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Navigating how Transformational Leadership, Creative Engagement, and Green Innovation impact SME Performance and Growth: The Mediating and Moderating Role of Top Management Support

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This study was approved by the Humanities and Social Sciences Research Ethics Committee (HSSREC) at the University of the Western Cape, South Africa (Reference Number: HS24/10/48). All participants were briefed on the research's purpose, their voluntary participation rights, and confidentiality. Informed consent was obtained from each participant beforehand. No personal identifiers were collected, and data were used exclusively for academic purposes. The study complied with the ethical standards of the University of the Western Cape.

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Abstract:	This study investigated the relationships among green transformational leadership, creative process engagement, green innovation (product and process), and firms' innovative performance, focusing on small and medium-sized enterprises (SMEs) in South Africa. Unlike previous studies that examined these factors in isolation or across developed and Asian economies, this study presents a comprehensive model explaining how green leadership influences creativity, innovation, and business growth in an emerging-economy context. The research followed a positivist philosophy and employed a quantitative approach. Data were collected through a structured survey distributed to 321 managers from manufacturing SMEs in Cape Town, Western Cape province, South Africa, using simple random sampling. SmartPLS software version 4.0.9.5 was utilised to analyse both the measurement and structural models. The results indicate strong positive relationships between green transformational leadership and creative process engagement, which in turn lead to green product and process innovation. Both types of green innovation significantly contribute to firms' innovative performance, ultimately positively impacting SME business growth. A significant contribution of this study is the identification of the dual role of top management support: both a mediator and a moderator in the relationship between innovative performance and SME business growth, thereby elucidating the organisational mechanisms through which innovation drives sustained growth. The findings offer practical recommendations for SME owners, managers, and policymakers seeking to utilise green leadership and top-management commitment to promote innovation, competitiveness, and long-term growth.

SCHOLARONE MANUSCRIPTS

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Keywords: green transformational leadership; creative process engagement; green product innovation; green process innovation; SME business growth, business performance

1. Introduction

In emerging and transitioning economies alone, approximately 310 million SMEs (Small to Medium Enterprises) drive employment creation, income generation, and industrial diversification (Doan *et al.*, 2023). SMEs constitute a foundational pillar of the global economy, accounting for more than 60% of the total employment and over 95% of the registered firms worldwide (Arghashi & Okumus, 2022) In the South African context, SMEs represent about 97.5% of all businesses, contribute nearly 58% of employment, and generate between 34% and 38.8% of the Gross Domestic Product (GDP) (Zuma, 2023). Beyond their quantitative importance, SMEs play a strategic role in manufacturing value chains by supplying intermediate inputs to larger firms, thereby enhancing cost efficiency and operational flexibility (Pride *et al.*, 2023). Their broader socio-economic role, including poverty reduction, community development (Vu *et al.*, 2024), and social cohesion, further positions SMEs as critical agents of inclusive and sustainable development (Nieuwenhuizen, 2018; Khoase *et al.*, 2020).

Despite their economic centrality, SMEs' contribution to sustainability increasingly hinges on their ability to mitigate environmental externalities through green innovation. Green process and product innovations, such as resource-efficient production, waste and water recycling, low-carbon emission technologies, and environmentally sustainable product design, have emerged as primary mechanisms through which SMEs can align competitiveness with environmental performance (Perez *et al.*, 2023). Leadership is widely recognised as a critical enabler of such innovation. Green transformational leadership has been shown to embed environmental values into organisational strategy, stimulate employee engagement with sustainability challenges, and facilitate the implementation of green innovation (Begun *et al.*, 2022). However, empirical evidence explaining

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the pathways by which green transformational leadership fosters engagement in the creative process and, subsequently, translates into green process and product innovation remains limited, especially within manufacturing SMEs.

Extant research in emerging and transitioning economies offers initial insights into these relationships but remains fragmented and context-dependent. Research conducted in China (Zhang *et al.*, 2020), the United Arab Emirates (UAE) (Singh *et al.*, 2020), Turkey (Cop et al., 2020), India (Pradhan & Jena, 2019), and South Korea (Hoo-Song *et al.*, 2012) report positive associations between transformational or green leadership, employee engagement, innovation outcomes, and environmental performance across diverse sectors. However, much of this evidence originates from contexts characterised by relatively stronger institutional frameworks, higher technological readiness, and more developed green innovation ecosystems. As such, the generalisability of these findings to settings marked by resource constraints, regulatory inconsistencies, and capability limitations remains uncertain.

In South Africa, empirical research on green innovation in SMEs is comparatively nascent. While prior research has investigated green organisational behaviour (Mukonza & Swarts, 2019), employee retention dynamics (Engelbrecht & Samuel, 2019), and green packaging and advertising in manufacturing SMEs (Maziriri, 2020), there is a need for more research explicitly linking green transformational leadership with creative process engagement and its downstream effects on green process and product innovation. Moreover, little is known about how these green innovations jointly influence innovative performance and firm growth in South African manufacturing SMEs.

The central research gap, however, extends beyond the limited geographical coverage of prior studies. Existing research has largely examined green transformational leadership, employee creativity, green innovation and firm performance through individual or partially connected relationships (Zhang et al., 2020; Begum et al., 2022). For example, prior studies have established that green transformational leadership can foster creative process engagement and that such engagement subsequently facilitates green product and process innovation (Zhang et al., 2020; Begum et al., 2022). While these findings provide an important foundation, they offer limited explanation of the complete organisational process through which sustainability-oriented leadership is translated from an employee-level behavioural response into firm-level innovation and, ultimately, business growth. This limitation is particularly consequential in manufacturing SMEs, where resource constraints mean that leadership-driven creativity and green innovation may not automatically translate into commercially valuable innovation or sustained growth (Bos-Brouwers, 2010; Triguero et al., 2013).

This limitation is particularly consequential in manufacturing SMEs, where resource constraints mean that leadership-driven creativity and green innovation may not automatically translate into commercially valuable innovation or sustained growth; rather, firms require complementary capabilities to orchestrate and deploy innovation resources effectively (Bos-Brouwers, 2010; Triguero *et al.,* 2013; Appiah *et al.,* 2025). Moreover, prior models give insufficient attention to the organisational conditions that enable innovative performance to generate growth, particularly the role of top management support in mobilising resources, legitimising innovation initiatives and reinforcing strategic priorities (Teece, 2018; Leksono *et al.,* 2020; Mondal & Samaddar, 2023).

This theoretical limitation becomes especially salient in South Africa, where SMEs operate amid constrained access to financial and technological resources, uneven environmental-regulatory enforcement, limited green-finance availability and gaps in sustainability-oriented managerial capabilities. More broadly, research demonstrates that resource limitations, workforce capabilities, access to technology, infrastructure and formal management practices can constrain the innovative

capacity of SMEs (Nam & Luu, 2022). Models developed predominantly in better-resourced institutional and innovation environments may therefore insufficiently explain how firms operating under such constraints convert green leadership into innovation-driven growth. The unresolved question is thus not simply whether green transformational leadership, creativity or green innovation improves organisational outcomes, but how these mechanisms connect across employee and firm levels and under what organisational conditions innovative performance is translated into SME growth.

To address this gap, the present study develops and empirically tests an integrated, sequential model in which green transformational leadership stimulates creative process engagement, which subsequently facilitates green product and process innovation, enhances innovative performance and ultimately contributes to SME business growth. The study further theorises top management support as both a mediating and moderating organisational mechanism within the innovative performance–growth relationship. In doing so, the study integrates Schumpeter's innovation theory with the Natural Resource-Based View (NRBV): Schumpeter's perspective explains the innovation-driven process through which new ideas and practices generate economic development, while the NRBV explains how environmentally oriented organisational resources and capabilities can be mobilised to create sustainable competitive value (Hart, 1995; Hart & Dowell, 2011). This integration extends existing models by explaining not only whether green leadership and innovation matter for SME outcomes, but also the behavioural and organisational mechanisms through which, and conditions under which, these effects progress from leadership to growth in a resource-constrained emerging-economy setting.

Accordingly, this study addresses this gap by empirically investigating how green transformational leadership and associated green practices shape innovative performance and business growth among manufacturing SMEs in South Africa. Drawing on data from SME managers, the study contributes context-specific evidence and extends the comparative understanding of green innovation mechanisms in emerging markets and transitional economies. The current research aims to answer the following questions:

RQ1: *How does green transformational leadership influence employees' creative process engagement within South African manufacturing SMEs?*

RQ2: *To what extent does creative process engagement mediate the relationship between green transformational leadership and green process and product innovation?*

RQ3: *How do green process and product innovations impact innovative performance and overall growth of manufacturing SMEs in South Africa?*

RQ4: *How do the combined effects of green transformational leadership, creative process engagement and green innovation jointly influence SME performance outcomes in resource-constrained emerging economies?*

Accordingly, this study investigates how green transformational leadership shapes employees' engagement in the creative process and how these mechanisms translate into green process and product innovation within manufacturing SMEs in South Africa. Specifically, the study examines the mediating role of creative process engagement in the relationship between leadership and innovation outcomes, and evaluates how green innovations subsequently influence innovative performance and firm growth. By drawing on data from SME managers operating in resource-constrained environments, the research provides empirically grounded insights into the combined effects of leadership, employee engagement, and green innovation on SME performance. In doing so, the study contributes to the literature by offering context-specific evidence from an under-researched emerging economy, clarifying the behavioural and organisational pathways linking sustainability-oriented leadership to innovation outcomes, and extending theoretical and practical understanding of how SMEs can align environmental responsibility with competitiveness and growth.

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The structure of this paper is organised as follows: Section 1.1 highlights the study's originality and novelty; Section 2 presents the theoretical grounding, followed by the conceptual model and formulation of hypotheses in Section 3. Section 4 covers the research methodology, while Section 5 provides the analysis and results. The discussion of the results is presented in Section 6, and Section 7 concludes with recommendations and outlines future research opportunities.

1.1 Research originality and novelty

This study's originality lies in its contextual, mechanistic, and theoretical positioning within the green innovation literature. While prior research, particularly in Asian and developed economy contexts, has examined integrated relationships among green transformational leadership, creativity, and innovation outcomes, this study extends the conversation by empirically investigating these dynamics within manufacturing SMEs in South Africa, an under-researched emerging economy characterised by resource constraints, institutional inconsistencies, and limited green innovation support structures. The research develops and tests a sequential, process-oriented model that explains how green transformational leadership stimulates creative process engagement, which in turn drives dual green product and process innovation, enhances innovative performance, and ultimately contributes to SME business growth. In contrast to studies examining isolated or partially mediated relationships, this model provides a holistic pathway linking leadership behaviours to growth outcomes. A further novel contribution is the conceptualisation of top management support as both a mediating and moderating mechanism within the innovation–growth nexus, offering new insight into how leadership commitment and resource orchestration condition the translation of innovation into sustained growth. Theoretically, integrating Schumpeter's innovation theory with the Natural Resource-Based View (NRBV) advances sustainability-oriented innovation scholarship by positioning leadership and managerial commitment as strategic capabilities that mobilise creativity, innovation, and competitive advantage. Empirically, the study contributes rare context-specific evidence from South African manufacturing SMEs, addressing geographic and sectoral gaps in the literature and strengthening comparative understanding of green innovation mechanisms across emerging economies. Collectively, these contributions advance theory and provide actionable insights for SME leaders and policymakers seeking to align environmental responsibility with performance and growth.

2. Theoretical Underpinning

Several theories can underpin the study, spanning both social and natural sciences. The research is grounded in Schumpeter's theory of innovation and the natural resource-based view. The synergy between these theories provides a solid framework for understanding the dynamics of green leadership and innovation in manufacturing SMEs. These theories will be elaborated on in the subsequent sections.

2.1 Schumpeter's Innovation Theory

The Austrian economist Joseph Alois Schumpeter is the founder of the theory of innovation. He was the first academic to integrate innovation and entrepreneurship into economic theory, not as a supplementary concept but as a fundamental aspect essential for understanding the dynamics of economic growth, comparable in significance to the idea of equilibrium. Schumpeter (1934) describes the Schumpeterian innovator as a unique business visionary who creates and implements '*new combinations*' of resources and ideas. According to Langroodi (2021), Schumpeter's economic theory achieves a crucial synergy among economic, historical, political, social, and other facets of capitalism's functioning and growth. For both established firms and Schumpeterian enterprises, a variety of internal and external connections and resources are essential for acquiring, assimilating, and marketing knowledge (Audretsch *et al.*, 2022). Botchie, Sarpong, and Meissner (2022) clarify that the groundbreaking distinction between inventions and innovation has enhanced the

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understanding of technical change, asserting that innovation, which alters the output that can be produced from a given amount of input, is a vital aspect of technological advancement. Based on these insights, Schumpeter's theory of innovation posits that development and technological change are fundamental drivers of economic growth and progress.

From a green innovation perspective, Schumpeter's theory provides an essential foundation by framing innovation as a disruptive force that reshapes production systems, markets, and industrial trajectories. Green innovation in SMEs, such as eco-design, clean technologies and process innovations, can be understood as Schumpeterian '*new combinations*' that respond to environmental constraints while generating competitive advantage (Cainelli *et al.*, 2015). SMEs often act as agents of creative destruction, introducing flexible, niche-oriented green solutions that challenge incumbent technologies (Bos-Brouwers, 2010).

However, despite its explanatory power, Schumpeter's innovation theory showcases important limitations when applied to green innovation in SMEs. First, the theory largely assumes that innovation is driven by entrepreneurial dynamism and market opportunities, while underemphasising regulatory pressure, institutional frameworks, and environmental constraints that are central to green innovation (Horbach *et al.*, 2012). Second, Schumpeter's original work focuses primarily on radical innovation, whereas empirical research show that green in innovation in SMEs is often incremental, cumulative, and constrained by limited financial and absorptive capacities (Triguero *et al.*, 2013). This creates a theoretical mismatch between the disruptive ideal of Schumpeterian innovation and the gradual, resource-constrained reality of SME green innovation.

Furthermore, Schumpeter's framework does not explicitly address sustainability trade-offs. Empirical evidence shows that green innovations may initially reduce firm profitability due to high implementation costs, demand uncertainty, and technological risk, particularly for SMEs (Ghisetti & Rennings, 2014). These contradictions propose that while Schumpeter's theory is valuable for understanding innovation dynamics, it requires integration with sustainability-oriented perspectives, such as the natural resource-based review, to fully explain green innovation behaviour in SMEs.

2.2 Natural Resource-Based View

According to Hart (1995), the constraints and challenges posed by the natural (biophysical) environment will be among the most significant drivers of new resource and capacity development for organisations. The natural resource-based view (NRBV) examines how organisational resources, processes, and products derived from these resources impact the environment. We propose that the NRBV underscores the potential for businesses to develop capabilities for the efficient utilisation of natural resources to address environmental challenges, drawing on theoretical insights from the NRBV to explain the connection between green innovation (Hart 1995). The NRBV framework seeks to clarify the relationships between a company's resources, competencies, and external environment. This theory identifies three strategic competencies for sequential resource allocation: product stewardship, sustainable development, and pollution prevention. The pollution prevention strategy aims to minimise commercial emissions, waste, and contamination. The product stewardship approach focuses on reducing the environmental impact of products throughout their life cycle, evaluating ecological implications at each stage of the manufacturing process, from raw material selection to product use and disposal. Finally, the sustainable development strategy emphasises the creation of low-impact products and innovations. These pillars of green innovation are designed to protect the environment and promote more sustainable energy usage (Rehman, Kraus, Shah, Khanin, & Mahto, 2021).

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According to Rehman *et al.* (2021), the natural resource-based view (NRBV) can provide unique value to activities that are difficult to replicate by effectively leveraging human, physical, and organisational resources. Ahmed, Mozammel, and Zaman (2021) recently established a link between green transformational leadership and the development of environmentally friendly products. They argue that the inspirational and motivational elements of green transformational leadership encourage the creation of innovative environmental solutions. We assert that green innovation represents a crucial strategic asset. By utilising the NRBV, production managers can discover innovative methods to reduce waste and minimise emissions and pollutants in business operations, and to develop low-impact products and technologies to enhance green innovation. Although Ahmed et al. (2021) do not explicitly clarify the NRBV, their findings suggest that it plays a crucial role in SME creativity, particularly in green product innovation, creative process engagement, and green transformational leadership. The NRBV helps producers reduce the use of harmful substances and replace them with greener alternatives.

Despite its strong explanatory relevance, the Natural Resource-Based View (NRBV) also faces theoretical and empirical criticisms in the context of SMEs (del Rio *et al.*, 2016). One of the primary limitations is its assumption that firms can strategically develop valuable, rare, and inimitable environmental capabilities, which may not hold for resource-constrained SMEs lacking access to capital, advanced technologies, and specialised skills (Aragón-Correa *et al.*, 2008; Chen *et al.*, 2012). Additionally, research reports mixed results on the performance outcomes of Natural Resource-Based View (NRBV)- driven green innovation, with some studies finding positive effects on competitiveness and others identifying cost burdens and delayed returns (Testa *et al.*, 2014). These inconsistencies propose that contextual factors such as firm size, industry characteristics, and institutional support moderate the effectiveness of NRBV mechanisms.

2.2.1 Theoretical positioning of the study

Through applying Schumpeter's theory of innovation and the Natural Resource-Based View (NRBV), this study adopts an integrative theoretical perspective to explain how green transformational leadership enables innovation-driven growth in manufacturing SMEs. Schumpeter's theory provides a dynamic explanation of how leadership-driven creativity and innovation act as engines of change, while the NRBV explains how environmentally oriented capabilities can be mobilised to generate sustained competitive advantage. By combining these perspectives, the study conceptualises green transformational leadership, creative process engagement, and top management support as organisational mechanisms through which innovation potential is translated into green innovation outcomes, innovative performance, and SME business growth, particularly in resource-constrained emerging-economy contexts.

2.2.2 Theoretical Integration

Importantly, the organisational mechanisms through which leadership activates these innovation capabilities extend beyond the direct mobilisation of resources. Recent leadership and organisational behaviour research suggests that leadership shapes firm-level outcomes partly by creating relational, cultural and behavioural conditions that enable employees to contribute beyond formally prescribed roles. For example, Linuesa-Langreo *et al* (2025) demonstrate that servant leadership at the senior-management level can strengthen internal social capital, thereby creating relational resources that facilitate entrepreneurial orientation. Although servant leadership differs conceptually from green transformational leadership, this evidence reinforces the broader proposition that leadership influences strategic outcomes not only through managerial direction but also by cultivating trust, shared understanding and productive internal relationships. Within the present study, green transformational leadership can similarly be understood as creating a social and motivational environment in which employees are more willing to engage creatively with environmental challenges.

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This relational mechanism is complemented by organisational culture and value alignment. Ruiz-Palomino *et al* (2026) demonstrate that interventions involving upper-level managers can strengthen employees' perceptions of ethical organisational culture, while also showing that sustaining such effects requires effective mechanisms through which managerial values and practices are transferred throughout the organisation. Similarly, Zoghbi-Manrique-de-Lara *et al* (2023) show that person–organisation fit and value congruence can stimulate organisational citizenship behaviours through employee compassion. Collectively, these findings suggest that leadership, organisational values and employee behaviour operate as interconnected mechanisms rather than isolated organisational phenomena. Applied to green innovation, leaders who consistently articulate environmental priorities and reinforce them through managerial support may strengthen employees' alignment with sustainability-oriented organisational values, encourage discretionary and prosocial contributions, and increase their willingness to participate in creative problem-solving.

These insights deepen the integration of Schumpeter's innovation theory and the NRBV in the present study. Schumpeter explains why innovation generates organisational renewal and growth, while the NRBV explains how environmentally relevant resources and capabilities can generate sustainable competitive advantage. Contemporary leadership and organisational behaviour research additionally clarifies how such capabilities become socially embedded within the organisation: leadership cultivates relational resources, managerial practices reinforce organisational values, and employees translate these values into creative and discretionary behaviours. Green transformational leadership, creative process engagement and top management support therefore represent interconnected micro- and organisational-level mechanisms through which sustainability-oriented values are transformed into green innovation and, ultimately, firm-level performance and growth.

2.3 Empirical studies on green innovation in SMEs

A growing number of research studies have explored green innovation in SMEs, employing quantitative, qualitative and mixed-method approaches across diverse national and industrial contexts. SMEs have been constrained by limited access to entrepreneurship competencies, workforce skills, finance, technology, infrastructure, networks, and formal management practices (Nam & Luu, 2022; UN, 2012). This has prevented them from innovating in human resources management, which is considered a critical element of competitive advantage (Chowhan, 2016; Nam & Luu, 2022). Systematic reviews and meta-analyses reveal that green innovation in SMEs is predominantly driven by a combination of internal capabilities (e.g., leadership commitment, absorptive capacity) and external pressures (e.g., regulation, market demand, stakeholder expectations) (Rennings, 2000; del Rio et al., 2016).

Empirical studies consistently show that environmental regulation and policy initiatives play a strong role in motivating green innovation in SMEs than voluntary mechanisms, contradicting purely Schumpeterian assumptions of innovation driven by entrepreneurial opportunity alone (Horbach *et al.*, 2012; Triguero *et al.*, 2013). Moreover, research indicates that SMEs are more likely to adopt process-oriented green innovations, such as waste reduction and energy efficiency rather than radical green product innovations due to lower risk and investment requirements (Bos-Brouwers, 2010; de Jesus Pacheco *et al.*, 2018).

From an NRBV view, empirical evidence supports the notion that green innovation can enhance long term competitiveness, but not under specific conditions. Studies demonstrate that environmental capabilities yield performance benefits when aligned with organisational learning, green human resources practices, and external collaboration networks (Chen *et al.* 2012; Albort-

Morant *et al.*, 2018). However, contradictory findings also suggest that green innovation may impose short-term financial strain on SMEs, particularly in developing countries with weak institutional support (Zhang *et al.*, 2019).

Critically, the literature remains fragmented, with limited consensus on the causal link between green innovation and firm performance. Methodological limitations, such as cross-sectional designs, self-reported measures, and sectoral bias, further constrain generalisability. Additionally, most studies adopt static theoretical lenses, overlooking the dynamic and evolutionary nature of green innovation processes in SMEs. These gaps highlight the need for integrative frameworks that combine Schumpeterian innovation dynamics within Natural Resource-Based View (NRBV) sustainability logic to better understand how SMEs navigate environmental constraints while pursuing innovation-driven growth.

Despite growing interest in green innovation among SMEs, the reviewed literature reveals three persistent gaps. First, prior studies (Ashraf, Qing, Nasir & Amin, 2025; Begum, Ashfaq, Xia & Awan, 2022) largely examine green transformational leadership, creativity, green innovation, or firm performance in isolation. This approach offers limited insight into the sequential mechanisms linking leadership to growth outcomes. Second, empirical evidence on these relationships remains heavily concentrated in developed and Asian economies, with limited attention to emerging economy contexts characterised by resource constraints and institutional voids, such as South Africa. Third, while innovation is often assumed to drive SME growth directly, much remains to be known about the organisational conditions under which innovative performance is effectively translated into sustained business growth. These gaps motivate the present study, which develops and tests an integrated model that explains how green transformational leadership shapes creative process engagement, green innovation, innovative performance, and SME growth, while explicitly examining the mediating and moderating roles of top management support.

2.4 Theoretical contributions of the study

This study makes several explicit theoretical contributions to the literature on innovation, leadership, and SME growth. First, it extends Schumpeter's theory of innovation by demonstrating that innovation-driven growth in SMEs is not automatic but contingent upon organisational mechanisms that enable the mobilisation and scaling of innovation outputs. Specifically, the findings position green transformational leadership and creative process engagement as micro-level conduits through which Schumpeterian innovation dynamics are activated in sustainability-oriented contexts. Second, the study advances the Natural Resource-Based View (NRBV) by empirically showing how green leadership and creative engagement function as firm-specific capabilities that facilitate green product and process innovation, thereby strengthening innovative performance in manufacturing SMEs. This refines the NRBV by highlighting the role of leadership and human-centric processes, rather than technological assets alone, in driving sustainability-oriented competitive advantage. Third, by identifying top management support as both a mediator and a moderator between innovative performance and SME business growth, the study extends existing innovation–growth models that typically assume a direct relationship. This dual-role conceptualisation clarifies *how* and *under what conditions* innovative performance translates into growth, offering a more nuanced, process-oriented explanation of SME growth dynamics in emerging economies.

3. Conceptual model and hypotheses formulation

The conceptual model for this study illustrates the relationships among the key variables examined (Figure 1). Subsequently, the hypotheses for the current review will be presented.

[Insert Figure 1 here]

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3.1 Green transformational leadership and creative process engagement.

Green transformational leadership inherently encourages and empowers subordinates to engage in creative processes and decision-making, enabling them to consider environmental issues from multiple perspectives and devise innovative solutions (Zhang *et al.*, 2020). Moreover, Begum, Xia, Ali, Awan, and Ashfaq (2022) found a significant influence of green transformational leadership on engagement in the creative process, suggesting a strong and positive impact on creativity. Nabi *et al.* Hasan (2023) examined the relationship between transformational leadership and radical creativity among followers, highlighting the importance of involvement in the creative process and leaders' expectations for creativity. By integrating Schumpeter's innovation theory, which emphasises the role of entrepreneurial leadership in fostering innovation, with the Natural Resource-Based View (NRBV) (Ali *et al.*, 2022), which focuses on leveraging internal capabilities for sustainable advantage, this position green transformational leadership as a key driver of creative engagement that supports both environmental and organisational innovation. Recent organisational behaviour research provides further insight into why leadership may stimulate such employee-level engagement. Linuesa-Langreo *et al.* (2025) show that senior leadership can generate internal social capital by strengthening relational resources within organisations, while Zoghbi-Manrique-de-Lara *et al.* (2023) demonstrate that congruence between employees and organisational values can encourage discretionary citizenship behaviours through prosocial mechanisms such as compassion. Although these studies examine different leadership and behavioural outcomes, together they indicate that leadership influences employee behaviour partly by shaping relational conditions and reinforcing shared organisational values. In the environmental context, green transformational leaders may therefore stimulate creative process engagement not merely by requesting innovative behaviour, but by embedding environmental values, strengthening employees' identification with sustainability objectives, and creating a supportive relational climate in which employees feel encouraged to explore and contribute green ideas. Therefore, based on the preceding discussion and prior empirical evidence, the current study proposes the following hypotheses:

H1: *There is a positive and significant connection between green transformational leadership and creative process engagement.*

3.2 Creative process engagement, green product innovation and green process

This study posits that employee involvement in the creative process plays a crucial role in driving both green process innovation and green product innovation. Although many manufacturing companies are currently adopting environmentally friendly strategies centred on products and processes, the literature has paid limited attention to the organisational factors that facilitate the development and implementation of these green strategic initiatives (Ziegler & Seijas Nogareda, 2009). As ecological challenges intensify, businesses are increasingly pressured to innovate and embrace creative approaches to remain competitive and successful in the market (Cheng & Yang, 2019). Creative processes, which are essential for fostering innovation (Cheng & Yang, 2019), are vital for producing original and practical eco-friendly products and processes (Gilson & Shalley, 2004; Zhang *et al.*, 2020). Both green process and product innovations necessitate varying degrees of changes in employee mindsets. As a result, organisations are increasingly prioritising employee involvement in creative processes to seek sustainable solutions. This aligns with the quest for innovative solutions through creativity (Mahmood *et al.* 2019), in which active participation in the creative process helps employees identify relevant procedures, gather information, and utilise data to develop new methods and techniques that advance both green process and green product innovation. Creative process engagement can be viewed through Schumpeter's theoretical lens as a mechanism for generating novel solutions that disrupt traditional practices. At the same time, Natural Resource-Based View (NRBV) underscores the importance of deploying internal knowledge and capabilities toward sustainable innovation (Zhang *et al.* 2020). Together, these

theories frame employee creativity as a dual pathway to competitive advantage and environmental stewardship. Based on the above explanations and empirical evidence, it can be hypothesised that:
H2: *Creative process engagement has a positive and significant impact on green product innovation.*
H3: *Creative process engagement positively affects green process innovation.*

3.3 Green product innovation and the firm's innovative performance

The significance of accessing and integrating knowledge from external sources is increasingly vital to driving internal product innovation (Chesbrough, 2003; Ardito and Petruzzelli, 2017). The Resource-Based View (RBV) theory emphasises that a firm's resources and capabilities are crucial drivers of achieving sustainable innovation advantages (Leskovar-Spacapan and Bastic, 2007). Building on this foundation, firms aiming to maximise economic gains can utilise green product innovation to enhance their overall innovative performance. Research by Fatema and Islam (2023) indicates a significant positive relationship between product innovation and manufacturing firms' performance in India. Therefore, it is increasingly important for firms to align with evolving consumer attitudes by prioritising green product innovation, thereby enhancing their innovative performance in both economic and environmental terms. By combining Schumpeter's focus on innovation-driven growth with the Natural Resource-Based View (NRBV)'s emphasis on leveraging unique capabilities for sustainability (Chesbrough, 2003; Ardito and Petruzzelli, 2017)., green product innovation is positioned as a critical factor in achieving both superior firm performance and long-term environmental advantage. Consequently, the current study hypothesises the following:
H4: *Green product innovation positively affects a firm's innovative performance.*

3.4 Green process innovation and the firm's innovative performance

The hypothesis proposes that firms that adopt green process innovation are likely to improve their innovative performance. This assertion is supported by research indicating that companies with strong organisational capabilities in managing innovation-related activities, as noted by Piening and Salge (2015), are more inclined towards process innovation, which correlates with increased profitability. Additionally, studies such as those conducted by Fatema and Islam (2023) demonstrate a positive relationship between process innovation and the overall performance of manufacturing firms in India, highlighting the potential advantages of embracing innovative practices. Furthermore, the research by Ma, Hou, and Xin (2017) points to additional benefits of green process innovation, including increased industry influence, improved government relations, and higher employee retention rates. While these advantages may not yield immediate financial returns, they contribute to the firm's long-term competitive edge and sustainability. Schumpeter's theory highlights the transformative impact of process innovation on market competitiveness. At the same time, Natural Resource-Based View (NRBV) explains how deploying firm-specific capabilities to implement green processes strengthens sustainable performance (Piening & Salge 2015))—this dual theoretical lens positions green process innovation as a strategic lever for competitive and environmental success. Thus, the hypothesis suggests that investing in green process innovation can result in a range of benefits, ultimately strengthening a company's market position and promoting its longevity. The following hypothesis has therefore been formulated:
H5: *Green process innovation has a positive effect on the firm's innovative performance*

3.5 The firm's innovative performance and SME business growth

This hypothesis proposes a positive relationship between a firm's innovative performance and the growth of small and medium-sized enterprises (SMEs). Drawing on various studies and empirical evidence, it suggests that firms that prioritise innovation management techniques are likely to achieve sustainable, superior performance. Baldwin and Johnson (1996) offer foundational support for this claim, emphasising the critical role of innovation in enhancing overall firm performance. Furthermore, Lin and Chen (2007) bolster this hypothesis by demonstrating that

For Peer Review

organisational innovation significantly contributes to firms' total sales. This indicates that innovative firms are better equipped to generate revenue and sustain growth compared to their less innovative peers. Additionally, Le, Le, Pham, and Van Vo (2023) provide evidence that SMEs with an innovation focus tend to outperform those without such a focus, reinforcing the importance of innovation for SME growth. Coad and Rao (2008) also support this hypothesis by showing that the positive effects of innovative activities on firm growth are particularly pronounced among the fastest-growing companies. This suggests that innovative firms are more likely to experience accelerated growth than non-innovative firms. Moreover, empirical surveys by Coad (2009) and others, including Crepon et al. (1998) and Ortega-Argiles et al. (2011), consistently reveal a positive correlation between innovation and firm growth. Audretsch, Coad, and Segarra (2014) further support the hypothesis, suggesting that firm-level innovation is likely to positively influence sales growth and productivity growth. This implies that firms investing in innovation not only expand their sales but also enhance productivity, improving their growth prospects. Schumpeter's perspective frames innovation as a driver of firm growth, and the Natural Resource-Based View (NRBV) reinforces the idea that firm-specific resources and capabilities, enhanced through innovative practices, translate into measurable business growth, particularly for SMEs navigating resource constraints. Thus, based on the aforementioned arguments supported by empirical evidence, this study hypothesises that:

H6: *The firm's innovative performance has a positive effect on SME business growth.*

3.6 Top management support and business growth

Top management support is crucial for driving business growth in South African manufacturing SMEs. Research by Leksono et al. (2020) highlights the importance of this support in developing and implementing management policies and in integrating various organisational functions. Furthermore, Mondal and Samaddar (2023) emphasise that support from upper management fosters a positive attitude among employees, leading to higher levels of engagement and motivation. The influence of senior management also operates through the institutionalisation of organisational values and practices. Ruiz-Palomino et al. (2026), for example, demonstrate that interventions directed at upper-level managers can initially strengthen employees' perceptions of organisational ethical culture, while highlighting the importance of effectively cascading managerial values and practices throughout the organisation if such cultural effects are to endure. This insight is particularly relevant to sustainability-oriented SMEs, where top management support can provide the formal reinforcement, resource commitment and behavioural signalling needed to embed environmental priorities beyond individual leadership behaviours. Top management support may therefore help transform sustainability-oriented values into shared organisational practices that sustain employee engagement, innovation and subsequent business outcomes. In line with Schumpeter's theory of innovation, top management supports functions that catalyse entrepreneurial activities within firms. At the same time, the Natural Resource-Based View (NRBV) suggests that such leadership backing mobilises and enhances firm-specific resources, thereby facilitating business growth. This supportive environment, as highlighted by Men et al. (2023), Basana et al. (2022), and Uddin & Akhter (2022), enables manufacturing SMEs to effectively tackle the challenges of global competition and continually improve management processes, ultimately promoting sustained business growth. Therefore, it can be hypothesised that:

H7: *Top management support has a positive effect on SME business growth.*

3.7 The Mediating role of top management support

Top management support plays a pivotal mediating role in translating a firm's innovative performance into tangible SME business growth. While innovative performance reflects a firm's ability to generate and implement new ideas, products, or processes, innovation alone does not automatically lead to sustained growth unless it is actively supported, resourced, and institutionalised by top management (Tarigan & Ivandianto, 2020). Top management support

provides the strategic direction, allocation of financial and human resources, and organisational legitimacy required to convert innovation outputs into market expansion, productivity gains, and long-term growth (Leksono et al., 2020; Mondal & Samaddar, 2023). From a resource-based and dynamic capabilities perspective, senior leaders act as key orchestrators who mobilise internal capabilities and align innovation efforts with broader growth strategies, thereby enabling innovative performance to generate superior business outcomes (Teece, 2018).

Empirical studies suggest that top management support enhances the effectiveness of innovation by fostering a supportive climate, reducing resistance to change, and accelerating the commercialisation of innovative outcomes (Basana et al., 2022; Men et al., 2023). In SMEs, where structural constraints and limited resources are typical, the role of top management becomes even more critical, as growth decisions are often centralised at the top (Coad & Rao, 2008). Without strong managerial backing, innovative initiatives may remain isolated or underutilised, limiting their impact on firm growth. Conversely, when top management actively champions innovation, provides strategic oversight, and reinforces innovation-oriented values, the positive effects of innovative performance are more likely to materialise in the form of sales growth, market share expansion, and overall business development (Audretsch et al., 2014; Le et al., 2023).

Accordingly, this study posits that top management support functions as an internal organisational mechanism through which innovative performance is transformed into SME business growth. By mediating this relationship, top management support explains how and why innovative performance leads to growth, thereby extending prior innovation–growth models that have mainly overlooked this critical organisational conduit. This mediating perspective offers a more nuanced understanding of SME growth dynamics, particularly in emerging economy contexts where leadership commitment is essential for sustaining innovation-driven growth. Therefore, the following hypothesis is proposed:

H8: *Top management support mediates the relationship between firm innovative performance and SME business growth.*

3.8 The moderating role of top management support

In addition to the relationships outlined in the conceptual model, there may be both direct and indirect relationships among the variables under investigation. Figure 1 incorporates top management support as a moderating variable to explore these potential relationships. While hypotheses (***H1***, ***H2***, ***H3***, ***H4***, ***H5***, and ***H6***) establish primary associations between the research variables, further investigation into the complex connections could yield additional insights into this phenomenon. The role of top management support as a moderator in the manufacturing sector has been relatively under-researched (Hidayat et al. 2020). Top management support is widely acknowledged as an organisational factor that can impact various aspects of business and management research. Their findings revealed a positive moderation effect, indicating that top management support enhanced the relationship between supply chain performance and internal audit competency. The importance of leadership in the success of internal programs and initiatives, such as supply chain management efforts, is highlighted in several studies (Alshourah *et al.* 2022; Hidayat *et al.* 2020; Tarigan & Ivandianto, 2020; Leksono *et al.* 2020). Top management support, interpreted through the lens of Schumpeter's theory of innovation, enhances the firm's capacity to implement innovative initiatives. At the same time, the Natural Resource-Based View (NRBV) highlights how such support maximises the utilisation of unique organisational resources (Hidayat *et al.*, 2020). Together, they establish a distinctive theoretical stance where leadership amplifies the link between performance and SME growth. Building on previous empirical evidence and existing literature, the following hypothesis is proposed:

H9: *Top management support positively and significantly moderates the nexus between firm innovative performance and SME business growth*

For Peer Review

4. Methodology

This study was grounded in the positivist research philosophy, which asserts that research phenomena can be comprehended through the collection and analysis of quantitative data to generate verifiable outcomes (Dzomonda & Neneh, 2023; Saunders et al., 2019). Positivism facilitates the attainment of objectivity and generalizability in findings (Bell, Bryman & Harley, 2022; Saunders et al., 2019). The selection of the quantitative research method for this study was based on its focus on gathering and analysing numerical data to gain insights into the research problem (Bell et al., 2022). A causal research design was employed to investigate the relationships among creative process engagement, firm innovative performance, green product innovation, green process innovation, green transformational leadership, and SME business growth.

4.1 Sample and data collection

The study focused on small and medium-sized enterprises (SMEs) operating in the manufacturing sector in the Western Cape province of South Africa. During the 2023 data-collection period, the target respondents were managers of manufacturing SMEs. The sampling frame comprised 1,945 manufacturing SMEs obtained from the Small Enterprise Development Agency (SEDA), a government-supported national institution for small enterprise development. This database provided the sampling frame from which respondents were selected using simple random probability sampling. The required sample size was determined using the Raosoft sample size calculator based on a population of 1,945 SMEs, a 95% confidence level, a 5% margin of error, and a 50% response distribution. Accordingly, questionnaires were distributed to 321 randomly selected manufacturing SMEs. Of the 321 questionnaires distributed, 304 were retained as complete and usable responses, yielding an effective response rate of 94.7%. Seventeen questionnaires (5.3%) were excluded because of incomplete responses. The final sample of 304 respondents exceeded commonly recommended sample-size requirements for multivariate analysis and structural equation modelling and was considered adequate relative to the study population (Hair et al., 2019; Krejcie & Morgan, 1970). The Western Cape was selected because of its economic diversity and concentration of SMEs. Nevertheless, because the sample was geographically confined to one South African province and specifically to manufacturing SMEs, potential regional and sectoral differences are acknowledged, and the findings should therefore be generalised beyond comparable contexts with appropriate caution (Bryman, 2016).

4.2 Measures

This study used items derived from prior research to test the hypotheses. Modifications to the scale items were made to reflect the study context. The scale indicators were affixed to a strongly disagree (1) to strongly agree (5) Likert-scale continuum. All constructs were measured using scales adapted from prior validated studies. Items were modified to reflect the South African SME context while preserving their theoretical meaning, in line with established guidelines for scale adaptation (Hinkin, 1998; De Vellis, 2017). The questionnaire underwent expert review by three SME scholars to ensure content validity, followed by pilot testing with 30 SME managers. Minor wording refinements were made to enhance clarity, with no changes to the construct structure. Table 1 outlines the measurement scales, corresponding items, original sources, and Cronbach's alpha coefficients for each construct.

[Insert Table 1 here]

4.2.1 Controls

It was important to control for firm- and owner-level characteristics that could provide alternative explanations for SME business growth**.** In line with prior research, this study controlled for firm age, level of education, and gender**,** as these factors are widely recognised to influence SME growth outcomes. Firm age was included because more established SMEs tend to benefit from accumulated experience, stronger networks, and greater resource stability, which can independently affect growth trajectories (Coad & Rao, 2008; Audretsch et al., 2014). In addition, the owner/manager's level of education and gender were controlled for, as human capital attributes shape strategic decision-making, innovation orientation, and growth performance in SMEs (Neneh, 2019; Shinnar et al., 2018; Neneh & Dzomonda, 2024). Controlling these variables enables a more precise estimation of the relationship between innovative performance, top management support, and SME business growth.

4.2.2 Non-Response bias

Non-response bias was assessed using a wave analysis comparing early and late respondents (Armstrong & Overton, 1977). No statistically significant differences were found across key variables, indicating that non-response bias is unlikely to affect the results.

4.2.3 Common Method Bias

Given the cross-sectional, self-reported design, procedural and statistical measures were employed to address common method bias (CMB). Procedurally, anonymity was assured and item wording was carefully refined (Podsakoff et al., 2003). Statistically, Harman's single-factor test showed that no single factor accounted for the majority of variance, while all full-collinearity VIF values were below 3.3 (Kock, 2015), suggesting that CMB was unlikely to materially affect the findings.

4.2.4 Ethical clearance

This study was approved by the institutional research ethics board, and all participants were briefed on the research's purpose, their rights to voluntary participation, and confidentiality. Informed consent was obtained from each participant beforehand.

4.3 The demographic profile of the respondents

The respondents' demographic profile is diverse across gender, age, education level, business characteristics, and location. Many respondents were male (61.5%), with a smaller percentage female (32.6%), and a few did not disclose their gender (5.9%). The age distribution varied, with the highest percentages in the 31 to 39 years (31.9%) and 50 to 59 years (31.6%) categories. Education levels varied, with a significant portion holding diplomas (39.1%) and degrees (30.3%). The majority of businesses were in industrial areas (74.0%) rather than central business districts (26.0%). This diverse demographic profile provides a comprehensive understanding of the sample population, laying the groundwork for further analysis and interpretation of the study's findings. The details are summarised in Table 2.

[Insert Table 2 here]

4.4 Methodological justification and robustness considerations

Partial Least Squares Structural Equation Modelling (PLS-SEM) was deemed appropriate for this study given the model's predictive, theory-extension orientation, its complexity, and the characteristics of the data. The conceptual framework simultaneously estimates multiple mediation and moderation effects with several latent constructs measured reflectively, which aligns well with PLS-SEM's strengths in handling complex models with non-normal data distributions and medium sample sizes (Hair et al., 2017; Hair et al., 2019). Unlike covariance-based SEM, PLS-SEM prioritises variance explanation and predictive accuracy, which is consistent with the study's

For Peer Review

objective of explaining how green transformational leadership-driven innovation mechanisms translate into SME growth outcomes in an emerging economy context. Common-method bias (CMB) was addressed through both procedural and statistical remedies. Procedurally, anonymity was ensured, item wording was refined, and scale items were psychologically separated to reduce respondents' apprehension about evaluation (Podsakoff et al., 2003). Statistically, in addition to full-collinearity VIF assessment (Kock, 2015), Harman's single-factor test was conducted, and no single factor accounted for a majority of the variance, suggesting that CMB is unlikely to bias the findings materially. Nevertheless, the use of cross-sectional survey data limits causal inference, as temporal precedence cannot be definitively established and reciprocal relationships may exist among innovation-related constructs (Maxwell & Cole, 2007; Spector, 2019). Consequently, the reported relationships should be interpreted as theoretically grounded associations rather than strict causal effects. Potential endogeneity concerns, such as omitted variables or reverse causality between innovative performance and SME growth, were considered conceptually, but not formally modelled due to data constraints. While PLS-SEM is relatively robust to specific forms of endogeneity, future research could strengthen causal claims by employing longitudinal designs, instrumental variable approaches, or panel data techniques to explicitly address endogeneity and dynamic feedback effects (Antonakis et al., 2010; Hult et al., 2018). Overall, the analytical approach adopted is methodologically appropriate for the study's objectives, while the limitations are transparently acknowledged.

5. Results of structural equation modelling

In accordance with the guidelines set out by Hair et al. (2017), this study employed a two-step approach to assess PLS-SEM outcomes. The first step involved evaluating the measurement model, which included analysing internal consistency (using Cronbach's alpha [α] and composite reliability), convergent validity (indicator reliability and average variance extracted [AVE]), and discriminant validity (via the Fornell–Larcker criterion and the heterotrait–monotrait [HTMT] ratio of correlations). The second step concentrated on the structural model, which examines the significance and magnitude of the path coefficients within the research model, as well as the coefficients of determination (R^2), effect size (f^2), and predictive relevance (Q^2) (Hair et al. 2017).

5.1.1 Measurement model validation

Table 3 outlines the various measures used to evaluate the reliability and validity of the constructs in this study. The descriptive statistics indicate that the mean scores for all measurement items range between approximately 3.85 and 4.07, suggesting that respondents generally expressed moderate to high agreement with the statements across all constructs. This pattern reflects favourable perceptions of green transformational leadership, creative process engagement, innovation, top management support, and SME business growth within the sampled firms. Importantly, none of the items exhibit extreme mean values that would suggest ceiling or floor effects, thereby supporting the stability and reliability of the measurement scales (Field, 2013; Hair et al., 2019). Regarding dispersion, the standard deviations are relatively low and tightly clustered (approximately 0.76–0.90), indicating limited variability around the means and a high degree of consistency in responses. In line with prior work by Maziriri, Chuchu and Madinga (2019) standard deviation values well below 2 on Likert-type scales have been interpreted as evidence of the absence of problematic outliers within the data (Maziriri et al., 2019). As noted in that study, "the SD values are below 2; hence, it indicates that there was no presence of outliers," underscoring that this threshold serves as a contextual guideline rather than a universal statistical rule. Applying this rationale to the current study, the observed SD values strongly suggest that outliers are unlikely to compromise the robustness of the results. Furthermore, concerns about missing data were mitigated by excluding 17 incomplete questionnaires, yielding a clean, complete dataset for analysis. Taken together, the combination of stable mean values, low dispersion, and careful data screening provides reassurance that the results are not unduly influenced by outliers or missing data, thereby

For Peer Review

supporting the reliability and credibility of the findings (Tabachnick & Fidell, 2019; Hair et al., 2022).

The assessment of the outer model focused on composite reliability (CR) for internal consistency, outer loadings for indicator reliability, and average variance extracted (AVE) for convergent validity. Composite Reliability is considered a suitable measure of internal consistency reliability as it accounts for the varying outer loadings of the indicator variables, whereas alpha does not. In contrast, Cronbach's alpha assumes that all indicators have equal reliability (Hair et al. 2017). For all research constructs, the lowest item loading was 0.710. As illustrated in Table 2, Cronbach's alpha values ranged from 0.782 to 0.845, surpassing the 0.70 benchmark for acceptable internal consistency reliability (Field, 2013). According to Table 3, the lowest CR value of 0.863 is significantly above the suggested minimum of 0.6 (Hulland, 1999), and the lowest AVE value of 0.603 exceeds the recommended threshold of 0.4 (Anderson & Gerbing, 1988). Collectively, these results confirm that the measurement model demonstrates satisfactory reliability and validity, supporting the suitability of the constructs for subsequent structural analysis.

[Insert Table 3 here]

5.1.1 Discriminant validity

Field (2013) explains that discriminant validity involves distinct concepts using distinct items. The results of the discriminant validity analysis are presented in Tables 4 and 5. This validity was assessed using the heterotrait–monotrait (HTMT) ratio (Table 3) and the Fornell–Larcker criterion (Table 4). A conservative approach indicates that discriminant validity is established when the HTMT value is below 0.9 or 0.85 (Maziriri, Nyagadza, & Maramura 2024; Maziriri, Mashapa, Nyagadza, & Mabuyana, 2023; Henseler et al., 2015). Table 4 indicates that the highest HTMT value recorded is 0.819, which is below the conservative threshold of 0.85. Therefore, all constructs fulfil the criteria for discriminant validity. The results show that the highest inter-factor correlation is 0.783, which occurs between creative process engagement and top management support. This value is lower than the lowest square root AVE, which is 0.777 (for creative process engagement). This statistical evidence confirms the discriminant validity of the measurement model and indicates that the measures are valid for structural model analysis.

[Insert Table 4 here]

[Insert Table 5 here]

5.1.2 The variance inflation factors, the coefficient of determination (R^2), the effect size (f^2) and the predictive relevance (Q^2)

In the context of PLS-SEM, a full collinearity assessment was conducted to evaluate potential common method bias (CMB) following Kock's (2015) procedure. Variance inflation factor (VIF) values were used to assess collinearity with a recommended threshold of 3.3. As shown in Table 2, all constructs had VIF values below the threshold (Kock & Lynn, 2012), indicating no problematic multicollinearity and suggesting that CMB did not threaten the validity of the estimates.

Model fit was further examined using the Standardised Root Mean Square Residual (SRMR), which captures the discrepancy between observed and model-implied covariance matrices (Islam, 2023; Chen, 2007). The obtained SRMR value of 0.06 falls below the recommended cut-off of 0.08 (Hu & Bentler, 1998), indicating satisfactory model fit. Supporting this conclusion, the Normed Fit Index (NFI) value of 0.901 exceeded recommended thresholds (Afthanorhan, 2013), while the

For Peer Review

Chi-square statistic of 1,919.037 remained within acceptable bounds for complex variance-based structural models. Collectively, these indicators confirm the adequacy of the structural model.

The model's explanatory capability was evaluated using the coefficient of determination (R^2), which reflects the proportion of variance in the endogenous constructs explained by their predictors (Schumacher et al., 2016). Following the benchmarks proposed by Hair et al. (2019), R^2 values of 0.75, 0.50, and 0.25 indicate substantial, moderate, and weak explanatory power, respectively. The model produced R^2 values of 0.405 for creative process engagement, 0.457 for green product innovation, 0.369 for green process innovation, 0.619 for firm innovative performance, and 0.563 for SME business growth. These results demonstrate moderate to substantial explanatory power across all endogenous constructs, indicating that the model accounts for a meaningful proportion of variance and adequately explains behavioural and performance outcomes within the SME context.

Predictive relevance was assessed using Stone–Geisser's Q^2 obtained through blindfolding procedures. All Q^2 values were positive and exceeded zero, confirming predictive relevance (Hair et al., 2019). Specifically, Q^2 values of 0.446, 0.415, 0.368, 0.349, and 0.373 were obtained for creative process engagement, green product innovation, green process innovation, firm innovative performance, and SME business growth, respectively. These values exceed the threshold for large predictive relevance (0.35), indicating strong out-of-sample predictive capability of the structural model.

To further strengthen interpretive transparency, effect sizes (f^2) were computed to assess the relative contribution of exogenous constructs to changes in R^2 (Hair et al., 2019). Consistent with reporting recommendations, effect size magnitudes were interpreted using established thresholds, and their contributions are presented in Table 6. In addition, bootstrapping procedures were used to generate confidence intervals for structural path estimates, providing greater statistical precision and robustness than significance testing alone. The inclusion of these statistics strengthens the overall assessment of structural relationships and confirms the stability of the model estimates.

[Insert Table 6 here]

Path model

The structural model is presented in Figure 2, which illustrates both the beta path coefficients and the corresponding R-squared values.

[Insert Figure 6 here]

[Insert Table 7 here]

6. Hypotheses testing results

Table 7 presents the proposed hypotheses, path coefficients, t-statistics, and whether each hypothesis is rejected or supported. Chin (1998) suggests that $t>1.96$ indicates a significant relationship, and that higher path coefficients indicate stronger relationships among latent variables. Drawing from the results in Table 6, H1 (β=0.636; t=17.800), H2 (β=0.676; t=20.270), H3 (β=0.608; t=17.180), H4 (β=0.403; t=5.982), H5 (β=0.434; t=6.058), H6 (β=0.215; t=2.043), H7 (β=0.622; t=6.571) and H8 (β=0.125; t=2.992) are supported significantly because the t-statistics are greater than 1.96. Figure 2 shows the structural model, including path coefficients and factor loadings.

For Peer Review

6.1 Discussion

The findings provide empirical support for the sequential process through which green transformational leadership contributes to innovation and growth in manufacturing SMEs. Green transformational leadership had a positive influence on creative process engagement, suggesting that sustainability-oriented leaders can stimulate innovation by encouraging employees to identify environmental challenges, explore alternative solutions and participate actively in creative problem-solving. This finding supports previous research linking green transformational leadership with employee creativity and engagement (Zhang et al., 2020; Begum et al., 2022). However, the present study extends this evidence to South African manufacturing SMEs, where financial, technological and institutional constraints may limit formal innovation capabilities. In such environments, leadership that encourages employees to contribute ideas and engage with sustainability challenges may represent an important internal mechanism for developing innovation capacity.

Creative process engagement, in turn, positively influenced both green product and green process innovation. This finding demonstrates that employee creativity becomes organisationally valuable when it is translated into tangible changes in products and production processes. It is consistent with prior research emphasising creative engagement as an antecedent of innovation (Gilson & Shalley, 2004; Zhang *et al.,* 2020), while showing that its effects extend simultaneously to both product- and process-oriented environmental innovation. From the Natural Resource-Based View (NRBV), creative engagement can therefore be understood as an organisational capability through which employee knowledge and environmental awareness are mobilised into green innovation. This is particularly important for resource-constrained SMEs, where innovation may depend less on extensive formal R&D infrastructure and more on effectively leveraging existing human and organisational resources.

Both green product and green process innovation positively influenced firm innovative performance. These findings support previous evidence linking product and process innovation with improved organisational performance (Piening & Salge, 2015; Fatema & Islam, 2023). Green product innovation can strengthen firms' capacity to respond to changing customer and environmental expectations, whereas green process innovation can improve resource utilisation, operational efficiency and environmentally responsible production. The findings therefore suggest that environmental innovation should not be regarded solely as a response to regulatory or sustainability pressures but also as a strategic mechanism through which SMEs can strengthen their broader innovative capabilities. This supports the NRBV proposition that environmentally oriented resources and capabilities can create organisational value when effectively developed and deployed.

Firm innovative performance subsequently had a positive effect on SME business growth, consistent with previous evidence linking innovation with sales, productivity and firm growth (Coad & Rao, 2008; Audretsch *et al.,* 2014; Le *et al.,* 2023). This relationship provides support for the Schumpeterian view of innovation as an important driver of economic development and firm expansion. Importantly, however, the findings indicate that the innovation-growth relationship should not be understood as an isolated direct process. Top management support also had a significant positive relationship with SME growth and mediated the relationship between innovative performance and business growth. This suggests that innovative outputs are more likely to generate growth when senior management provides the strategic direction, resources and organisational commitment necessary to exploit them. The finding is consistent with research highlighting the role of management support in facilitating innovation implementation and organisational performance (Leksono *et al.,* 2020; Basana *et al.,* 2022; Mondal & Samaddar, 2023).

Taken together, the findings provide a more integrated explanation of how sustainability-oriented leadership translates into SME growth. Rather than treating leadership, creativity, green innovation and performance as isolated organisational phenomena, the results reveal a connected pathway in which green transformational leadership stimulates creative engagement; creative engagement facilitates green product and process innovation; these innovations strengthen innovative performance; and innovative performance contributes to business growth, with top management support providing an important organisational mechanism in this transition. In this respect, the findings extend Schumpeter's innovation theory by demonstrating the organisational and behavioural processes through which innovation-driven growth occurs and complement the NRBV by highlighting leadership, employee creativity and managerial support as capabilities through which environmentally oriented resources are transformed into organisational value. These relationships are particularly salient in the South African manufacturing SME context, where resource constraints increase the importance of effectively mobilising internal human and managerial capabilities.

[Insert Figure 3 here]

Crucially, the results reveal that top management support plays both a mediating and moderating role in the innovation-growth relationship. This highlights leadership commitment as the organisational mechanism through which innovation outcomes are prioritised, resourced, and scaled. In South African SMEs, where decision-making authority is highly centralised, top management support determines whether innovative performance remains latent or is converted into sustained business growth.

6.2 Theoretical and practical contributions

This study makes several important theoretical and practical contributions to the literature on green leadership, innovation, and SME growth in emerging economies. Prior research, particularly in Asian and developed-economy contexts, has examined the relationships among leadership, creativity, and green innovation; the present study extends this body of knowledge by providing empirical evidence from manufacturing SMEs in South Africa, a resource-constrained and institutionally distinct emerging-economy setting. In doing so, the study strengthens the comparative understanding of how green innovation mechanisms operate across diverse contexts and addresses a geographic and sectoral gap in the literature.

From a theoretical perspective, the study advances Schumpeter's theory of innovation by demonstrating that innovation-driven growth in SMEs is not automatic but contingent upon organisational mechanisms that enable the mobilisation, scaling, and commercialisation of innovation outputs. Specifically, the findings highlight green transformational leadership and creative process engagement as behavioural conduits that activate Schumpeterian innovation dynamics within sustainability-oriented SME environments. Furthermore, the study refines the Natural Resource-Based View (NRBV) by empirically showing that leadership behaviours and creative engagement operate as firm-specific capabilities that facilitate green product and process innovation and strengthen innovative performance. This extends NRBV scholarship by emphasising human-centric and managerial capabilities, rather than technological assets alone, as drivers of sustainability-oriented competitive advantage.

A further theoretical contribution lies in conceptualising top management support as both a mediating and moderating mechanism within the innovation–growth nexus. By demonstrating that leadership commitment shapes how innovative performance translates into SME business growth, the study extends conventional innovation–growth models, which typically assume direct effects. This dual-role perspective offers a more nuanced, process-oriented explanation of SME growth

For Peer Review

dynamics and highlights top management support as a critical organisational boundary condition in emerging economies.

From a practical standpoint, the findings demonstrate that sustainability-oriented innovation in SMEs does not necessarily require large-scale R&D investment or advanced technological infrastructure. Instead, green innovation can be driven through leadership behaviours that legitimise environmental values, encourage employee creativity, and actively support innovation initiatives. By emphasising creative engagement and incremental process improvements, the study offers realistic and actionable pathways for SME owners and managers to pursue sustainability-driven competitiveness and growth despite financial and institutional constraints. These insights are particularly relevant for policymakers and SME development agencies seeking to design capability-building initiatives that strengthen leadership capacity, innovation engagement, and sustainable business practices within emerging economies.

6.3 Managerial implications for South African SMEs

When it comes to SME owners and managers, the findings emphasise that green innovation begins with leadership behaviour rather than technology alone. Additionally, leaders should actively communicate environmental values, encourage experimentation, and involve employees in problem-solving related to sustainability challenges. Even in the absence of sophisticated R&D infrastructure, SMEs can foster green innovation by embedding creativity into daily operations. Furthermore, managers are also encouraged to prioritise incremental green process innovations, such as energy efficiency improvements, waste reduction, and cleaner production practices, which offer immediate performance benefits and require lower investment than radical product innovations. These process improvements can free up resources for further innovation and growth. Notably, the study highlights that innovation efforts must be supported by visible, sustained top-management commitment. This includes allocating budgets, setting clear sustainability goals, rewarding innovation-related behaviour, and integrating innovation outcomes into broader growth strategies. Without such support, innovative performance is unlikely to translate into tangible business growth.

6.4 Policy implications

Stemming from a policy perspective, the findings suggest that support for SME innovation should extend beyond financial incentives and technology grants. Policymakers should invest in leadership development and managerial capability-building programmes that equip SME owners with the skills to champion green innovation and manage the innovation-growth transition. The results underscore the important role of the green transformational leadership, creative engagement and top management support in driving SME growth and innovation, offering several actionable policy directions. Policymakers should motivate and incentivise leadership development programs that embed sustainability-oriented transformational practices, enabling leaders to foster employee creativity and green innovation even in resource-constrained SMEs (Begum *et al.*, 2022). Support methodologies such as grants and or tax breaks for SMEs adopting green process and product innovations, can build internal capabilities that enhance long-term innovative performance (Hart & Dowell, 2011). Considering the importance of top management support in converting innovation into measurable growth, policy frameworks should promote training of management and mentorship programs that improve strategic resource allocation and innovation commercialisation (Teece, 2018; Kraus *et al.*, 2022). In addition, joining SME innovation policies with sector specific environmental standards can encourage sustainable eco-innovation, alignment with incentives, capacity building initiatives and regulatory guidance, policymakers can create an ecosystem where sustainability-driven innovation becomes both feasible and commercially rewarding for SMEs. Government agencies and development institutions could also design targeted green finance instruments that prioritise SMEs, thereby demonstrating strong top-

For Peer Review

management commitment to sustainability. Furthermore, policies should recognise that green process innovation is often the most feasible entry point for SMEs and tailor support accordingly, particularly within the manufacturing sector. By aligning leadership development, innovation support, and sustainability policy, South Africa can strengthen SMEs' capacity to contribute meaningfully to inclusive and environmentally responsible economic growth.

7. Implications of the study

The study makes a significant contribution to the existing literature on green transformational leadership, creativity, and innovation. It establishes a positive correlation between green transformational leadership and engagement in the creative process, expanding our understanding of how this leadership style impacts organisational creativity and green innovation. This finding is consistent with previous research, such as Begum et al. (2022), which highlights the essential role of leadership in fostering a sustainable organisational culture. Additionally, the study advances the Resource-Based View (RBV) by demonstrating how green product and process innovations can enhance a firm's innovative performance. This alignment with RBV theory, as discussed by Leskovar-Spacapan and Bastic (2007), provides a theoretical basis for the strategic importance of sustainability in gaining a competitive advantage. The moderating effect of top management support on the relationship between firm innovative performance and SME business growth represents a theoretically meaningful contribution to existing studies. Prior research has primarily examined top management support as a direct antecedent of performance outcomes (Basana et al., 2022; Mondal & Samaddar, 2023) or as a contextual enabler of operational initiatives such as supply chain effectiveness, auditing quality, or green practices (Hidayat et al., 2020; Tarigan & Ivandianto, 2020). While these studies acknowledge the importance of senior leadership commitment, they stop short of explaining how and when innovation performance translates into growth outcomes. By contrast, the present study demonstrates that top management support strengthens the conversion mechanism through which innovative performance leads to SME business growth, thereby extending innovation–growth models that have traditionally assumed a direct relationship (Coad & Rao, 2008; Audretsch et al., 2014). Theoretically, this finding advances Schumpeterian innovation theory by highlighting that innovation-driven growth in SMEs is not automatic but contingent upon leadership-backed resource orchestration and strategic alignment. From a natural resource-based view, top management support functions as a higher-order organisational capability that amplifies the value of innovation by legitimising, scaling, and embedding innovative outputs into growth-oriented strategies. This moderating role is particularly salient in resource-constrained SME contexts, where managerial discretion is centralised, and leadership commitment determines whether innovative capabilities are fully leveraged or underutilised. Consequently, this study extends prior leadership and innovation research by repositioning top management support from a peripheral contextual factor to a critical boundary condition that explains variance in the innovation–growth relationship, thereby offering a novel, theoretically grounded contribution to the SME growth literature.

Beyond its moderating influence, the mediating role of top management support offers a substantive theoretical contribution by explaining how innovative performance is translated into tangible SME business growth. Prior innovation research has predominantly treated innovative performance as a direct driver of growth outcomes, implicitly assuming that innovation outputs automatically translate into improved sales, productivity, or market expansion (Audretsch et al., 2014; Coad & Rao, 2008). However, emerging evidence suggests that innovation outcomes often fail to generate growth unless they are actively supported, prioritised, and strategically embedded by senior leadership (Leksono et al., 2020; Tarigan & Ivandianto, 2020). By empirically demonstrating that top management support mediates the relationship between firm innovative performance and SME business growth, this study advances theory by identifying leadership commitment as a critical organisational conduit that converts innovation potential into realised

For Peer Review

growth. From a Schumpeterian perspective, this finding refines innovation theory by showing that entrepreneurial innovation requires managerial orchestration to achieve economic impact, particularly in SMEs where decision-making authority is highly centralised. Similarly, from a natural resource-based view, top management supports functions as a coordinating capability that mobilises firm-specific resources, legitimises investment in innovation, and aligns innovative outputs with long-term growth strategies. This mediating perspective extends existing innovation–growth models by shifting attention from whether innovation leads to growth to how and under what organisational conditions this transformation occurs, thereby offering a more nuanced, process-oriented explanation of SME growth dynamics, especially in a resource-constrained emerging-economy context.

On a practical level, the findings provide concrete guidance for South African manufacturing SMEs seeking to leverage green innovation to sustain growth. First, the results suggest that SME owners and managers should move beyond symbolic environmental commitments and invest in structured green transformational leadership development programmes. For example, industry bodies such as sector education and training authorities (SETAs) and local business chambers could collaborate with universities to deliver short courses and executive workshops focused on green leadership, creative problem-solving, and sustainability-oriented decision-making tailored to SME contexts. Such programmes can equip managers with the skills required to embed environmental values into daily operations and stimulate employee engagement in creative processes despite resource constraints.

Second, the findings highlight the need for SMEs to adopt incremental, cost-effective green product and process innovations, such as energy-efficient machinery, waste minimisation practices, and eco-friendly packaging, which are more feasible in the South African SME environment. Policymakers can support this transition by expanding access to green finance, tax incentives, and government-backed grants that specifically target sustainability-driven innovation among manufacturing SMEs. Third, the study underscores the pivotal role of top management support in translating innovation into business growth, suggesting that SME leaders should actively champion innovation by allocating dedicated budgets, forming cross-functional innovation teams, and setting clear performance metrics linked to sustainability outcomes. From a policy perspective, this implies that innovation support initiatives should not only fund technological upgrades but also prioritise leadership commitment and managerial capability development as prerequisites for SME growth. Collectively, these practical insights provide actionable strategies for SME leaders and policymakers to strengthen the innovation–growth nexus in South Africa by aligning green leadership, supportive top management, and context-appropriate innovation practices to achieve long-term competitiveness and sustainability.

Limitations and suggestions for future research

When evaluating the results, it is important to consider potential flaws despite the study's theoretical and practical advancements. Due to the cross-sectional nature of the study, the possibility of reverse causality or a causal relationship cannot be entirely ruled out (Churchill & Iacobucci, 2018; Hancock et al., 2019). To address these issues, future longitudinal research is necessary (Denzin & Lincoln, 2018; Saunders et al., 2019). Another major limitation was the study population's restriction to SME managers in the Western Cape province of South Africa, which limited the generalisability of the findings to SME managers nationwide. Future research should consider expanding data collection to include SME managers from other provinces, such as the Northern Cape or Limpopo, to provide more comprehensive insights. Although the empirical setting is South Africa, the underlying mechanisms linking green transformational leadership, innovation, and top management support are likely to be relevant to SMEs operating in other emerging economies that face similar resource constraints, institutional challenges, and

For Peer Review

sustainability pressures; nevertheless, cross-country comparative studies are required to validate this applicability empirically. This study lays the groundwork for future research on green practices in South Africa, particularly in the manufacturing sector. However, future studies should investigate other sectors of the economy to gain a more comprehensive understanding of the impact of green practices on business growth. Additionally, future research should consider employing a mixed-methods approach, including qualitative methods, to gain a deeper understanding of SMEs in the South African context. Explorations through ethnographies, case studies, and experiments could provide valuable insights into respondents' reactions to green practices and the potential mediators and moderators that influence these relationships. Concepts such as perceived ethics and concern for the future could be explored as potential mediators, while variations in industry norms could serve as potential moderators. While acknowledging these limitations, it is important to note that they do not diminish the study's contributions but rather pave the way for future research endeavours. In addition, future researcher can dwell on exploring green innovation and low carbon operations focusing on the role of net-zero capabilities in transition towards carbon neutrality in circular supply chains in South Africa (Awan *et al.*, 2025).

Finally, the empirical focus on manufacturing SMEs in the Western Cape limits the generalisability of the findings. Future studies could extend this research to other provinces in South Africa, different economic sectors, or conduct cross-country comparative analyses across emerging economies. Qualitative or mixed-method approaches, including case studies and interviews, could also provide deeper insight into how SME leaders and employees interpret and enact green leadership and innovation practices in context. When jointly considered together, these limitations do not detract from the study's contributions but rather highlight promising avenues for advancing theory and empirical understanding of green leadership, innovation, and SME growth in emerging economies.

For Peer Review

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Table 1: Development of measurement scales

Construct	Item Code	Measurement Item	Source
Creative Process Engagement	CPE1	I spend considerable time trying to understand the nature of the problem	Chen & Chang (2013)
	CPE2	I think about environmental problems from multiple perspectives	
	CPE3	I decompose a difficult environmental problem or assignment into parts to obtain greater understanding	
	CPE4	I consult a wide variety of information	
	CPE5	I search for information from multiple sources (e.g. personal memories, others' experiences, documentation, and Internet)	
	CPE6	I retain large amounts of detailed information in my area of expertise for future use	
	CPE7	I consider diverse sources of information in generating new ideas	
	CPE8	I look for connections with solutions used in seemingly diverse areas	
	CPE9	I generate a significant number of alternatives to the same problem before choosing the final solution	
	CPE10	I try to devise potential solutions that move away from established ways of doing things	
	CPE11	I spend considerable time sifting through information that helps generate new ideas	
Green Transformational Leadership	GTL1	The leader encourages human resources to achieve environmental goals	Zhang & Bartol (2010)
	GTL2	The leader provides a clear environmental vision for followers to follow	
	GTL3	The leader inspires followers with environmental plans	
	GTL4	The leader gets employees to work together toward environmental goals	
	GTL5	The leader acts by considering the environmental beliefs of individuals	
	GTL6	The leader stimulates subordinates to think about green ideas	
	GPI1	Our firm emphasises developing new green products using technologies that simplify packaging	Cheng, Yang & Sheu (2014)
	GPI2	Our firm emphasises developing new green products using technologies that simplify construction	
	GPI3	Our firm emphasises developing new green products using technologies that allow components to be recycled	
	GPI4	Our firm emphasises developing new green products using technologies that allow materials to decompose easily	

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	GPI5	Our firm emphasises developing new green products using technologies that use natural materials	
	GPI6	Our firm emphasises developing new green products using technologies that reduce waste damage	
	GPI7	Our firm emphasises developing new green products using technologies that minimise energy use	
Green Process Innovation	GPRI1	The manufacturing process effectively reduces emissions of hazardous substances or waste	Kawai, Strange & Zucchella (2018)
	GPRI2	The manufacturing process recycles waste/emissions for reuse	
	GPRI3	The manufacturing process reduces consumption of water, electricity, coal, or oil	
	GPRI4	The manufacturing process reduces the use of raw materials	
SME Business Growth	SBG1	Our business has experienced growth in profits over the past few years	Lotz & Van der Merwe (2013)
	SBG2	Our business has experienced growth in turnover over the past few years	
	SBG3	Our business has experienced growth in market share over the past few years	
	SBG4	The competitive position of our business has improved over the past few years	
Top Management Support	TMS1	Top management recognises the importance of green practices	Noor Faezah et al. (2024)
	TMS2	Top management proactively supports implementation of green practices	
	TMS3	Top management shows a positive attitude towards green practices	
	TMS4	Top management is willing to invest resources needed for green practices	
	TMS5	Top management would approve special funding for green initiatives	
	TMS6	Top management has clearly defined organisational environmental policy	

Source: Authors's own compilation

Table 2: Sample demographic Characteristics

Gender	**Frequency**	**%**
Male	187	61.5
Female	99	32.6
Prefer not to say	18	5.9
Total	**304**	**100**
Age distribution of the respondents (years)	**Frequency**	**%**
18 to 30	37	12.2
31 to 39	97	31.9
40 to 49	56	18.4

50 to 59	96	31.6
60 and above	18	5.9
Total	**304**	**100**
Level of Education	**Frequency**	**%**
No formal education	57	18.8
Basic Education	36	11.8
Diploma	119	39.1
Degree	92	30.3
Total	**304**	**100**
Family business	**Frequency**	**%**
Yes	109	35.9
No	195	64.1
Total	**304**	**100**
Number of employees (full-time)	**Frequency**	**%**
Less than 10	7	2.3
Between 10 and 50	131	43.1
Between 50 and 100	76	25.0
Between 100 and 200	90	29.6
Total	**304**	**100**
Age of business (years)	**Frequency**	**%**
1 to 3	9	3.0
4 to 6	120	39.5
7 to 10	16	5.3
11-20	159	52.3
Total	**304**	**100**
The location of the business	**Frequency**	**%**
CBD	79	26.0
Industrial	225	74.0
Total	**304**	**100**

Source: Summarised SPSS output
Key: CBD - Central Business District.

TABLE 3: Accuracy analysis statistics.

Research construct		Means	Standard deviations	Cronbach's alpha value	CR	AVE	Factor loadings	VIF (outer) values
Code	Code items							
CPE	CPE4	3.920	0.842	0.835	0.884	0.603	0.786	2.112
	CPE5	3.880	0.791				0.793	2.337
	CPE6	4.010	0.807				0.827	2.024
	CPE7	3.950	0.864				0.733	1.645
	CPE9	3.900	0.819				0.742	1.645
FIP	FIP1	3.890	0.873	0.845	0.890	0.618	0.801	2.287
	FIP2	3.940	0.842				0.797	2.612

	FIP3	3.970	0.816				0.851	2.552
	FIP4	3.850	0.901				0.710	1.396
	FIP5	3.910	0.858				0.764	1.635
GPI	GPI2	3.860	0.889	0.810	0.875	0.637	0.807	1.793
	GPI3	3.930	0.847				0.847	2.061
	GPI4	3.880	0.861				0.770	1.659
	GPI5	3.900	0.834				0.766	1.430
GPRI	GPRI1	3.950	0.827	0.788	0.876	0.703	0.838	1.644
	GPRI2	4.020	0.792				0.867	1.903
	GPRI3	3.980	0.813				0.808	1.560
GTL	GTL3	4.050	0.774	0.789	0.863	0.612	0.816	1.780
	GTL4	3.990	0.821				0.773	1.636
	GTL5	4.070	0.763				0.802	2.027
	GTL6	3.960	0.838				0.736	1.815
SBG	SBG1	3.870	0.884	0.782	0.873	0.696	0.807	1.548
	SBG2	3.920	0.857				0.856	1.748
	SBG3	3.890	0.869				0.839	1.618
TMS	TMS1	4.010	0.801	0.790	0.863	0.613	0.789	1.671
	TMS2	3.970	0.836				0.740	1.521
	TMS3	3.940	0.848				0.753	1.460
	TMS4	4.030	0.793				0.844	1.705

α, alpha; CR: composite Reliability; AVE, average variance reliability; CPE: Creative process engagement; FIP: Firm innovative performance; GPI: Green product innovation; GPRI: Green process innovation; GTL: Green transformational leadership; SBG: SME business growth; TMS: Top management support

Table 4. Heterotrait– monotrait ratio (HTMT)

Variables	CPE	FIP	GPI	GPRI	GTL	SBG	TMS	TMS x FIP
CPE								
FIP	0.729							
GPI	0.717	0.764						
GPRI	0.742	0.799	0.751					
GTL	0.776	0.688	0.732	0.737				
SBG	0.787	0.819	0.763	0.813	0.719			
TMS	0.656	0.670	0.654	0.634	0.800	0.813		
TMS x FIP	0.292	0.595	0.302	0.395	0.194	0.309	0.555	

Source: Table by authors

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CPE: Creative process engagement; FIP: Firm innovative performance; GPI: Green product innovation; GPRI: Green process innovation; GTL: Green transformational leadership; SBG: SME business growth; TMS: Top management support

Table 5. Fornell–Larcker criterion

Variables	CPE	FIP	GPI	GPRI	GTL	SBG	TMS
CPE	*0.777*						
FIP	0.710	*0.786*					
GPI	0.676	0.736	*0.798*				
GPRI	0.608	0.743	0.768	*0.838*			
GTL	0.636	0.581	0.662	0.584	*0.782*		
SBG	0.641	0.680	0.607	0.639	0.572	*0.834*	
TMS	0.783	0.682	0.692	0.736	0.643	0.736	*0.783*

Source: Table by authors

Notes: Italic diagonal values are the square root of the AVEs.

CPE: Creative process engagement; FIP: Firm innovative performance; GPI: Green product innovation; GPRI: Green process innovation; GTL: Green transformational leadership; SBG: SME business growth; TMS: Top management support

Table 6: Coefficient of Determination (R^2), Predictive Relevance (Q^2), and Effect Size Contributions (f^2)

Endogenous Construct	R^2	Interpretation	Q^2	Predictive Relevance	Effect Contribution (f^2)
Creative Process Engagement	0.405	Moderate	0.446	Large	3.423
Green Product Innovation	0.457	Moderate	0.415	Large	2.823
Green Process Innovation	0.369	Moderate	0.368	Large	2.469
Firm Innovative Performance	0.619	Moderate–Substantial	0.349	Medium–Large	2.527
SME Business Growth	0.563	Moderate–Substantial	0.373	Large	2.834

Source: Table by authors

TABLE 7: Results of structural equation model analysis.

Hypothesis	Hypothesised relationship	Path Coefficient values	*t*-statistics (|O/STDEV|)	P values	Decision
H1	GTL-> CPE	0.636	17.800	0.000	Supported
H2	CPE -> GPI	0.676	20.270	0.000	Supported
H3	CPE -> GPRI	0.608	17.180	0.000	Supported
H4	GPI -> FIP	0.403	5.982	0.000	Supported
H5	GPRI -> FIP	0.434	6.058	0.000	Supported
H6	FIP -> SBG	0.215	2.043	0.041	Supported
H7	TMS-> SBG	0.622	6.571	0.000	Supported
$H8_{Mediation}$	FIP -> TMS-> SBG	0.147	3.124	0.000	Supported
$H9_{Moderation}$	TMS x FIP -> SBG	0.125	2.992	0.003	supported

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Controls					
	Gender-> SBG	0.321	1.469	0.137	
	Firm age-> SBG	0.234	1.251	0.194	
	Level of education-> SBG	0.067	1.473	0.584	

Source: Table by authors

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Figure 1: Conceptual model

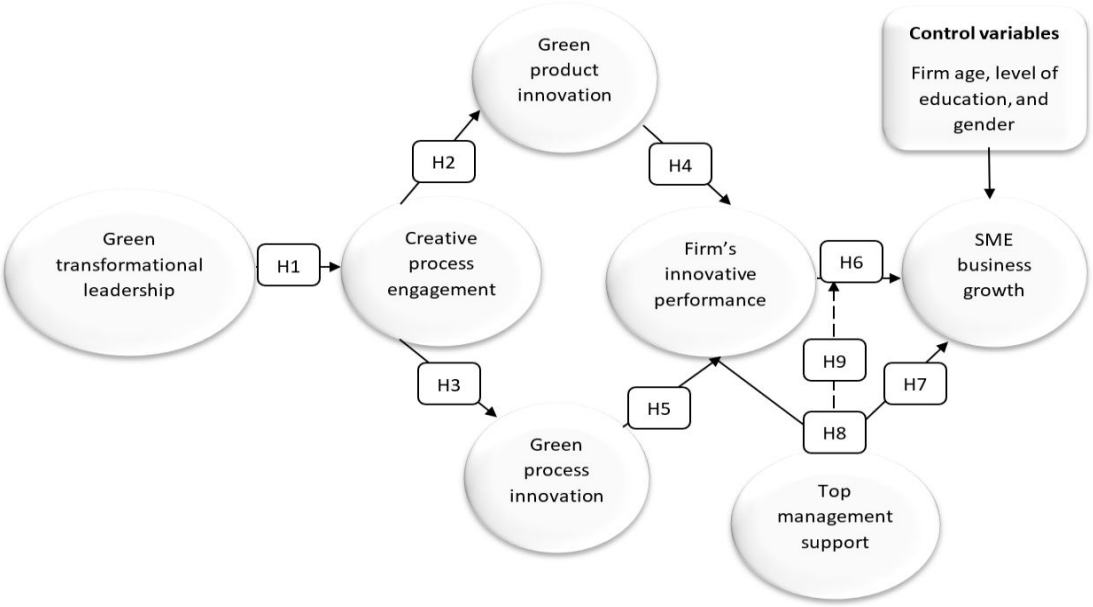
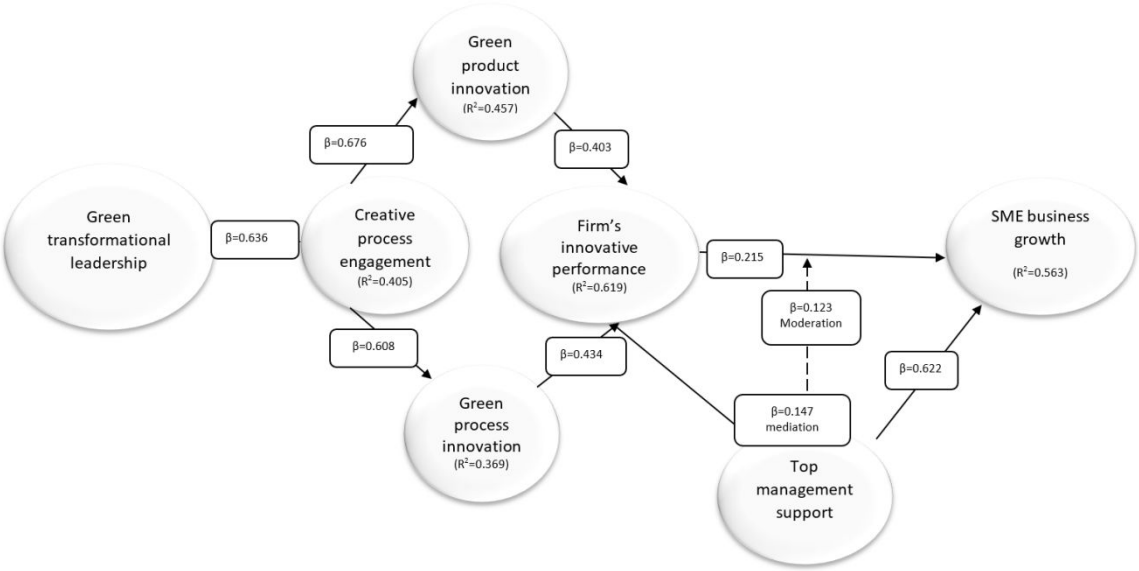


Figure 2: Structural model



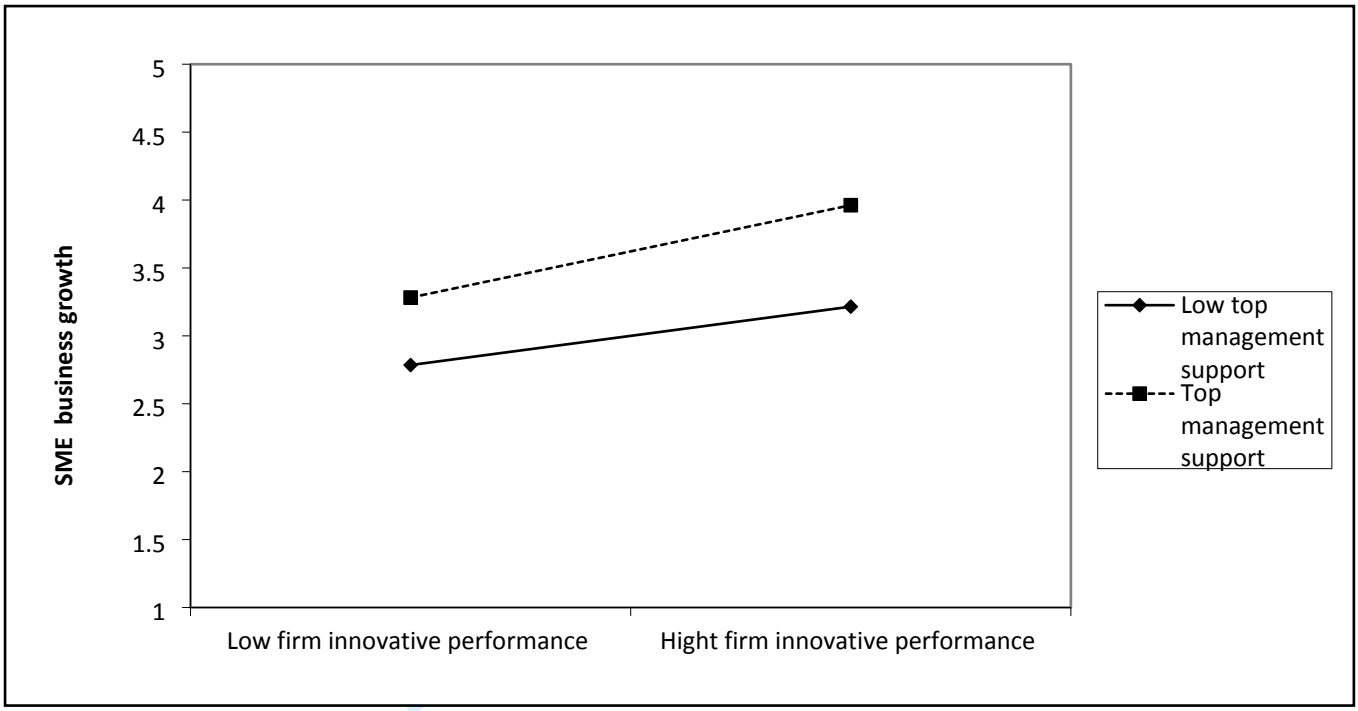


Figure 3: The interaction plot for the top management support moderating variable on the nexus between supply chain performance and organisational performance

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