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[The Impact of Agile Strategic Entrepreneurship Capabilities on Sustainable Innovation in Pakistan's Textile Industry]

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ABSTRACT

Sustainable business performance (SBP) has emerged as a critical global objective over the past two decades, emphasizing the preservation of natural resources for future generations. This study develops a distinctive moderated-mediation agile framework aimed at enhancing SBP within Pakistan's textile industry through key agile components—namely agile capabilities, organizational agility culture, and agile operational practices. Employing a correlational quantitative design, data were collected via structured surveys from 221 professionals associated with the textile sector in Pakistan. The analysis was conducted using SmartPLS to assess the proposed model, which explores the mediating effect of entrepreneurial agility (EA) and the moderating role of stakeholder engagement (SE) between agile dimensions and SBP. The empirical results indicate that all three agile dimensions significantly and positively influence both EA and SBP. Furthermore, EA itself is found to be a strong predictor of SBP. The findings also confirm the mediating effect of EA in the relationship between agile factors and SBP, as well as the enhancing role of SE as a moderator. This research underscores the importance for textile enterprises to integrate agile frameworks to strengthen entrepreneurial responsiveness and long-term sustainability. Additionally, it offers valuable insights for industry experts, policy-makers, and practitioners aiming to advance sustainability in Pakistan's textile sector.

Keywords: Agile Capabilities, Agile organizational Culture, Agile Practices, Entrepreneurial Agility, Sustainable Business Performance

Introduction

The Sustainable Development Goals (SDGs) 2030 represent the United Nations' collective agenda to promote peace, prosperity, and environmental protection across the globe. These goals serve as a global roadmap, urging nations and industries to shift from a profit-centric mindset toward a sustainable future that safeguards the well-being of future generations. The SDGs emphasize urgent action across various domains, including healthcare, education, climate change, poverty alleviation, energy access, infrastructure, and social equity (Rasoolimanesh et al., 2023; Zhu et al., 2024). Importantly, these goals are not limited to any one sector; instead, they advocate a universal approach, engaging all nations and industries—developed and developing alike—in a shared pursuit of global sustainability (Chevrollier et al., 2023).

Within this global context, Pakistan's textile industry stands out as a key driver of economic activity and employment, contributing significantly to the country's GDP and export earnings. As one of the largest manufacturing sectors in Pakistan, the textile industry has historically been pivotal in shaping economic growth. However, to align with the SDGs, the sector has begun to reorient its business models and operational frameworks towards sustainable and responsible practices (Khan et al., 2021, Khan et al., 2020).

Despite its critical role and consistent growth, the textile sector continues to grapple with a wide range of complex challenges. These include intensifying domestic and international competition, heightened consumer expectations, stringent regulatory

standards, environmental degradation, shifting stakeholder demands, and the continuous need for innovation and compliance with global sustainability norms (Ahmed et al., 2015, Khan & Rehman, 2023). These evolving pressures highlight the urgent need for the sector to embrace business models that are both resilient and adaptable—models that can support long-term sustainable business performance (Gul et al., 2024).

To meet these demands, a transition from conventional management systems to more adaptive and dynamic approaches is essential (Kakakhel et al., 2016). One such approach is the adoption of agile frameworks, which enable organizations to remain flexible, innovate effectively, and sustain performance in turbulent business environments (Carvalho et al., 2023; John & Eapeen, 2024). Agility, in this sense, is not only a tool for technological sectors but is increasingly relevant for traditional industries like textiles that must now navigate global sustainability imperatives.

Agile frameworks typically consist of foundational components—agile resources, agile capabilities (at both individual and organizational levels), agile cultural orientation, and agile practices. These elements are collectively referred to as agile antecedents and are instrumental in fostering entrepreneurial agility (Nicklich et al., 2021; Zhang et al., 2022). Entrepreneurial agility, in turn, serves as a crucial link between these agile dimensions and sustainable business outcomes. As described by Muo and Azeez (2019), agile antecedents represent a combination of capabilities, processes, and cultural attributes that empower businesses to address social, environmental, and economic challenges.

Numerous studies over the past decade have emphasized the interconnectedness between agile components, innovation capacity, and sustainable performance (Demirel et al., 2021; Nuringsih & Nuryasman, 2021; Tien et al., 2023; Yasir et al., 2023). For instance, Satalkina and Steiner (2020) highlighted the pivotal role of entrepreneurial agility in driving innovation and ensuring business sustainability. While literature supports the relevance of agility in achieving sustainability, empirical research that conceptualizes these components within a unified agile framework—especially in the context of the textile industry in developing countries—is still limited.

Moreover, although agile methodologies have gained widespread application in project management, particularly in IT and software industries, their adoption at the organizational level in traditional sectors such as textiles remains relatively underdeveloped in Pakistan (Gul et al., 2021). Likewise, limited empirical evidence exists regarding the role of stakeholder engagement in shaping sustainable strategies within this sector (Atif et al., 2024).

In response to these research gaps, the present study seeks to develop a comprehensive agile framework tailored for Pakistan's textile industry. This framework integrates key agile antecedents—agile capabilities, organizational culture, and agile practices—with entrepreneurial agility as a mediating factor and stakeholder engagement as a moderating variable, to explore their collective impact on sustainable business performance. This study offers a novel theoretical contribution and practical insight by contextualizing agility in an industry that is traditionally production-focused but increasingly under pressure to adopt sustainable and innovative business strategies.

Literature Review

Theoretical Premise

To explore the concept of sustainable business performance within the textile sector of Pakistan, this study draws on two foundational theories: the Process Theory of Change and the Theory of Sustainable Development.

The Process Theory of Change, first proposed by Weiss (1995), offers a useful perspective for understanding organizational transformation. It emphasizes how businesses shift from conventional operational norms to more adaptive, innovation-driven approaches. In the current study, this theory supports the view that textile enterprises in Pakistan must reform traditional business practices—such as rigid production processes or hierarchical structures—into more flexible, entrepreneurial systems that respond effectively to environmental, economic, and social demands (Rana et al., 2024).

The second theoretical underpinning comes from Veblen's Theory of Sustainable Development (1917), which stresses the importance of progress that does not compromise the needs of future generations. This theory is highly relevant in the context of the textile industry, which has historically contributed to environmental degradation. It supports the idea that sustainable growth must balance current production goals with long-term environmental and social responsibility (ul Hassan et al., 2023).

Informed by these two theoretical foundations, the study proposes a moderated mediation model incorporating agile capabilities, organizational culture, and practices as drivers of entrepreneurial agility, which in turn impacts sustainable business performance (khan et al., 2020). The role of stakeholder engagement is also tested as a moderator, recognizing its potential to enhance the effectiveness of agile strategies in the textile sector of Pakistan.

Hypotheses Development

Agile Capabilities (ACap) and Entrepreneurial Agility (EA)

Capabilities reflect the functional strengths of a business—what it can do effectively with its current resources. In the textile industry, agile capabilities might include adaptive production systems, digital supply chains, and flexible workforce strategies. These capabilities allow enterprises to respond swiftly to demand fluctuations, environmental regulations, and shifting fashion trends. Past research confirms that such capabilities are critical for fostering entrepreneurial agility, enabling textile firms to remain competitive and resilient (Karimi & Walter, 2021; Ahmad et al., 2024).

H1: Agile Capabilities (ACap) are positively related to Entrepreneurial Agility (EA).

Agile Organizational Culture (AoCul) and Entrepreneurial Agility (EA)

A culture that supports adaptability, innovation, and continuous learning is essential in a volatile industry like textiles. Agile organizational culture encourages team collaboration, rapid problem-solving, and an openness to new ideas. Such environments foster entrepreneurial behavior, allowing firms to proactively identify and act upon new opportunities in sustainable textiles, eco-friendly production methods, or global market demands (Radu & Radu, 2023; Felipe et al., 2024).

H2: Agile Organizational Culture (AoCul) is positively related to Entrepreneurial Agility

(EA).

Agile Practices (AP) and Entrepreneurial Agility (EA)

Agile practices in the textile sector may include short production cycles, responsive customer feedback systems, sustainable sourcing, and digital design processes. These practices support quick adaptation to market shifts and promote a culture of iterative improvement and innovation. Research shows that such practices significantly enhance entrepreneurial agility, especially in industries facing demand uncertainty and environmental scrutiny (Cermann et al., 2023; Diebold & Dahlem, 2024).

H3: Agile Practices (AP) are positively related to Entrepreneurial Agility (EA).

Entrepreneurial Agility (EA) and Sustainable Business Performance (SBP)

Entrepreneurial agility enables textile enterprises to navigate external shocks—like raw material shortages or trade restrictions—while maintaining a focus on long-term sustainability goals. It empowers firms to integrate eco-friendly practices, diversify their product lines, and enter new markets, all of which contribute to sustained performance over time (Karimi & Walter, 2021; Zulganef et al., 2023).

H4: Entrepreneurial Agility (EA) is positively related to Sustainable Business Performance (SBP).

Mediating Role of Entrepreneurial Agility (EA)

Entrepreneurial agility acts as a key linking mechanism between agile antecedents and sustainable performance. In the context of Pakistan's textile sector, this implies that agile capabilities, culture, and practices alone are not enough—they must be channeled through a responsive, entrepreneurial mindset that embraces change and pursues innovation. This mediating relationship has been highlighted in various studies across industries and regions.

H5: Entrepreneurial Agility (EA) mediates the relationship between Agile Capabilities (ACap) and Sustainable Business Performance (SBP).

H6: Entrepreneurial Agility (EA) mediates the relationship between Agile Organizational Culture (AoCul) and Sustainable Business Performance (SBP).

H7: Entrepreneurial Agility (EA) mediates the relationship between Agile Practices (AP) and Sustainable Business Performance (SBP).

Moderating Role of Stakeholder Engagement (SE)

Engaging internal and external stakeholders—such as suppliers, labor unions, customers, and sustainability regulators—is increasingly seen as a driver of sustainable innovation. In Pakistan’s textile industry, involving stakeholders can enhance responsiveness to environmental concerns, product quality expectations, and ethical standards. High stakeholder engagement strengthens the relationship between agile practices and entrepreneurial agility by integrating diverse perspectives into decision-making (Hollebeek et al., 2022; Nair, 2024).

H8: Stakeholder Engagement (SE) moderates the relationship between Agile Capabilities (ACap) and Entrepreneurial Agility (EA), strengthening the relationship at higher levels of SE.

H9: Stakeholder Engagement (SE) moderates the relationship between Agile Organizational Culture (AoCul) and Entrepreneurial Agility (EA), strengthening the relationship at higher levels of SE.

H10: Stakeholder Engagement (SE) moderates the relationship between Agile Practices (AP) and Entrepreneurial Agility (EA), strengthening the relationship at higher levels of SE.

Research Methodology

In alignment with the pragmatism paradigm, this study adopts a quantitative research approach to examine the dynamics of sustainability within Pakistani IT enterprises. The selection of this approach was grounded in its suitability for analyzing cause-effect relationships among clearly defined variables (Watson, 2015). The study specifically targeted senior personnel—including tech entrepreneurs, executives, and upper-level managers—within IT firms operating in Pakistan. These individuals were chosen due to their strategic roles in implementing agile methodologies that could influence sustainable business performance.

Given the unknown size of the total population of eligible respondents, the study employed a convenience sampling method, which is appropriate when the researcher does not have access to a comprehensive sampling frame (Stratton, 2021). Through this method, a total of 320 participants were invited to complete a structured survey. Multiple follow-ups were conducted via email and in-person visits, resulting in 253 completed questionnaires. After screening for completeness, 38 responses were excluded due to missing data, leaving 221 valid responses, yielding a response rate of 69.06%.

The final sample of 221 respondents was deemed sufficient based on the "10-times rule" suggested by Louangrath and Louanglath (2014), which recommends a sample size at least ten times the number of variables in studies with unknown populations. Further confirmation was obtained using G*Power software (version 3.1.9.2), which calculated a minimum sample requirement of 173 to achieve 97% statistical power at a 5% significance level.

Data collection was carried out through a structured survey, which included both self-administered and online formats. The questionnaire consisted of two primary sections: Demographic information of the participants and Measurement items related to the core variables of the study

Among the valid respondents 153 (69.23%) identified as male, and 68 (30.76%) as female, regarding professional experience, 109 (49.32%) had 5–10 years of experience, 75 (33.93%) had 11–15 years and 37 (16.74%) had more than 15 years in the IT sector. Concerning business type, 179 (80.99%) worked in software services, while 42 (19.01%) were from hardware or tech equipment firms. All respondents were employed in firms that had been operational for over four years and had a workforce exceeding ten employees.

For item development, the study relied on previously validated scales sourced from globally conducted research. A five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) was employed. The measurement items per variable are detailed are Agile Capabilities (ACap): 37 items from Tahmasebifard et al. (2017) and Kurniawan et al. (2020). Agile Organizational Culture (AoCul): 6 items from Elipe et al. (2017), Agile Practices (AP): 17 items from Malik et al. (2020), Entrepreneurial Agility (EA): 13 items from Chakravarty et al. (2013), Sustainable Business Performance (SBP): 12 items

from Kordab et al. (2020), Stakeholder Engagement (SE): 10 items from Balijepally et al. (2014)

To ensure both content and face validity, the questionnaire was reviewed by subject-matter experts, including domain specialists and academic professionals in the fields of management and information systems. Additionally, Cronbach's Alpha was applied to test the internal consistency and reliability of the items, following the recommendation of Hayes and Coutts (2020), who support its use for Likert-scale-based research in the social sciences.

For empirical analysis, both SPSS (version 24) and SmartPLS (version 3) were employed. SPSS was used to conduct Confirmatory Factor Analysis (CFA) and descriptive statistics, helping to evaluate factor structure and relationships among observed variables. To assess the measurement model and test the structural relationships, Partial Least Squares Structural Equation Modeling (PLS-SEM) was conducted using SmartPLS, as endorsed by Hair et al. (2016) for its robustness in exploratory and confirmatory business research.

Results & Discussion

Measurement Model Assessment

Reliability and Convergent Validity

To assess the reliability and convergent validity of constructs, PLS-SEM was employed. As per the threshold recommended by Hair et al. (2016), all constructs demonstrated satisfactory internal consistency: AVE and Rho_A values exceed 0.50, and CR values surpass the minimum threshold of 0.70. Hence, the constructs Agile Capabilities (ACap), Agile Organizational Culture (AoCul), Agile Practices (AP), Entrepreneurial Agility (EA), Sustainable Business Performance (SBP), and Stakeholder Engagement (SE) are reliable and suitable for further analysis.

Discriminant Validity

Discriminant validity was evaluated using both Fornell-Larcker Criterion and the HTMT ratio. The result shows that the square roots of AVE (√AVE) for all constructs are greater than their inter-construct correlations, confirming discriminant validity (Fornell & Larcker, 1981). Similarly, HTMT values for all construct pairs are below the critical threshold of 0.90 (Henseler et al., 2015), reaffirming that each construct is distinct from the others.

Principal Component Analysis (PCA)

To further ensure construct validity, PCA was conducted. Items with weak or cross loadings were removed. The retained items showed acceptable loading ranges (≥ 0.4), and KMO values for all constructs were above 0.6, except SE which was marginally acceptable at 0.583. Bartlett's Test of Sphericity was significant ($p < 0.05$) for all constructs, indicating the dataset's suitability for factor analysis.

Descriptive Statistics

Descriptive analysis indicates that the study received a satisfactory response rate of 69.06% (n=221). Mean values for all constructs range between 4.450 and 4.770, while standard deviations range between 0.1338 and 0.7389. These results suggest a generally high agreement level among respondents with moderate variability.

Structural Model Assessment

To test the proposed relationships, structural modeling was carried out using Smart-PLS.

The R^2 values for endogenous constructs ranged from 0.325 to 0.494, meeting the acceptable range for moderate predictive power (Henseler et al., 2015). Path coefficients and corresponding p-values confirmed the significance of all hypothesized direct relationships.

Direct Effects

As shown in Table 6, all direct paths (H1–H4) are statistically significant ($p < 0.01$). Agile Capabilities ($\beta = 0.193$), Agile Organizational Culture ($\beta = 0.314$), and Agile Practices ($\beta = 0.390$) each positively influence Entrepreneurial Agility (EA). Furthermore, EA significantly contributes to Sustainable Business Performance (SBP) ($\beta = 0.632$). These results validate the core assumption of the model that agility-related antecedents enhance entrepreneurial agility, which in turn promotes sustainable performance.

Mediation Analysis

The mediating role of EA was tested for the relationships between agile antecedents and SBP (Table 7). Results confirmed full mediation, with significant indirect effects: ACap ($\beta = 0.469$), AoCul ($\beta = 0.523$), and AP ($\beta = 0.497$), all with p-values < 0.01. These findings suggest that EA is a critical pathway through which agile elements influence SBP.

Moderated Mediation Analysis

Moderation analysis tested Stakeholder Engagement (SE) as a moderator between agile antecedents and EA. Results (Table 8) indicate that SE significantly strengthens these relationships: ACap–EA ($\beta = 0.364$), AoCul–EA ($\beta = 0.467$), and AP–EA ($\beta = 0.493$). The conditional indirect effect of SE was also analyzed at three levels (–1 SD, M, +1 SD), revealing that higher SE levels consistently amplified the strength of indirect relationships between agile antecedents and SBP.

In an environment marked by rapid change and unpredictability, agility emerges as a critical enabler of sustainable performance. The findings of this study validate a novel moderated mediation framework, demonstrating that Agile Capabilities, Agile Organizational Culture, and Agile Practices are significant enablers of Entrepreneurial Agility, which, in turn, drives Sustainable Business Performance. These findings are aligned with prior research (e.g., Chakravarty et al., 2013; Troise et al., 2023; Khan & Rehman, 2023), reinforcing the critical role of agility in organizational resilience.

Additionally, EA's mediating role corroborates the work of Stubbs (2019), indicating that agility is not merely a direct input but a transformative process that channels agile antecedents into sustainable outcomes. Finally, the moderating role of Stakeholder Engagement underlines the importance of external collaboration and dialogue. High stakeholder engagement not only strengthens internal agility but also enhances its effect on performance, reflecting a more holistic view of organizational adaptability.

In summary, this study empirically confirms a comprehensive framework linking agility and sustainability within the context of Pakistani IT enterprises, with potential implications for other emerging economies and sectors.

Discussion

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Organizational Culture, and Agile Practices are significant enablers of Entrepreneurial Agility, which, in turn, drives Sustainable Business Performance. These findings are aligned with prior research (e.g., Chakravarty et al., 2013; Troise et al., 2023; Khan & Rehman, 2023), reinforcing the critical role of agility in organizational resilience.

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In summary, this study empirically confirms a comprehensive framework linking agility and sustainability within the context of Pakistani IT enterprises, with potential implications for other emerging economies and sectors.

Conclusion

This study set out to establish a moderated mediation model examining the impact of three agile antecedents—Agile Capabilities (ACap), Agile Orientation and Culture (AoCul), and Agile Practices (AP)—on Entrepreneurial Agility (EA) and their collective influence on Sustainable Business Performance (SBP), under the moderating role of Stakeholder Engagement (SE). Based on the empirical findings, it can be concluded that all three agile antecedents serve as critical drivers in achieving both entrepreneurial agility and sustainable business performance within the contextual framework of Pakistani IT enterprises. Furthermore, Entrepreneurial Agility (EA) was empirically validated as a mediating factor between the agile antecedents and sustainable business performance. In addition, Stakeholder Engagement (SE) was found to significantly moderate the relationship between agile antecedents and entrepreneurial agility, reinforcing their direct effect. Overall, the moderated mediation model proposed in this study was empirically tested and confirmed, demonstrating its validity in the context of IT enterprises in Pakistan.

Implications of the Study

In alignment with prior literature, this study offers a range of academic and practical implications for theory development, policy formulation, and professional practice. Academically, the research employed the theoretical underpinnings of the *Theory of Change* (Weiss, 1995) and the *Theory of Sustainable Development* (Veblen, 1917) to explore the determinants of sustainable business performance through agile antecedents and entrepreneurial agility. By doing so, the study contributes to the growing body of literature by proposing and validating a novel moderated mediation model, where agile antecedents act as precursors, entrepreneurial agility serves as a mediator, stakeholder engagement functions as a moderator, and sustainable business performance represents the ultimate outcome.

From a practical standpoint, the findings offer valuable insights for policymakers and industry practitioners. The study underscores the importance of focusing on agile capabilities, culture, and practices as essential components for fostering entrepreneurial agility and enhancing sustainable business outcomes, particularly in the rapidly evolving

and competitive Pakistani IT sector. It is recommended that policymakers actively promote stakeholder engagement to drive sustainable strategies and innovations. Furthermore, IT professionals and technology-driven enterprises should embed agility into their strategic orientation, team structures, business systems, and overall operational practices to remain resilient and competitive in the high-tech global economy.

Limitations and Future Research Agendas

Despite its valuable contributions, the study is not without limitations, which present opportunities for future research. Being a cross-sectional study grounded in a quantitative methodology, the findings are limited to a snapshot in time and may not fully capture the evolving nature of entrepreneurship and organizational agility. Future researchers are encouraged to explore these constructs using qualitative methods, which could provide deeper insights into the underlying drivers, cultural prerequisites, resource needs, and capability-building processes essential for entrepreneurial agility and sustainable performance.

Additionally, a mixed-methods approach could be adopted to examine the multifaceted nature of entrepreneurship, exploring its prevalence, enablers, and implications for organizational leadership and strategic decision-making. Although this study focused on IT enterprises in Pakistan, it did not analyze subcategories within the sector. Future research could extend this framework to other industries or geographic regions and conduct comparative analyses to explore sector-specific or regional variations, potentially using industrial clustering as a basis for comparison.

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