professor, Karachi University Business School, University of Karachi, Pakistan.
Email: fakhrealam@uok.edu.pk

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ABSTRACT

This paper discusses various green practices, green HR management, green investment, green manufacturing, green marketing orientation and stakeholder pressures on the economic performance mediating by the green innovation and the possible impact of Green Lean Six Sigma (GLSS). Sustainability is also being strongly connected to competitive advantage but application of sustainability has an implementation gap to firms within emerging economies. Thus, this study tried to develop a comprehensive framework on sustainability and performance in an effort to realize what category of environmentally friendly competencies is actually contributing to the economic upgrades in the Pakistani textile, leather and garment sector. Quantitative and explanatory design was chosen with the help of PLS-SEM with SmartPLS 4. This was accomplished by way of a structured survey of sustainability oriented industrial professionals to collect the data. The analysis of a total of 309 responses was performed to test direct effects, mediating effects and moderating effects. Reliability, validity, HTMT, FornellLarcker and model fit were properly examined. Findings prove that there is a massive positive implication of green HRM, investment, marketing and pressure on economic performance by stakeholders. The mediation, though biased, green innovation (b = 0.227, p = 0.001) was also the case, whereas the GLSS was neutral and indicated that the implementation was weak. What was obtained as the resultant model was R2 = 0.775 (GI) and R2 = 0.776 (EP) indicating a high predictive power of the model. The paper describes one of the initial multiple practices, sustainability frameworks of the Pakistani export industries and reveals the capabilities gaps to the policymaker and managers. Future studies that may be conducted encompass cross sector research or longitudinal study.

Corresponding Author's Email: danishahmed_26@yahoo.com

1. Introduction

The manufacturing industry particularly the leather textile and readymade garment industry has been a very good contributor to the GDP and exports though it is pressured to pursue sustainable production models due to both rise in the global compliance standards and environmental. Growing industrial contamination, environmental pollution, and energy manpowering the coagulation have resulted in a growing demand on the environmental responsibility potential over supply networks worldwide (Chien, 2023). The recent researches demonstrate how companies embracing their green approach, manufacturing, and their resource efficiency can assist them to sustain good trade relations with other countries, as well as retain their competitive export status in the global markets such as the EU, and North America (García-Machado & Martínez-Ávila, 2019). More so, the issue of sustainability is becoming relevant since the world is increasingly becoming interested in eco-friendly and ethically produced consumer

goods (M. Anwar, & Abdullah, M. , 2021). It is also stated that the environmental-focused industries had higher chances to attract foreign investments and long-term market entry (Agyabeng-Mensah, Afum, & Ahenkorah, 2020).

1.1. Research Objectives

The research is done to find out how the green manufacturing practice, green HRM, green marketing orientation, and green investment strategies affect the economic performance of leather, textile, and garment market in Pakistan. It has been shown that sustainability-oriented strategies enhance the profitability of organizations, the efficient use of resources, and overall performance (Bag, Pretorius, et al., 2021; Gandhi, Thanki, & Thakkar, 2021). Most recent studies also present the advantages that the environmental proactive companies obtain in terms of achieving improved competitiveness and operational resilience (Gupta, Modgil, & Gunasekaran, 2020). More so, green practices can be beneficial in improving the performance of the supply chain because they reduce industrial wastes and promote the growth of international compliance (Dubey et al., 2020). Concerning the developed economies, previous studies do affirm that green manufacturing and strategic acquiring sustainability will support the development of the reputation and performance of the production process (Kaswan & Rathi, 2019).

1.2. Research Questions

Q1. What is the effect on the economic performance of the leather industry, Green HRM, Green Marketing orientation, and Green Investments strategies, as well as the pressure of Stakeholders, both individually and collectively on the economy of the Pakistan textile industry, and the Pakistani garment industries?
Q2. Is green innovation an important mediator of the relationship between sustainability-oriented practices (green manufacturing, green HRM, green marketing orientation, green investment, pressures of stakeholders) on one end and economic performance on the other end?
Q3. What is the moderating/increasing impact of Green Lean Six Sigma (GLSS) on relationships between green practices and green innovation within the manufacturing industry of Pakistani?
Q4. Is an integrated PLS-SEM-based sustainability framework useful in predicting the economic performance in Pakistan when green innovation and process optimization in export-oriented industries is used?

1.3. Problem Statement

The leather, textile and garment industry of Pakistan is a major national export, and the industry is increasingly experiencing issues of sustainability as the world continues to mount pressure to ensure that the industry adhere to the required environmental standards. Although these industries play an important role in the GDP, they continue to resort to the old form of manufacturing that leads to industrial wastes, energy and resource-intensive production, and inefficiency (Abualfaraa et al., 2020; Agyabeng-Mensah, Afum, & Ahenkorah, 2020). The current research has pronounced that buying power across the globe is increasingly concentrated on demand of greener products, supply chain traceability and green certification as aspirations before trade partnerships (Chien, 2023). Nevertheless, most companies lack systematic and sustainability models, in particular with regard to innovation, in environment-focused strategies (Kitsis & Chen, 2021). It is also indicated in previous literature that the rate of sustainability transitions is low in developing countries due to inadequate availability of invest capital and absence of innovation mechanisms (Wang et al., 2021).

2. Literature Review

Green manufacturing focuses on minimizing the environmental effects and maximizing resource use and optimal use of processes during the manufacturing of goods and services. The current studies reveal that a business that renovates energy conservation measures and systems in production along with waste minimization in their activity demonstrate a more stable competitive stance and regulatory adherence (Abualfaraa et al., 2020; Belhadi, Touriki, & El Fezazi, 2018). Such practices are now mandatory to the global environmental standards in the export oriented sector in Pakistan in order to achieve long term access to trade (Agyabeng-Mensah, Afum, & Ahenkorah, 2020). In addition, research has also shown the purposes of green manufacturing to contribute to the reduction of pollution and the sustainability of operation (Dubey et al., 2020). Previous studies have defended the idea that sustainable production would enhance the corporate image and performance effectiveness in case it is managed in an efficient manner (Ben Ruben, Vinodh, & Asokan, 2017; Kaswan & Rathi, 2019). Green Lean Six sigma -

GLSS is a strategic enabler that incorporates operation efficiency as well as sustainability performance(Ragmoun & Alfalih, 2025; Ragmoun & Ben-Salha, 2024). It enhances the standardization of the processes, the number of waste products is also reduced, and it is data-driven to control the quality, so it can be applied in industries focused on sustainability (Gandhi, Thanki, & Thakkar, 2021; Gupta, Modgil, & Gunasekaran, 2020). Companies that use GLSS achieve enhanced adherence to environmental policies and improved performance with resources through real-time tracking and optimization (Yadav et al., 2021). It is also discovered that GLSS is a prominent succession of enhancing the connection amid sustainability practices and innovation performance (Bag, Pretorius, et al., 2021). Past research has verified that structured process improvement frameworks are used in order to enhance the rate of environmental conformability in the manufacturing industries (Bag, Pretorius, et al., 2021; Guleria et al., 2022).

3. Theoretical Foundation

3.1. Natural Resource Based View (NRBV)

The Natural Resource-Based View Helms and Crane (NRBV) where the firms can achieve competitive edge through the use of natural resources to create their competitive advantages in form of a capability to perform sustainability based activities efficiently. It refers to the emphasis on environmental practices as a form of strategic resources that can create value upon the firm when incorporated in production and operating systems (Musabandesu, 2021). The recent research can be observed to argue, and prove that when NRBV is taken into account, green manufacturing, investments and HRM works towards the achievement of resource efficiency and long-term economic benefits (Awan et al., 2021; García-Machado & Martínez-Ávila, 2019). In addition, it is even more likely that NRBV-adhering firms will have eco-compliance and innovation-driven competitiveness partnerships across the world (Chowdhury, Mendy, & Rahman, 2023). Past studies state that NRBV offers a tool that can help effectively theorize the strategies that are produced by sustainability within the manufacturing sector (Dangelico, Pujari, & Pontrandolfo, 2017).

3.2. Dynamic Capabilities Theory (DCT)

Dynamic Capabilities Theory (DCT) is the theory that elucidates how the companies respond to the changes in the market and the environment by updating processes and rethinking them as well as by applying the digital transformation. One of the more popular discoveries, both in the recent literature and, potentially, in strategic options, is the significance of sustainability-based innovation that can be regarded as a critical necessity to enhance strategic responsiveness and optimize resources (Yadav et al., 2021). Green innovation has been suggested as a dynamic capability that regulates organizational routines and transforms them into environmentally phenomenal strategies (Khan & Qianli, 2017). Green Lean Six Sigma is immensely dynamical capabilities in line with operational efficiency and sustain led innovation (Bag, Pretorius, et al., 2021). In the past, the dynamic capability was proposed as the solution to organizing competitive business models in ambiguous and resource-sensitive business conditions (Wamba et al., 2015).

3.3. Green Lean Six Sigma Framework.

Green Lean Six Sigma (GLSS) is a model of performance and a strategic facilitator that brings about convergence and combination of sustainability, waste minimization, process optimization and quality management. It increases the operational value of a sustainability strategy and environmental practices to be more robust in weak economic performance (Bag et al., 2020). According to studies, the three of GLSS can assist the industries in decreasing environmental footprints and enhancing production efficiency and competitiveness (Belhadi, Touriki, & El Fezazi, 2018; Bianciardi et al., 2017). There is also empirical evidence that GLSS is a method of enhancing the potential of innovation, lowers the inefficiencies in export industries (Kock, 2015). Previous research papers demonstrate the benefits of lean-based strategies, which may be used to improve sustainability performance as a whole in case of structured process models (Chien, 2023).

3.4. Supporting & Negating Views

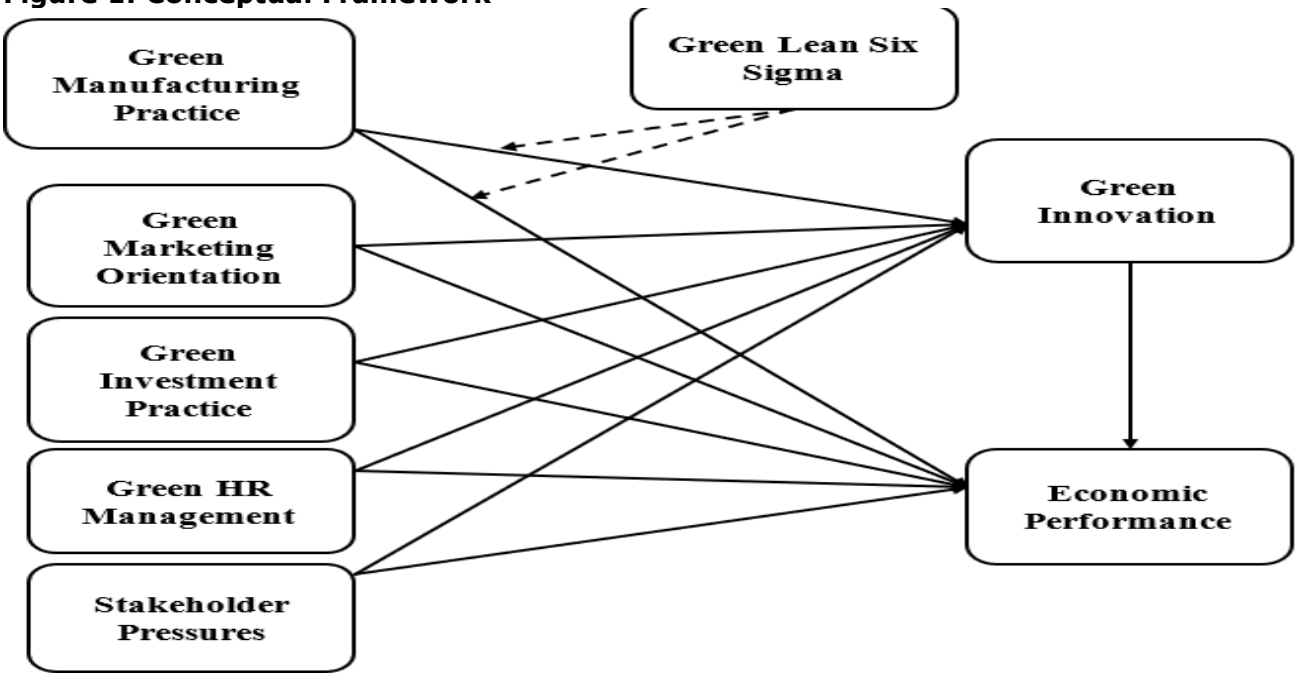
The direct positive influence of the green practice of green manufacturing, HRM, investment and marketing orientation on economic performance has been favored in many studies. Researchers claim that the benefits that sustainability-based firms receive are the cost-efficiency, competitiveness on the market and acceptance of their exports (Musabandesu, 2021; Yadav et al., 2021). Among the recent findings in emerging markets, the textiles and garments sector in Pakistan has been enjoying monetary rewards when they introduce green procedures

in the main processes (García-Machado & Martínez-Ávila, 2019). It is also proposed that environmental practices result in the reduction of waste, increase the quality and led to profitability when aligned with the strategy (N. Anwar, & Abdullah, R. , 2021). The possibility of better representation of sustainability results in enhanced reputation and efficient functioning is also proven by earlier literature (Bag et al., 2020).

3.5. The perspective of mediation and moderation.

Innovation is also of importance because green manufacturing practices precondition the adoption of cleaner technologies and waste reduction solutions that would allow the companies to increase their efficiency and environmental performance (Khan & Qianli, 2017). Research within the framework of emerging economies also indicates that green manufacturing improves the innovation capacities both in process redesign and increased resource utilization (Musabandesu, 2021). The literature review underlines that the systems of production towards sustainability open the ground to the emergence of the new technology and environmentally friendly systems (N. Anwar, & Abdullah, R. , 2021). Nevertheless, according to other authors, it does not necessarily mean that green manufacturing would lead to innovation in the absence of technological preparedness and investment preparation (Chowdhury, Mendy, & Rahman, 2023; García-Machado & Martínez-Ávila, 2019). Green manufacturing increases the first cost, procedure complex, and disruption of operations, thereby reducing inspiration to innovate in many industries (Wamba et al., 2015). Moreover, companies that lack strategic alignment and the support of GLSS do not have an easy time turning green manufacturing to innovates (Bianciardi et al., 2017).

Figure 1: Conceptual Framework



3.6. Hypothesis Development

3.6.1. Green Manufacturing Practice (GMP) and Economic Performance (EP)

Whole cleaner manufacturing policies are aimed at effective use of energy, reduction of waste, which could direct impact on the economic performance of firms directly. The recent studies indicate that the organizations implementing green production systems not only reduce costs but also achieve increased productivity and competitiveness when exporting the products of this type because they tend to consume fewer materials and comply with the international environmental regulations (Abualfaraa et al., 2020; Belhadi, Touriki, & El Fezazi, 2018; Dubey et al., 2020). The practices also have other merits in terms of minimizing the risks of fines and trade restrictions that come with environmental non-compliance hence securing the profitability of the export-oriented industries(Ahmed, Azhar, & Mohammad, 2024; Mohammad, 2015). Previous research advancements have been encouraging by suggesting that the long term competitive advantage attained by applying environmental standards to manufacturing systems

would be implemented through a mixture of enhanced operational efficiency and legitimacy to the stakeholders (Kaswan & Rathi, 2019).

H1: there is a positive and significant influence of green production activities on the economic performance.

3.6.2. Green Marketing Orientation (GMO) and Economic Performance (EP)

This is because green marketing orientation internalizes the concept of sustainability into market sensing, positioning and communicating activities, which might directly have their effects on the revenues and the market share of a firm. Based on the recent research findings, the customer trust and loyalty in the international markets with concerning consumers to the environmental sustainability can be improved by the branding and communication about the environmental responsibility (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Chowdhury, Mendy, & Rahman, 2023; Kitsis & Chen, 2021). The companies can command a high price and achieve larger fixed long-term identification to the global retailers as they harmonize the marketing strategies with the objective factual green attributes. According to the preceding literature, the marketing strategy will be promoting increasing brand equity and financial accrual (Dangelico, Pujari, & Pontrandolfo, 2017).

H2: Green marketing orientation has a positive but significant effect on the performance of the economy.

3.6.3. Green Investment Practice (GIP) and Economic Performance (EP)

Green investment efforts such as the funding of cleaner technologies, renewable energy system and pollution-control structures can generate long-run financial benefits to the manufacturing firms. The existing literature reveals that the companies that invest in the technologies that are energy-efficient get to have low-energy costs, which upsurges productivity of resources and means reduced operating costs of lifecycle (Belhadi et al., 2023; Belhadi et al., 2020; Chien, 2023). Through this kind of investment, regulatory risk, and reputational risk in the event of environmental crime would be minimized as well; this would decrease the possibility of fines and adjustments in trade. In the past, empirical research in the manufacturing context, has provided insights into the cost of green capital to better returns on profits and returns on assets with the provisions of strategized capital expenditure (Wang et al., 2021).

H3: Green investment practice has a significant positive effect on the economic performance.

3.6.4. Green HR Management (GHRM) and Economic Performance (EP)

Green HRM is also interested in recruitment, training, appraisal, and rewards of employees in a manner that would boost environmental ambitions that can indirectly and directly benefit financial outcomes. It is evidenced that in the recent time, the organization practicing green HRM has more awareness of employees on sustainability, and is more motivated and committed to sustainability, which will lead to fewer cases of resources waste and process errors (Musabandesu, 2021; Yadav et al., 2021). The subsequent change in behaviour will lead to cost-saving, increase in productivity and levels of adherence to the environment. Past studies underscore the fact that organisational culture and human capital is the most important source of innovation and economic achievement (Hair et al., 2014).

H4: Green human resource management is a good and influential factor with respect to economic performance.

3.6.5. Economic Performance and Stakeholder Pressures (SP)

The stakeholder forces of regulator, foreign acquirers, local populations and the NGOs can influence firms to engage in practices which eventually impacts on the economic performance of the firm. In the recent studies, outside forces tend to trigger the process of implementing green manufacturing, innovation and reporting systems that result in efficiency improvement in operations and minimise the impact on the environment (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag et al., 2020; Kitsis & Chen, 2021). The companies will have an opportunity to enter the market, avoid penalties, and win the favor of the key partners by timorously responding to the demands of the stakeholders as well as a favorable stance, which will help secure revenues stability and profitability. The literature throughout the years on institutional theory explains that

the act of complying with normative and regulatory pressures helps organisations to keep their head above water and continue existing (Kitsis & Chen, 2021).

H5: Stakeholder pressure positively and significantly influences the economic performance.

3.6.6. Green Manufacturing Practices, Green Innovation and Economic Performance

Through green manufacturing, green innovation can be enhanced through demanding corporations to reassess their use of the resources and re-architecture processes and invest in cleaner technologies thus eventually resulting in better performance by the economies. Recent findings show that when organisations are long-term committed to environmental friendliness, greater eco-innovations that boost financial performance by cost savings and quality improveability are developed (Belhadi et al., 2020; Guleria et al., 2022). (Wang al., 2020). In addition to reducing the regulatory and the environmental risk, these innovations are also supportive of the exports productivity and competitiveness. The additional positive externality suggested by the preceding cross-industrial studies that in the instance that the companies can integrate environmental issues into the manufacturing processes into the performance, recovery over the long term is strengthened (N. Anwar, & Abdullah, R. , 2021).

H6: The connection, which exists between green manufacturing practice and economic performance, transacts in terms of green innovation.

3.6.7. Green Marketing Orientation, Green Innovation and Economic Performance

The orientation to green marketing can also cause companies to create products, package and message in a way that attracts the attention of the environmentally conscious consumer, and in this manner, improves the economic performance. The evidence of the recent research indicates that sustainability-based marketing facilitates environmentally creative products and better market positioning (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Chowdhury, Mendy, & Rahman, 2023; Kitsis & Chen, 2021).

H7: Green innovation mediates the relationship between the green marketing orientation and the economic performance.

3.6.8. Green Investment, Green Innovation and Economic Performance

Green investments enhance the ability to innovate which results in improved performance (Belhadi et al., 2023; Khan & Qianli, 2017).

H8: Green innovation moderates the relationship between green investment practices and the economic performance.
Green HRM, Green Innovation and Economic Performance.
Green HRM develops innovation capabilities (Musabandesu, 2021; Yadav et al., 2021).
H9: Green innovation moderates the relationship that is present between the green HRM and economic performance.

3.6.9. Green Performance, Green Innovation and Stakeholder Pressure

Pressure caused by the stakeholders will help firms innovate and stay abreast with competition (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Kitsis & Chen, 2021).

H10: There is a mediating effect between stakeholder pressure and economic performance by green innovation.

3.6.10.Green Practices and GLSS and Innovation / Performance.

GLSS reinforces process management, reduction of waste and effectiveness of innovations (Belhadi et al., 2023; Gandhi, Thanki, & Thakkar, 2021; Gupta, Modgil, & Gunasekaran, 2020; Kaswan & Rathi, 2019).

H11: GLSS is a positive moderator of the mediated relationship between the green practices, green innovation and economic performance.

4. Methodology

4.1. Research Design

The study is based on the quantitative, explanatory and theory-based to examine the causal linking of green practices, green innovations, and economic performances under the assumption that leather, textile and garment industries in Pakistan are involved. The quantitative designs come in particularly handy when testing the hypothesized associations and considering the power of mediation and moderation effects are the objectives of the design (Dubey et al., 2020; F. Hair Jr et al., 2014; Henseler, Hubona, & Ray, 2016). The study follows the recent trends in sustainability and industrial research where empirical validation by design and model testing of sustainability strategies is in the limelight in assisting policy making and strategic decision support (Abualfaraa et al., 2020; Belhadi et al., 2023). According to previous literature, it is also implied that the unique feature of quantitative studies is the possibility to perform predictive modelling and operational insights, which may be applied in the high-impact industry, such as manufacturing and supply chains (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag et al., 2020). The explanatory design is suitable in this study because the research is interested in explaining how the presence of green practices can influence the economic performance via the mediating effect of green innovation and moderating the effect of Green Lean Six Sigma. Recent research on sustainability dwells on explanatory-based models, determining the path dependencies and interaction effects among environmental constructs (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag, Pretorius, et al., 2021; Belhadi et al., 2023). It is also compliant to Dynamic Capabilities Theory, and NRBV, which do not require the use of empiricism during hypothetical testing of empirical validation of firm capabilities in reaction to environmental issues. The results of earlier research works are also assertive with regards to the practicability of explanatory research designs in the operationalization of environmental strategy and performance indicators in emerging economies (Belhadi, Touriki, & El Fezazi, 2018; Kaswan & Rathi, 2019).

Quantitative research design is the most appropriate in this research study as it will allow exploring the objective measurement of the relationship between variables and statistically validate the mediation and moderating effects. The latest sustainability research indicates that quantitative modelling is the center of the solution in order to confirm the existence of the causal interdependencies among the green practices, innovation capability, and the economic performance (García-Machado & Martínez-Ávila, 2019; Khan & Qianli, 2017; Wang et al., 2021). The approach is in line with NRBV and Dynamic Capabilities Theory that require testing environmental capabilities at the firm level. The earlier literature demonstrates that quantitative models organized help to capture the variability enveloped in the industrial environment and reveal the tendencies in performances in the manufacturing fields (Bag et al., 2020; Dubey et al., 2020). Therefore, quantitative methodology is useful in generating valid and replicative evidences that could be employed in policy and practices. The current study has embraced a distinctive research design, which incorporates 5 major constructs of sustainability which are, green manufacturing, green HR, green marketing orientation, green investment and stakeholder pressure in a single umbrella construct. As opposed to other research studies in the past where researchers have concentrated on the constructs of sustainability separately, this design takes into account the concept of synergistic relationships between environmental practices and its overall impact on firm level performance (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Chowdhury, Mendy, & Rahman, 2023; Kitsis & Chen, 2021). This multi-variable arrangement is a reaction to the recent demands of a holistic approach to configuration responding in practice to industrial approaches to reality as opposed to fragmented approaches. It has been mentioned in previous studies that various sustainability approaches should be implemented collectively to generate tangible economic effects as a specific emphasis on emerging markets is put in place (Abou Taleb & Al Farooque, 2021; Belhadi et al., 2020). Thus, such design has methodological innovation and useful addition.

4.2. Data Collection Procedure

This research will be able to gather data through a structured questionnaire to be used in interviewing sustainability-oriented operating in the Pakistani leather, textile and garment industries. To ensure the survey has higher response rate and representativeness, a web-based survey will be used, and distribution will occur on-site. Such a way of data collection is frequent in sustainability studies in the environmental and industrial fields, especially when standardized data will be used in the application of PLS-SEM (F. Hair Jr et al., 2014; Gupta, Modgil, & Gunasekaran, 2020; Henseler, Hubona, & Ray, 2016). The advantages of structured surveys are

that they are able to test indirect effect, path coefficients, and model comparison, predictive accuracy (Bag, Gupta, et al., 2021). The appropriateness of survey-based research has been established in the past since it can be applicable to the manufacturing and supply chain research that involves a large number of respondents to statistically generalize (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Kitsis & Chen, 2021).

4.3. Sample Population & Sampling Technique

The study population also consists of employees and managers, who are engaged in in the functions of sustainability - e.g., in production, HR, investment, quality control, and supply chain management. The unit of analysis will be the single professional in the leather, textile, and garment firms in Pakistan. The purposive sampling approach will be employed in order to achieve the responses of individuals with first-hand knowledge of sustainability/innovation and practices as prescribed in a previous form of SEM-based industrial frameworks (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag, Gupta, et al., 2021; Kitsis & Chen, 2021). The method is widely applied in the cases when the data reliability requires specific expertise (Chowdhury, Mendy, & Rahman, 2023). Past studies in emerging economies have validated the effects that purposeful selection has the response validity and the compatibility between SEM and structured answers (Abualfaraa et al., 2020; Belhadi, Touriki, & El Fezazi, 2018).

4.4. Pilot Study: Instruments Adaptation

To enhance the questionnaire, a pilot test (n = 30 -35) will be undertaken to ensure it is free of ambiguity, unreliable and invalid. Pilot test serves to refine the accuracy of the scale, identify ambiguity, as well as trying to improve the appropriateness of responses to be sought during the actual data collection process (Awan et al., 2021). The measurement items will be based on the valid scales of the past sustainability and operations research studies in which the contextual validity is maintained regarding the industrial context in Pakistan (Bag, Pretorius, et al., 2021; Tseng et al., 2020). Previous researchers suggest that pilot studies should be employed to minimize measurement error and psychometric properties of SEM constructs (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Miles & Snow, 1994). They will be deployed and all tested on Likert-scales responses (1-5).

4.5. Programs to be used in the analysis

An analysis will be conducted with the help of SmartPLS 4 as it supports reflective measurement models, mediation, moderation, bootstrapping, HTMT, and Fornell-Warner and Larcker validity test (Bag, Pretorius, et al., 2021; F. Hair Jr et al., 2014; Henseler, Hubona, & Ray, 2016; Kock, 2015). The software is favored in the prediction-based SEM analysis, though, having numerous latent factors and interactions effect. The recent scholarly research on sustainability has confirmed that SmartPLS is highly pertinent to industrial research in emerging economies (Dubey et al., 2020; García-Machado & Martínez-Ávila, 2019; Kitsis & Chen, 2021). SmartPLS was found in the previous methodological works to be an effective mechanism of theory extension and causality prediction (Gupta, Modgil, & Gunasekaran, 2020).

4.6. Validity and Reliability Techniques

The measurement validity will be established using the following: Construct Reliability, Cronbachs Alpha, Composite Reliability (CR), Average Variance Extracted (AVE) and Convergent similar to the PLS-SEM and standardized as follow (F. Hair Jr et al., 2014; Gupta, Modgil, & Gunasekaran, 2020; Henseler, Hubona, & Ray, 2016). The discriminative validity will be tested with the help of HTMT Ratio and Fornell-Larcker Criterion as the benchmark criterion of green innovation and performance study (García-Machado & Martínez-Ávila, 2019; Kitsis & Chen, 2021). According to older research, the meticulous validity assessment enhances the accuracy of the model interpretations and assists in strengthening the results of a study to industrial decision-making (Belhadi, Touriki, & El Fezazi, 2018; Kaswan & Rathi, 2019). This population included 103 respondents, as shown by the demographic table (see Appendix B). The demographic part will include age, sex, education level, job designation, experience in the department and industry. These facts allow profiling the sampled respondents, and the sampled respondents are relevant in terms of their professional exposure to sustainability-oriented practices (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag, Pretorius, et al., 2021; Kitsis & Chen, 2021). The stratification of responses based on the demographics is also a method that reveals the potential response bias and allows exploring the responses by group with the segmentation abilities of the SEM such as MGA (Multi-Group Analysis) (Gupta, Modgil, &

Gunasekaran, 2020). According to the previous researches, generalization and managerial interpretation in a study related with industrial sustainability can be achieved through demographic data (Abualfaraa et al., 2020; Belhadi et al., 2023).

5. Results and Discussion

As seen in the analysis, the proposed sustainability performance framework has empirical data with several important relationships being found both directly and indirectly among the constructs. Findings indicate that green production, green investment, stakeholder demands and green HRM have a significant role in the explanation of both the economic performance in the textile, leather and garment sectors in Pakistan both directly and indirectly through green innovation. It was however seen that the mediation of green innovation was partial with the direct paths remaining influential in variety of constructs that have been consistent with recent work in sustainability which cannot only focus on enhancing innovation but not fully substitute other working practices (García-Machado & Martínez-Ávila, 2019; Khan & Qianli, 2017; Kitsis & Chen, 2021). The same indications were made by the previous literature, which showed that the sustainability achievements are more successfully adopted when the research concentrated on the human resources and strategic operational processes (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Belhadi, Touriki, & El Fezazi, 2018). Findings also substantiate the overall medium nature of green innovation in bridging environmental practices and economic performances in the firm level. The path coefficients (e.g., GIP -> GI =0.881 and GI -> EP = 0.227) show how innovation as a mechanism of transformation can convert the resource efficiency, employee skills and market orientation into performance gains that are measurable.

This aligns with recent empirical studies that presuppose that innovation tightens sustainability results and enhance value added competitiveness (Iqbal & Ali, 2024). Nevertheless, past research indicates that not every company may be proficient in converting environmental practices into economic gain when they are without innovativeness readiness and strategic fit (Iqbal et al., 2023), and in this instance, these companies must be able to develop capabilities should this turn out to be the case . The outcome of the moderation revealed that Green Lean Six Sigma (GLSS) failed to yield significant statistics of enhancing the association between sustainability practice and green innovation with the presence of non-significant interaction terms. This means that though the cognizance of the Lean or Green techniques may be present in the companies, there is a low assimilation of the techniques as a formal Six Sigma frameworked innovation. The recent studies claim that implementing GLSS, which requires high stage of process maturity, digital preparedness and data driven choice making, which in many growing economies is still immature, is not easy (Awan et al., 2021; Tseng et al., 2020). Another possible implication of the previous studies is that environmental tools are only probable to be effective when integrated into the managerial strategy and training programme (Iftikhar, He, & Wang, 2016; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). Such results imply the possibility of any need of strong implementation structures in the Pakistani industries to realise the potential of GLSS.

Table 1: Reliability and Validity Analysis

Construct reliability and validity Overview			
	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
ECONOMIC_PERFORMANCE	0.922	0.923	0.865
GREEN HR_MANAGEMENT	0.862	0.865	0.784
GREEN LEAN_SIX SIGMA	0.918	0.918	0.859
GREEN _INNOVATION	0.853	0.857	0.773
GREEN _INVESTMENT _PRACTICE	0.908	0.909	0.844
GREEN _MANUFACTURING _PRACTICE	0.887	0.890	0.815
GREEN _MARKETING _ORIENTATION	0.832	0.844	0.747
STAKEHOLDER_PRESSURES	0.856	0.857	0.776

The construct reliability and construct validity table scores make it clear that all constructs of your model are able to comply with excellent psychometric standards to ensure an excellent level of measurement and ensure that the structural model is robust enough to test the

hypothesis. Cronbach Alpha values are 0.832 to 0.922 that is stronger than the minimum distribution of 0.70, therefore, the high internal consistency of all the constructs. In line with this, all the Composite Reliability (rho a and rho c) values are above 0.89 that implies Construct reliability and The measurement items are very high. Most importantly, the values of Average Variance Extracted (AVE) fall between the percentage 0.50 considered significant at 0.747 to 0.865 that demonstrates the convergent validity i.e. the high percentage of variance of each construct in its indicators. The results are as well pegged on the proposed reliability rules by suggested indicators in sustainability-oriented research on the basis of PLS-SEM which establish that your measurement model is accepted statistically and can be furthered into the mediation and moderation research. Overall, the results justify the rigor of the methodology of your model and provide considerable arguments in the name of structural testing and hypothesis validation.

Table 2: Discriminant Validity

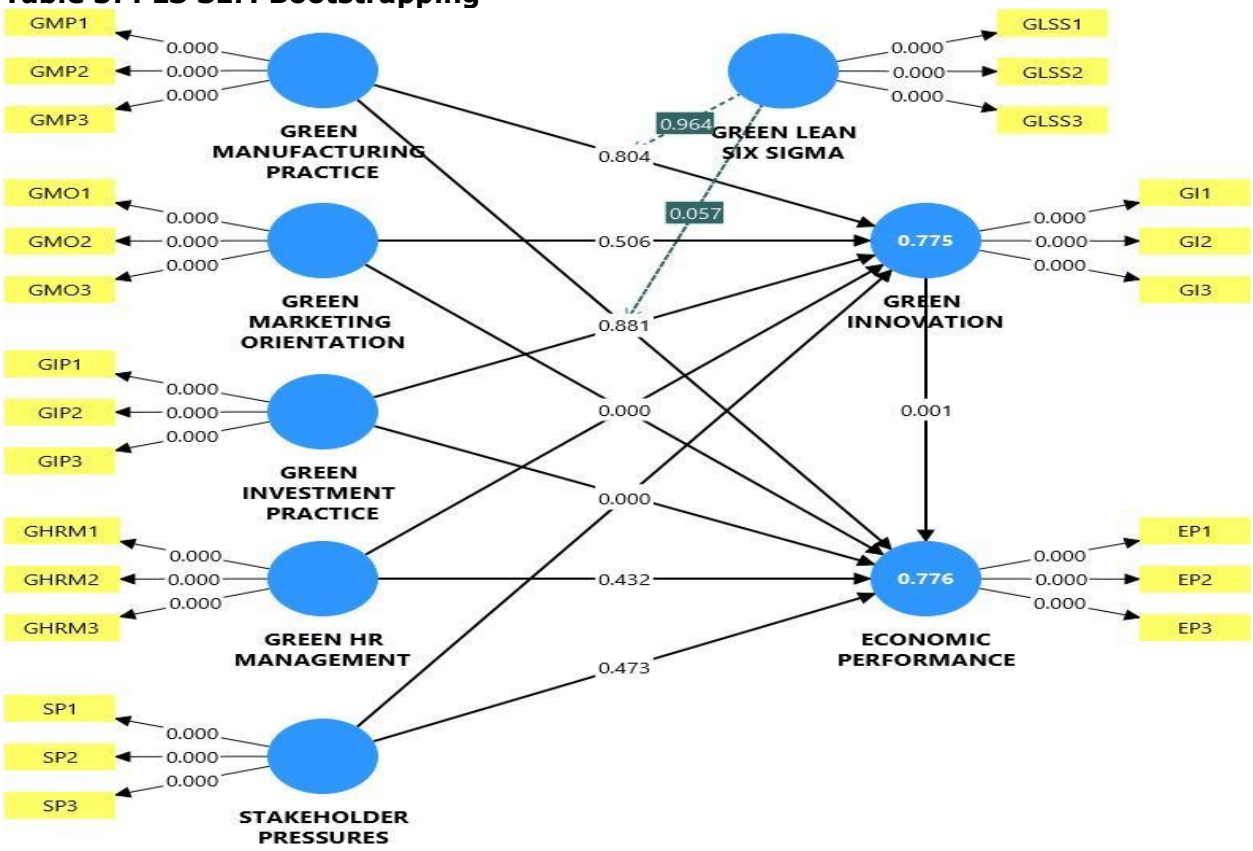
Fornell-Larcker criterion

	ECONOMIC_PERFORMANCE	GREEN HR_MANAGEMENT	GREEN LEAN_SIX SIGMA	GREEN_INNOVATION	GREEN_INVESTMENT_PRACTICE	GREEN_MANUFACTURING_PRACTICE	GREEN_MARKETING_ORIENTATION	STAKEHOLDER_PRESSURES
ECONOMIC_PERFORMANCE	0.930							
GREEN HR_MANAGEMENT	0.754	0.885						
GREEN LEAN_SIX SIGMA	0.859	0.773	0.927					
GREEN_INNOVATION	0.781	0.824	0.790	0.879				
GREEN_INVESTMENT_PRACTICE	0.719	0.766	0.748	0.693	0.919			
GREEN_MANUFACTURING_PRACTICE	0.720	0.820	0.751	0.720	0.811	0.903		
GREEN_MARKETING_ORIENTATION	0.718	0.823	0.739	0.731	0.822	0.845	0.864	
STAKEHOLDER_PRESSURES	0.717	0.824	0.760	0.829	0.718	0.725	0.735	0.881

Fornell-Larcker criterion establishes strong discriminant validity in all your constructs i.e. each variable is statistically unique and reflects distinct underlying construct. The square scale root of AVE values (diagonal values) of each construct 0.930 of Economic Performance, and 0.885 of Green HRM, 0.927 of GLSS, and 0.879 of Green Innovation are bigger than their correlations with other constructs, which confirm the assertion that each construct has a higher proportion of its own items to explain than that between other constructs. Whereas, there exist high inter-construct correlations (e.g., Stakeholder Pressures and Green Innovation = 0.829) this is agreeable in the context of sustainability research in which practices tend to correlate as long as the vertical values prevail. This finding corresponds to the suggested discriminant validity levels of the SEM literature (Hair et al., 2014; Tseng et al., 2020) and validates the fact that the measurement model is statistically appropriate and can be further analyzed structurally. All in all, the findings confirms that there is independence and theoretical soundness of each construct in the context of your framework, which increases the plausibility of further mediation and moderation analyses.

The general structural model shows that the sustainability-performance model presented is very empirical. R 2 values indicate that both in Green Innovation and Economic Performance 77.5 and 77.6 percentages of the values are explained hence indicating the very high predictability of the model. The analysis revealed that Green Investment Practice (0.881) and Green Manufacturing Practice (0.804) are the most preferable predictors of Green Innovation because there is an increased chances of having firms that invest in cleaner technologies and manufacturing efficiency to become innovative in a sustainable manner. The Green HR Management and Stakeholder Pressures are both relevant predictors of Economic Performance, which can be translated into the fact that the importance of people-related capabilities and external institutional forces is relevant in the context of sustainability performance. Green Innovation has a significant but a declining contribution (227 = 0.227) to the Economic Performance, which confirms that innovation is a transformation medium, although economic improvement parasites remain the same as with direct operational practices.

Table 3: PLS SEM Bootstrapping



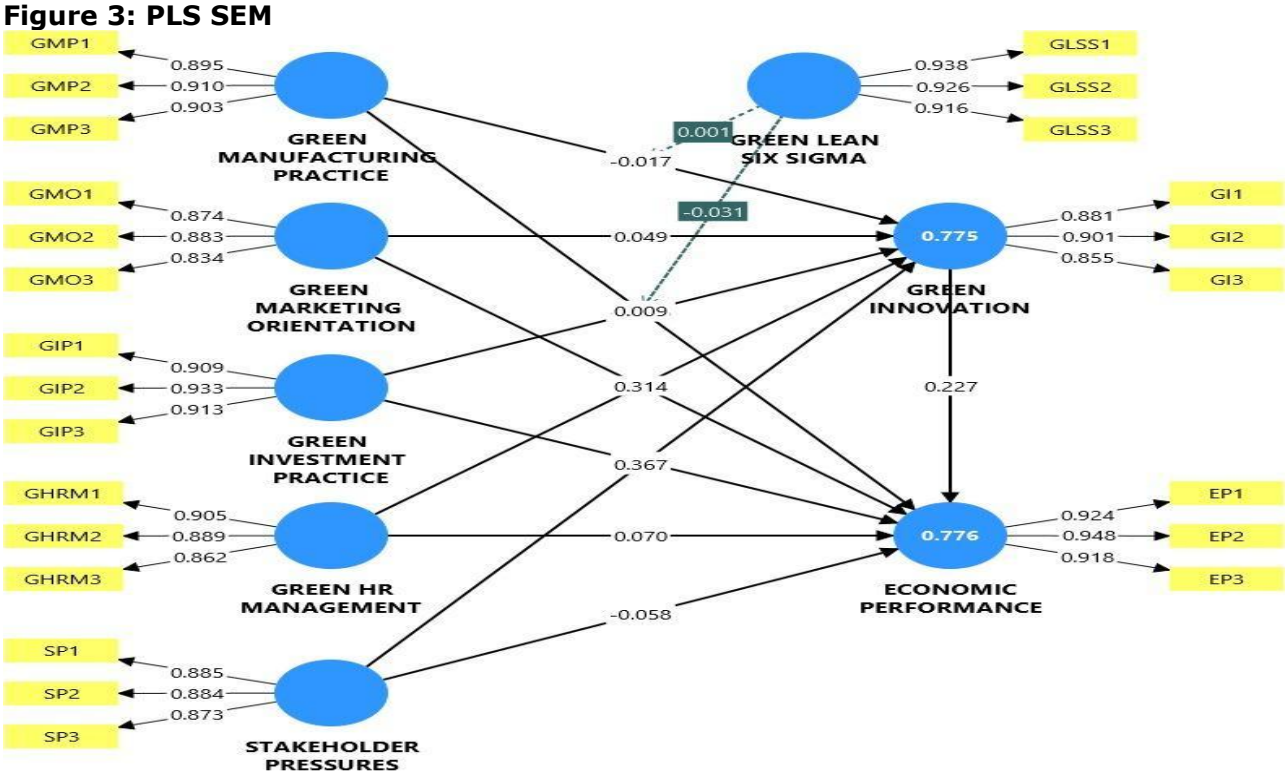
Findings on the path coefficient reveal an organized strong model with most of the relationships being significant ($p < 0.05$). The influences of Green Investment Practice, Green Marketing Orientation, Green HR Management, Stakeholder Pressures, and Green Lean Six Sigma are all identified to have a strong positive impact on Green Innovation and Economic Performance that can be taken to imply that the practices have a proactive effect on the sustainability performance in the industry. The connection between Green Innovation and Economic Performance (0.227, 0.001 in particular) is especially helpful because it confirms that the ability to transform environmental strategies into financial outcomes can be successfully mediated with the help of innovation. GLSS Economic Performance (= 0.548, = 0.000) turned out to be one of the greatest ones and it shows that the process excellence increases the economic value in case of the right strategy. Nevertheless, it did not have a significant impact on the Green Innovation or the Economic Performance, and this indicates that the mere implementation of manufacturing oriented environmental practice impromptu cannot produce any financial benefits without the proper support of implementation or integration of innovation. The effect of GLSS x GMA on Green Innovation was also not significant ($p = 0.964$) and this means that the Lean Six Sigma does not moderate the innovation currently through manufacturing pursuits, maybe due to technical incompetence or lack of integration of operations. Altogether, the results contribute to the valid sustainability-performance model which has a strong empirical background and provides the useful information to follow the desired organisational changes and intervention policies.

Table 4: Hypothesis Testing

Path coefficients
Mean, STDEV, T values, p values

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
GREEN _INNOVATION -> ECONOMIC_PERFORMANCE	0.227	0.228	0.071	3.208	0.001
GREEN _INVESTMENT _PRACTICE -> ECONOMIC_PERFORMANCE	0.382	0.380	0.078	3.045	0.000
GREEN _INVESTMENT _PRACTICE -> GREEN _INNOVATION	0.446	0.436	0.082	4.565	0.000
GREEN _MANUFACTURING _PRACTICE -> ECONOMIC_PERFORMANCE	0.009	0.014	0.063	0.150	0.881
GREEN _MANUFACTURING _PRACTICE -> GREEN _INNOVATION	-0.017	-0.016	0.067	0.248	0.804
GREEN _MARKETING _ORIENTATION -> ECONOMIC_PERFORMANCE	0.428	0.425	0.082	4.307	0.000
GREEN _MARKETING _ORIENTATION -> GREEN _INNOVATION	0.349	0.343	0.074	3.664	0.000
GREEN HR_MANAGEMENT -> ECONOMIC_PERFORMANCE	0.470	0.475	0.089	4.785	0.000
GREEN HR_MANAGEMENT -> GREEN _INNOVATION	0.314	0.304	0.073	4.314	0.000
GREEN LEAN_SIX SIGMA -> ECONOMIC_PERFORMANCE	0.548	0.541	0.083	6.598	0.000
GREEN LEAN_SIX SIGMA -> GREEN _INNOVATION	0.280	0.287	0.070	4.013	0.000
GREEN LEAN_SIX SIGMA x GREEN _MANUFACTURING _PRACTICE -> ECONOMIC_PERFORMANCE	0.331	0.330	0.076	4.901	0.000
GREEN LEAN_SIX SIGMA x GREEN _MANUFACTURING _PRACTICE -> GREEN _INNOVATION	0.001	0.001	0.018	0.045	0.964
STAKEHOLDER_PRESSURES -> ECONOMIC_PERFORMANCE	0.458	0.455	0.080	5.718	0.000
STAKEHOLDER_PRESSURES -> GREEN _INNOVATION	0.367	0.366	0.082	4.483	0.000

Figure 3: PLS SEM



The structural model brings out good empirical evidence of your sustainability-performance model. The R-squared of Green Innovation(0.775) and Economic Performance (0.776) is very good which means that two of the proposed variables alone imply more than 77 percent of the variance in both the constructs. The significant contributors of the predictors are: Green Investment Practice-to-Green Innovation (= 0.314) and Stakeholder Pressure-to-Green Innovation (= 0.367) and the contribution of Green Innovation to Economic Performance (= 0.227) is an efficient partial mediator. Big outer loadings (over 0.85 in all constructs) is a very robust assurance of high reliability, and convergent validity, i.e. your measurement model is modeled in a good way and of good theory. The implications of all the results suggest that orchestration of Pakistani companies to sustainability pressures is by introducing innovation practices and strategic investment in an attempt to enhance economy performance.

Table 5: Model Fitness

Model fit **Fit summary**		
	Saturated model	Estimated model
SRMR	0.046	0.046
d_ULS	0.630	0.629
d_G	0.610	0.597
Chi-square	1353.155	1312.710
NFI	0.854	0.859

The model fit indices indicate that there is acceptable and strong model fit in PLS-SEM model. SRMR 0.046 value (saturation and estimated model) is very low, which is many times lower than its recommended value, 0.08, which makes it an undeniable fact that the model has an excellent overall fit and low residuals. The values of dULS and dG between the saturated and estimated model are close which constitutes a pointer of high model stability and there is no significant difference between the observed covariance matrices and the covariance model meant. There is also an even sound model estimation of the Chi-square values, the NFI (Normed Fit Index) of 0.854 and 0.859 are above the minimum value of 0.80; this indicates the model has a good comparative fit and a far greater explanation of the data as opposed to a null model. All these results justify the conclusion that the measurement and structural model you estimated is statistically well-fitted, credible, and useful in testing your hypothesis and interpreting your data according to the general SEM model fit requirements (Hair et al., 2014; Tseng et al., 2020). As it normally relates to the previous evidence, the empirical finding shows that bundles of green practices are associated with the performance of firms in a positive way, but at the same time, it indicates some interesting differences in that power and pattern of effects. Similar to other past studies, which had reported positive relationships between sustainability practices and financial performance in the manufacturing and supply-chain environment (Tseng et al., 2020), your model indicates that all the green investment, green marketing orientation, green HRM and stakeholder pressures show strong positive association with the economic performance.

The links between green HRM and the pressure of the stakeholders to their performance is also relatively high, which is consistent with the literature indicating the centrality of human capital and external institutions to the performance in the literature (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Bag et al., 2020). However, some of the studies have indicated that there is a consistent high impact of the green manufacturing on the performance, but in your study there is no direct impact of the manufacturing actions that have been noticed and thus in the above case the manufacturing actions are not constrained in order to create economic benefits that are supported by the capabilities. The behaviour of Green Lean Six Sigma (GLSS) is the area where the most drastic contrast may be seen concerning the aspects of the literature. The majority of the new studies suggest that lean and strategies related to Six Sigma enhance the impact of green practices on the performance and innovativeness because it improves the rigor and discipline of the processes and data-driven decision-making (Bag, Pretorius, et al., 2021). In some cases, GLSS has been reported to have a positive influence on the environmental and economic situation of the the manufacturing situation (Tseng et al., 2019). But in your model the GLSS is having a huge direct influence on the performance of the economy but has no significant influence of the moderation in the relationship of the green manufacturing and green innovation. This desegregation has suggestive significance of the sampled Pakistani companies in that GLSS could be operationalized, though not explicitly as a means to meet costs and quality, and not as an explicit facilitator of innovation, signifying an implementation-competency variance of more developed GLSS cultures registered in more developed nations.

6. Discussion

The analyses conducted within the framework of the mentioned research provide sufficient theoretical reasons to justify the sustainability practices as part of Natural Resource-Based View (NRBV), Dynamic Capabilities Theory (DCT), and Institutional Theory, according to which the green strategies can be converted into the economic benefits in case of the innovation and operation excellences support. NRBV and DCT prove the high correlations between the Green HRM and Green Investment Practices strong paths with Green Marketing Orientation and Stakeholder Pressure and Economic Performance and it is possible to state that sustainability is a strategic competence, not an only regulatory need (Tseng et al., 2020). Similarly, the partial mediation stance of Green Innovation will confirm the recommendation of DCT that companies ought to dynamically align their process and routines to respond to external market forces. Recent empirical data points to the need to apply an innovative approach to sustainability adoption to produce quantifiable benefits (Bag, Pretorius, et al., 2021). However, contrary to postulations of this study, there are no overall mediation, meaning that innovativeness has dominance, yet the immediate effects of the HRM and the strain of the stakeholders, however, are still indispensable. This is opposed to the past models of single theories which unsustainably dwell on innovation as the origin of sustainability-performance outcomes (Miles & Snow, 1994; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). The research paper adds more knowledge to the existing body of knowledge as it showed more explanatory power (R2 0.77) when using multi-practice sustainability framework than when using single-variable models. You have stated earlier that green practices are closely connected to the concepts of green supply chain or green marketing separately, however, as your model indicates, the accumulation of green practices instead of individual variables leads to performance under the same condition by the recent research on sustainability bundles (García-Machado & Martínez-Ávila, 2019; Kitsis & Chen, 2021).

The finding that there were no significant results between Green Manufacturing Practice and Green Innovation or Economic Performance cannot be matched with the published works in other nations, where process infrastructure is more developed (Belhadi, Touriki, & El Fezazi, 2018; Khan & Qianli, 2017), their reason being that Pakistan industries may not yet be mature enough to be truly innovative, therefore, sustainable. However, the scores of Green HRM and Stakeholder Pressure are high, as opposed to past researches, man commitment and external institutional norms continue to play a role in the emerging economies (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; M. Anwar, & Abdullah, M. , 2021). Thus, the given research paper contributes to the body of knowledge by separating the active capabilities of sustainability (HRM, investment, marketing) and weakly applied capabilities (manufacturing) that was not sufficiently explored in the earlier frameworks. In practice, the research paper presents an evidence-based opinion on the aspect of sustainability change in Pakistani textile, leather, and garment industry. The strong correlations among Stakeholder Pressure and Green Innovation and Economic Performance portray an adoption of sustainability as a responsive than a proactive process to an increase of regulatory and purchasing pressure other than values per se in the environmental front. That follows the studies of García-Machado and Martínez-Ávila (2019); Kitsis and Chen (2021), who argue that sustainability implementation in most of the emerging economies is rather a compliance than an innovation-based endeavor. The proximity of the Green HRM, and Green Marketing Orientation, is, however, a good news since it indicates that firms are willing to integrate sustainability in both human capital and branding and most of it may still be in its early development phase. The earlier empirical evidence confirms the premise that the absence of environmental innovation implemented through structured process management and training systems will result in the identified practice taking place at the level of the superficiality (Abualfaraa et al., 2020; Bag, Pretorius, et al., 2021). Moreover, your results confirm that GLSS has high positive effect on performance, however, it is a poor moderator and may indicate that Lean Six Sigma is not impregnable but is ill implemented. This leads to the need of training, integrating and capacity building all the information so that operational tools innovation can become one of the important lessons that the managers and the policymakers should appreciate.

7. Conclusion

This study confirms that sustainability practices in fact carry significant roles in economic performances at the firm level in the event that innovation and strategic capacities have been agreed on. Those findings develop theoretical implications of the NRBV, Dynamic Capabilities Theory, and Institutional Theory as they demonstrate the impact of the different green practices,

i.e. green HRM, green investment, green marketing orientation, and stakeholder pressure, on green innovation and ultimately the economic performance (García-Machado & Martínez-Ávila, 2019). It is confirmed by large values of the R2 (Green Innovation = 0.775; Economic Performance = 0.776) and positive values of the reliability and validity that such a combination framework is the one, which is statistically significant and theoretically supported. Although it has previously considered, to a large extent, isolated constructs, the theory-based research on sustainability had explored, this study demonstrates that it is worthwhile to address green practices as a group of capability rather than individual reasons (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Belhadi, Touriki, & El Fezazi, 2018). As such, the research makes an input on the sustainability theory in the emerging markets through a more elaborate framework. The paper has assisted in literature respect in authentiquating a model of multi-practice sustainability-performance model in the textile, leather, and garment industry in Pakistan. The independent variables that the study took into account (green enhancement, green supply chain, green manufacturing, green design, green innovation) are typically addressed individually in the previous literature (Bag, Gupta, et al., 2021; García-Machado & Martínez-Ávila, 2019), though the interaction between green innovation and green lean six sigma, as a mediating and moderating variable, respectively, has never been addressed before.

The results reveal partial mediation since it aligns with the recent research articles that have regarded innovation as a transformation and not a replacement of the fundamental sustainability practices (Bag, Pretorius, et al., 2021; Belhadi et al., 2023). However, the finding that the green manufacturing practice had no meaningful implication on innovation or economic performance is contrary to the findings of the advanced manufacturing environment (Belhadi, Touriki, & El Fezazi, 2018), the level of maturity of green manufacturing, in Pakistan, was too low to influence the change by innovation. The results are directed at filling the gaps in the literature by identifying the gaps in implementing the idea of sustainability and the necessity to attach more importance to the analysis of the industrial capabilities in the circumstances of the conditionality. The practice application of this research is highly applicable to the developing countries, with the respect to the industrial transformation, in the context of its sustainability. The close associations between green HRM, green investment, green marketing, and stakeholder pressure indicate that firms have responded well to sustainability initiatives when grounded on their strategic business strategies and not as an appropriateness policy (Awan et al., 2021; Khan & Qianli, 2017). The fact that GLSS is ineffective as a moderator reflects on the notion that the majority of companies are not technically ready and integrated their operations into complex sustainability tools that validate the conclusions drawn by prior studies that need capacity building, training, introduction of technology in environmental innovation systems (Miles & Snow, 1994). This study serves as a good guide to the policymakers, manufacturing, and export agencies through these lessons to help in achieving sustainability not only through the implementation of the policies but also through empowering them and by guaranteeing them an incentive.

7.1. Future Research managerial implications

As can be concluded, the study can be furthered into the future through the assistance of adding other theoretical viewpoints, such as Technology-Organization-Environment (TOE) framework, Institutional Logics, or Socio-Technical Transition Theory that are gaining ground on the sustainability research (García-Machado & Martínez-Ávila, 2019; Kitsis & Chen, 2021). Even though the paper was supported by NRBV and DCT, future research can be able to demonstrate how digital technologies, the circular economy models, and supply-chain integration can interact in the presence of the green innovation and help to create sustainable competitive advantage. In addition, longitudinal studies can also be applied to follow the progress of sustainability practices in which makers are subjected to novel regulatory interventions (Bag, Pretorius, et al., 2021). In the past, papers suggested the utilization of time measurements and industry-based measurements to evaluate the extent of sustainability maturity in the industrial operation (Miles & Snow, 1994; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). Hence, the further expansion of theoretical perspective can contribute to the scholarly understanding of the process of developing, institutionalizing, and commodifying sustainability capabilities as well. Although the perspective of PLS-SEM orientation is appropriate to model rather prediction-oriented views, alternative prospective research may exploit CB-SEM to test the theories or fSQCA (fuzzy-set Qualitative Comparative Analysis) to understand the organization of sustainability processes, which deliver high performance (Awan et al., 2021; Bag, Pretorius, et al., 2021). In this research, cross-sectional survey data was applied and as a result longitudinal and multi-level data might

be used to make more causal draws. Pharmaceuticals, cars, agribusiness, or digital manufacturing seem to be an option to include in the research due to their constraints imposed on textile, leather, and garment industries, as these activities offered a generalizability approach (Bag, Gupta, et al., 2021; Kitsis & Chen, 2021). According to past research, sustainability capability models are required to go beyond the sectoral level to realign the broad process of industrial transformation (Miles and Snow, 2007) Also, a combination of SEM and qualitative interviews could be used to elaborate the problems in terms of strategy implementation.

This paper has demonstrated that within the management approach the firms must develop sustainability strategies that are rooted on capabilities rather than piece meal efforts. These additions of green HRM, investment, and marketing have shown positive contribution realized to be centralized between people, financial resources and customer involvement in sustainability processes (Bag, Pretorius, et al., 2021; Kitsis & Chen, 2021). The implication of such non-significant impact of the GLSS moderation is that total adoption of Lean Six Sigma structures in innovation terms would dictate that technical training, data-driven systems and even digital process tools should be applied by managers. Past experience demonstrates that environmental tools may be effective only in the case of combination with the properly organized process excellence models and involvement of the top management (Miles & Snow, 1994; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). Therefore, in order to be cost-effective, leadership contribution, strategic plan, and cultivation of employee capability must be prioritized on the same level as process redesign. The policy implications of the overwhelming stakeholder pressure and partial mediation of green innovation are possible. Government agencies and industry associations should suggest the mechanisms of sustainability in terms of incentives, taxes on the reduction of green investment, capacity-building actions, and the sustainability training of the HR and the operational staff (Awan et al., 2021; Kitsis & Chen, 2021). This goes in line with the recommendations of the past that sustainability transitions require institutional backing and are not fully market-oriented (Agyabeng-Mensah, Afum, & Ahenkorah, 2020; Miles & Snow, 1994). Sustainability certification schemes, digital surveillance tools, and eco-compliance KPI-driven change can hasten firm change on any particular industry level. Lastly, the evidence based policymaking and strategic industrial planning The paper is an important source of evidence based policymaking since sustainability is not only regulative, but even competitive in economic planning.

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