JOURNAL OF THEORETICAL AND APPLIED MANAGEMENT
Jurnal Manajemen Teori dan Terapan

https://e-journal.unair.ac.id/jmtt
p-ISSN: 1979-3650 e-ISSN: 2548-2149

Original Research

Volume 18, No. 1, 2025 OPEN ACCESS

Exploring the Link between Entrepreneurial Leadership and Innovation Success: Evidence from Small and Medium Enterprises

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Abstract

Objective: This study investigates the impact of entrepreneurial leadership on innovation performance, focusing on the mediating roles of innovation processes and products in small and medium enterprises (SMEs).
Design/Methods/Approach: Data were gathered from 105 SME employees through purposive sampling and analyzed using the Structural Equation Model (SEM) with Partial Least Squares (PLS).
Findings: Reveal that entrepreneurial leadership significantly influences innovation performance. The innovation process and products also play crucial roles in enhancing innovation performance. Additionally, entrepreneurial leadership positively affects the innovation process and products, which, in turn, mediate its relationship with innovation performance. These results highlight the importance of strengthening innovation processes and products to optimize the impact of entrepreneurial leadership. SMES should prioritize leadership development while balancing process and product innovation for sustainable growth. Lastly, innovative products can partially address process deficiencies, but an integrated approach is essential for long-term success.
Originality/Value: The research provides a unique contribution by integrating multiple factors (leadership, innovation processes, and products) rather than analysing them in isolation. In addition to SEM-PLS, the FsQCA methodology is employed, which offers a more nuanced analysis than traditional methods. It focuses on a specific regional context and provides localised insights for business growth.
Practical/Policy implication: The study provides actionable insights for SME leaders, emphasizing leadership training, R&D investment, and process efficiency. These are sensible recommendations that can be applied in real-world settings. Also, by highlighting the role of leadership in innovation, the research adds value to entrepreneurial strategy and organizational management literature. The study suggests a holistic approach integrating leadership, product innovation, and process improvement, paving the way for future research on external factors (e.g., policies and market conditions) affecting SME innovation.

Keywords: Entrepreneurial leadership; Innovation performance; Innovation process; Innovation products.

JEL Classification: L26, O31, O32

DOI: https://doi.org/10.20473/jmtt.v18i1.70558
Received: March 5, 2025; Revised: April 8, 2025; April 24, 2025; Accepted: April 24, 2025; Available online: April 25, 2025

Published by Universitas Airlangga, Department of Management, Faculty of Economics and Business

1. Introduction

In today's dynamic and competitive business environment, the ability to innovate is one of the keys to a company's success. Entrepreneurial leadership plays a vital role in encouraging innovation in organizations. Entrepreneurial leadership reflects a leader's ability to identify new opportunities, develop a strategic vision, and encourage measurable risk-taking to achieve company goals (Bagheri, 2017). Recent research shows that entrepreneurial leadership contributes to creating, implementing, and performing innovation within the company (Leitch & Volery, 2017). This leadership encourages employees to think creatively and take initiative, improving the organisation's ability to adapt and thrive in a rapidly changing market (Huang et al., 2022). Therefore, understanding the influence of entrepreneurial leadership on innovation performance is very important for companies that want to stay competitive and relevant in this era of globalisation.

Entrepreneurial leadership significantly influences innovation performance in the company through several key mechanisms. Entrepreneurial leadership encourages an organizational culture that supports creativity and innovation. Leaders with an entrepreneurial style tend to create a work environment open to new ideas and experimentation, allowing employees to feel freer to express their creativity (Rae, 2017). Entrepreneurial leadership plays a role in developing a clear and inspiring strategic vision, which guides the entire organisation in achieving innovative goals. Visionary leaders can communicate this vision effectively so all team members understand and support the company's strategic direction (Leitch & Volery, 2017). A clear vision helps align innovation efforts with the company's long-term goals, ensuring that resources are appropriately allocated to the most promising initiatives. Entrepreneurial leadership also encourages intelligent risk-taking. Innovation often requires risk-taking, and entrepreneurial leaders understand the importance of supporting employees in uncertainty and potential failure (Covin & Slevin, 1988). By providing support and encouragement, these leaders help create a climate where employees feel safe taking calculated risks, which can lead to innovative breakthroughs.

Entrepreneurial leadership and innovation in SMES are an exciting research area because they connect leadership theories with real-world business challenges. It has the potential to drive economic development, empower small businesses, and shape future entrepreneurial strategies in an increasingly competitive global market. As SMES often operate with limited resources and high uncertainty, strong entrepreneurial leadership fosters agility, creativity, and adaptive strategies. Research in this field explores how visionary and proactive leaders can inspire innovation, build resilient organizational cultures, and effectively navigate market dynamics. Furthermore, understanding the interplay between leadership behaviours and innovation outcomes can help policymakers and practitioners design targeted interventions to support SME growth. Integrating digital technologies and sustainability practices into SME innovation further enriches the research landscape, offering insights into modern entrepreneurial competencies.

Previous research on leadership and innovation has been conducted in a variety of contexts, such as in the healthcare sector (Al-Sharif et al., 2023), public administration and governmental organisations (Jabbour Al Maalouf et al., 2025), and technology-based startups in emerging markets (Petti et al., 2021). However, research on SMEs is still limited (Ur Rehman et al., 2019; Knezović A., 2021; Cui et al., 2022). Most previous studies focused on large companies (Yamova, 2018; Hoang et al., 2025; Zainol et al., 2018) and paid less attention to the unique characteristics of SMEs that influenced innovation. Therefore, more in-depth research is needed on the relationship between entrepreneurial leadership and innovation success in SMEs. In this research, we aim to understand the relationship between entrepreneurial leadership and innovation success by examining the underlying mechanism of the innovation process and the innovation product. This study contributes to the literature by providing contextual evidence from SMES, emphasising how entrepreneurial leadership can be a strategic driver of innovation success in resource-constrained and dynamic environments.

This research provides several vital contributions both theoretically and practically. Theoretically, it enriches the literature on entrepreneurial leadership by specifically investigating its role in shaping innovation success within small and medium enterprises (SMEs). This sector has often been underrepresented in leadership and innovation studies. Unlike studies focusing on large corporations, this research highlights the unique challenges and opportunities SMES face, such as limited resources, flatter organisational structures, and higher market uncertainty, which require distinct leadership approaches. By exploring the mechanisms of the innovation process and innovation product as mediating dimensions, the study deepens the understanding of how entrepreneurial leadership behaviours, such as vision articulation, risk taking, and empowerment, translate into tangible innovation outcomes.

The findings offer actionable insights for SME owners and managers in adopting leadership strategies that can foster a culture of innovation, enhance employee involvement, and accelerate product and process innovations. These insights are particularly valuable for SMES in emerging economies where agility and innovation are key to survival and growth. Furthermore, the study provides policy-level implications by suggesting that leadership development programs and innovation support schemes should be tailored to the specific needs of SMES. Overall, this research bridges the gap between leadership theory and innovation practice, contributing to the advancement of both academic discourse and business development in the SME sector.

This research can provide a basis for developing effective leadership strategies to encourage innovation in SMES. The results of this study can also provide practical guidance for small and medium-sized business owners to improve innovative performance.

2. Literature Review and Hypotheses Development

2.1 Theoretical Background

The resource-based view (RBV) theory constitutes a strategic theoretical framework that elucidates how organizations can attain sustainable competitive advantage by deploying distinct, valuable, and challenging internal resources (Barney, 1991). Within this paradigm, resources extend beyond physical assets to encompass intangible resources, such as knowledge, organizational culture, and managerial competencies (Wernerfelt, 1984). The RBV underscores the significance of identifying and managing these resources to facilitate the organization's strategic objectives. This theory holds particular relevance in innovation studies, as innovation frequently hinges on an effective amalgamation of internal resources. Consequently, RBV establishes a theoretical foundation for comprehending the origins of excellence within the organization (Peteraf, 1993).

In this research model, RBV is employed to elucidate how entrepreneurial leadership functions as a strategic internal resource propelling innovation. Entrepreneurial leadership represents organisational capabilities that can bolster utilising additional resources, including knowledge, technology, and human capital (Alvarez & Busenitz, 2001). By adopting the RBV approach, the leadership variable is perceived not solely as a managerial style but as a strategic asset that has the potential to augment the firm's innovation capacity. In this context, the relationship between entrepreneurial leadership and innovation is correlational and causal, predicated on superior resource utilization (Engelen et al., 2015). Additionally, RBV elucidates how leaders can cultivate competitive advantage by establishing an innovative culture and judicious risk-taking (Miao et al., 2019).

Numerous prior studies have leveraged the RBV framework to elucidate the entrepreneurial phenomenon. For instance, research conducted by Newbert (2007) demonstrates that the unique confluence of resources and managerial capabilities predicts new venture performance. Furthermore, a study by Wiklund and Shepherd (2003) utilised the RBV to illustrate that entrepreneurial orientation and internal resource utilisation significantly contribute to the growth of small businesses. Another investigation by Alvarez and Barney (2007) emphasised that opportunity-driven entrepreneurship hinges on acquiring and utilising resources inaccessible to competitors. Collectively, these three studies accentuate how RBV can be instrumental in understanding the role of resources in achieving entrepreneurial success, thereby reinforcing the validity of RBV in research on entrepreneurial leadership and innovation.

2.2 Hypotheses Development

2.2.1 Entrepreneur Leadership has an effect on Innovation Performance, Innovation Process, and Innovation Product

Entrepreneurial leadership is characterised by opportunity recognition, calculated risk-taking, proactiveness, innovation, and the ability to mobilise and inspire others toward entrepreneurial goals (Gupta et al., 2004). This type of leadership is ever more recognised as having a role in enabling companies to navigate uncertain and turbulent market environments by making innovative decisions and adapting strategy (Imran & Aldaas, 2020). Innovation performance in this case means both internal project success—e.g., time-to-market, meeting R&D budgets, and product quality—and external market results, such as product acceptance, profitability, and market share (Popaitoon & Siengthai, 2014).

According to the Resource-Based View (RBV), firms achieve sustainable competitive advantage by acquiring and utilizing valuable, rare, inimitable, and non-substitutable (VRIN) resources and capabilities (Barney, 1991). Entrepreneurial leadership may be framed as a strategic intangible asset meeting the VRIN requirements because it is firmly rooted in organisational culture and is imitable (Fisher et al., 2020; Kuratko et al., 2015). Entrepreneurial leaders drive innovation through communicating an attractive vision, empowering teams, promoting risk-taking, and motivating creative endeavours (Bagheri et al., 2022; Hoang et al., 2023).

Empirical studies have established that entrepreneurial leadership (EL) improves the capacity of micro, small, and medium enterprises (MSMES) to develop and implement innovative projects, thereby improving their innovation performance (Fonias & Rocklind, 2021). Although Gebert et al. (2003) caution that inadequately managed entrepreneurial leadership leads to an overwhelming effect or a mismatch of innovation activities, later studies point out that when properly executed, EL promotes innovation through mechanisms like strategic coherence and resource alignment (Yu et al., 2022).

Based on the theoretical and empirical information provided above, the present research hypothesises the following:

H1: Entrepreneurial Leadership positively influences Innovation Performance.

The Innovation Process (IP) refers to a company's methodical endeavours to transform ideas into new or improved products, services, or processes. It often includes the phases of idea genesis, development, and implementation

(Crossan & Apaydin, 2010). Entrepreneurial leadership is crucial for influencing and advancing a successful innovation process (Chang et al., 2015). The Resource-Based View (RBV) posits that sustainable competitive advantage is derived from the strategic utilization of firm-specific resources that are valuable, rare, inimitable, and non-substitutable (VRIN). Entrepreneurial leadership functions as a strategic intangible asset by enhancing a firm's capacity to allocate resources efficiently, especially in innovation (Barney, 1991). EL enables firms to leverage human capital, knowledge, and organizational routines—core resources of the Resource-Based View—more innovatively and adaptively. Thus, entrepreneurial leaders act as catalysts, transforming internal potential into innovative results (Newbert, 2007).

A plethora of empirical studies corroborate that entrepreneurial leadership exerts a favorable influence on each stage of the innovation process: Entrepreneurial leaders foster environments that encourage creativity and openness to new ideas (Gupta et al., 2004); they facilitate resource allocation and team collaboration necessary for experimentation and prototype creation (Bagheri & Pihie, 2011); and they reduce resistance to change while guiding the commercialization or institutionalization of innovations (Ling et al., 2008).

In today's hyper-competitive and technologically disruptive environments, firms continuously face mounting pressure to innovate (Renko et al., 2015). Entrepreneurial leadership is an intangible but powerful organizational asset with untapped potential to improve creative processes (Gupta et al., ibid). Addressing this issue is essential for enabling leadership-driven innovation in dynamic markets. Thus, the proposed theory is articulated as follows:

H2: Entrepreneurial Leadership positively impacts the Innovation Process

Innovation Product is developing and introducing new or significantly improved products or services. It is a critical component of a company's competitiveness, driven by market adaptability, technological innovation, and creativity (Kanagal, 2015). The Resource-Based View (RBV) substantiates the premise, which identifies leadership behaviour as a foundational strategic asset coordinating innovation processes. By effectively utilising internal competencies, this strategic alignment enables companies to innovate. The considerable impact of entrepreneurial leadership on product innovation is supported by numerous studies, including the role of entrepreneurial leaders as catalysts for introducing novel products and adapting business models to emerging technologies (Kopalle et al., 2025). Furthermore, entrepreneurial executives in family enterprises foster product innovation by nurturing an innovation-centric culture and strategic succession planning (Bahmann & Carbon, 2025). Additionally, leadership promotes collaboration and research and development, directly impacting innovative product development (Sushant et al., 2025).

It is imperative to understand how entrepreneurial leadership encourages product innovation in light of the unpredictable nature of the market and the rapid pace of technological advancements (Maiolini et al., 2025). Examining the relationship between leadership and innovation will provide essential insights for business strategists, educators, and policymakers as innovation arises as the foundation of economic resilience (Edobor et al., 2025). As a result, the following theory is proposed:

H3: Entrepreneurial Leadership positively impacts the Innovation Product

2.2.2 Innovation Process Affects Innovation Performance

The Innovation Process is a systematic set of actions companies take to generate, assess, and actualize new ideas into business products, commodities, or operational enhancements (Camisón & Villar-López, 2014). The Resource-Based Perspective (RBV) contends that a firm's sustainable competitive advantage is its capacity to utilize valuable, rare, inimitable, and non-substitutable (VRIN) resources and capabilities. Innovation processes show these strategic capabilities, which are embedded in the firm's routines and thus enable various competitive positioning and superior organizational performance (Barney, 1991; Camisón & Villar-López, ibid).

Empirical studies regularly highlight innovation processes' critical role in enhancing performance. For example, Camisón and Villar-López (ibid) found a significant positive impact of innovation processes on innovation performance, showing that systematically structured innovation processes significantly contribute to the success of product innovation, operational efficiency, and market competitiveness. Also, based on recent studies by Zhang et al. (2018), dynamic and structured innovation processes significantly contribute to firms' capacity to introduce successful innovations quickly and effectively, resulting in improved innovation performance. Empirical evidence refers to the reality that organizations that are efficient in managing their innovation processes will tend to have improved outcomes regarding innovation performance. Therefore, the following hypothesis is put forward:

H4: The Innovation Process positively affects Innovation Performance.

2.2.3 Innovation Product Affects Innovation Performance

Product innovation is the creation or significant alteration of products or services to meet consumer demands in new and improved ways. Such activity encompasses design, function, material, or use enhancements to provide more value and differentiate products in the market (Harvard Business School Online, 2023). Innovation performance means

the ability of an organization to transform innovation-related inputs into tangible outputs in producing some results and outcomes through the innovation process (Li, Li, & Zhang, 2023).

The Resource-Based View (RBV) posits that a firm's sustainable competitive advantage is rooted in its unique resources and capabilities, which are characterised by their value, rarity, inimitability, and non-substitutability (Barney, Ketchen, & Wright, 2021). For product innovation, the RBV argues that companies with better resources, such as proprietary technologies, highly skilled individuals, or excellent research and development capabilities, are more likely to develop innovative products that competitors cannot easily replicate. These unique assets enable organizations to attain remarkable innovative performance levels through their ability to leverage their internal capabilities effectively (Barney et al., 2021).

Empirical evidence has backed a positive relationship between innovation performance and product innovation. For instance, research indicates that companies that invest in product innovation initiatives—e.g., developing new products or improving existing ones—have superior innovation performance, including rising patent applications, increasing market share, and enhancing financial performance (Alegre & Chiva, 2013; Brettel & Cleven, 2011). The results are explained by the organization's capacity to address changing consumer demands and develop a distinctive identity in competitive markets (Alegre & Chiva, 2013).

Finally, product development is one of the determinants of innovation performance that enables companies to engage their unique resources in creating products that meet the market's needs and gain competitive positioning. The Resource-Based View would suggest that the correlation accentuates strategic investment in product innovation as the fundamental element necessary for enhancing a company's innovative performance and overall performance (Barney et al., 2021; Alegre & Chiva, 2013). Thus, the hypothesis is as follows:

H5: Innovation Product positively influences Innovation Performance

2.2.4 Innovation Process Mediates the Relationship between Entrepreneurial Leadership and Innovation Performance

The innovation process mediates entrepreneurial leadership and performance (Hu et al., 2017). Entrepreneurial leadership denotes the capacity of leaders to direct and inspire employees in identifying opportunities, promoting innovation, and participating in proactive behaviours amid uncertain environments. This method combines opportunity-focused actions with strategic foresight and risk-taking (Renko et al., 2015). The innovation process includes the actions, decisions, and routines necessary for generating, developing, and implementing ideas within an organisation. The process encompasses idea generation, selection, development, and commercialization (Tidd, 2023). Innovation performance reflects an organization's capability to transform innovation activities into measurable outcomes, such as new product introductions, process improvements, or increases in market share (Gunday et al., 2011).

The Resource-Based View (RBV) posits that sustainable competitive advantage stems from resources and capabilities characterized as valuable, rare, inimitable, and non-substitutable (VRIN) (Barney, 1991). The resource-based view (RBV) suggests that enhanced innovation performance results from the availability of resources, such as leadership, and their effective transformation via organizational processes, particularly innovation processes.

Multiple studies provide empirical evidence of the innovation process's mediating role in transforming entrepreneurial leadership into improved innovation outcomes. Entrepreneurial behaviours, including proactiveness and risk-taking, enhance innovation performance via internal knowledge sharing and innovation routines (Qasim et al., 2025). Leadership styles positively impact innovation performance through the mediating factors of innovation-related processes and cultural enablement (Sandra & Ilyas, 2025). The mediating effects of creative self-efficacy and learning in the relationship between entrepreneurial leadership and innovation suggest partial mediation (Takeed et al., 2025).

In a dynamic and unpredictable business environment, visionary leadership is insufficient for attaining enduring innovation success (Qasim et al., 2025). The gap exists within the innovation process, particularly regarding the effectiveness of leadership in directing organisational energy and resources toward implementing innovation (Sandra & Ilyas, 2025). Investigating this mediating mechanism is crucial for enhancing theoretical understanding and guiding managerial practices. This study examines the shortcomings of RBV-based empirical models by clarifying how entrepreneurial leadership enhances innovation outcomes. Therefore, the hypothesis proposed:

H6: The innovation process mediates the relationship between entrepreneurial leadership and innovation performance.

2.2.5 Innovation Product Mediates the Relationship between Entrepreneurial Leadership and Innovation Performance

Entrepreneurial leadership motivates employees to recognise opportunities and foster innovation (Renko et al., 2015). Product innovation is a quantifiable outcome of innovative efforts, demonstrating a firm's creative potential (OECD, 2005). Innovation performance denotes a firm's capacity to generate, implement efficiently, and market novel ideas, products, or processes, leading to improved efficiency, effectiveness, or competitive advantage (Hagedoorn & Cloodt, 2003).

The Resource-Based View (RBV) asserts that a firm's competitive advantage is derived from its unique resources and capabilities (Barney, ibid). The Resource-Based View suggests that innovation capabilities and outputs, including

new products, act as mediating resources that transform leadership competencies into measurable innovation success (Barney, 1991; Teece et al., 1997).

Several previous studies have examined this mediating relationship and offer support for the proposed hypothesis. Product innovation mediates the relationship between tacit knowledge management and firm performance, underscoring the importance of leadership in promoting innovative outcomes (Zhang et al., 2025). Research on entrepreneurial leadership behaviours in telecommunications indicates that knowledge sharing, a precursor to product innovation, mediates the pathway to innovation performance (Qasim et al., 2025). Moreover, innovation capability mediates entrepreneurial marketing, leadership, and the performance of SMES (Siregar et al., 2024).

The hypothesis that "product innovation mediates the relationship between entrepreneurial leadership and innovation performance" is crucial for comprehending how firms translate entrepreneurial intentions into measurable innovative outcomes (Murad et al., 2024). Innovation is an essential factor influencing competitive advantage in dynamic markets. Understanding the mediating mechanisms enhances the precision of leadership development, resource allocation, and innovation strategies (Zhang et al., 2025). This hypothesis enhances RBV-based innovation theory, refines empirical models, and offers insights for policy and managerial practices in innovation-driven economies. The hypothesis proposed is as follows:

H7: The Innovation Product mediates the relationship between Entrepreneurial Leadership and Innovation Performance.

The conceptual framework and hypothesis in this study are as follows:

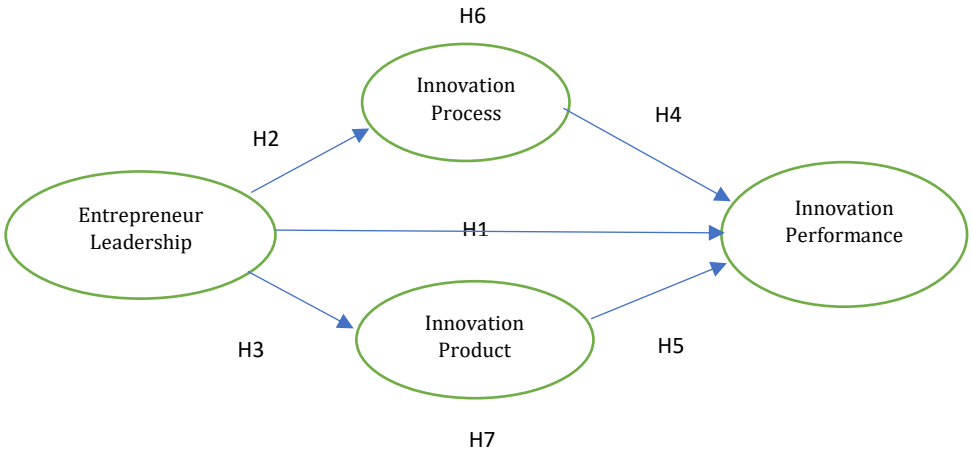

Figure 1. Conceptual Framework and Hypothesis

3. Method

The proposed research falls under exploratory research, which elucidates the effects generated by a research subject through both quantitative and qualitative methodologies (Sugiyono, 2019). This study investigates the impact of various independent, mediating, and dependent variables.

3.1 Sampling Method

The dependent variable is innovation performance. Moreover, innovative products and processes serve as intervening variables, but entrepreneurial leadership functions as an independent variable. Indonesia is a pertinent backdrop for our research on entrepreneurial leadership and innovation success for several reasons. Indonesia possesses a substantial and dynamic SME sector, comprising over 64 million SMEs that contribute more than 60% to the nation's GDP and employ over 97% of the workforce (Ministry of Cooperatives and SMEs, 2023). This renders SMEs an essential element of Indonesia's economic framework, necessitating the enhancement of their innovative capacities. Secondly, governmental programs like the Gerakan Nasional 1000 Startup Digital and innovation incentives from the Ministry of Research and Technology illustrate Indonesia's increasing dedication to entrepreneurship and innovation (Bappenas, 2022). Third, Indonesia, as a developing nation, presents a distinctive context in which the interplay between leadership and innovation encounters specific limitations (e.g., constrained resources, informal structures), thereby yielding valuable insights for both theory and practice concerning Innovation Challenges in Developing Economies (Yusof & Jainudin N. H., 2020).

This research utilised a purposive sampling method, focusing on employees of SMES in Malang City, East Java. East Java is notable for having one of the most significant concentrations of SMEs in Indonesia, with about 9 million

enterprises. The area exemplifies Indonesia's SME ecosystem, rendering it suitable for broadly applicable findings (Qurrata et al., 2024). East Java is the second-largest contributor to Indonesia's GDP. The performance of SMEs in East Java directly influences national economic results. Comprehending innovation in this context possesses significance at both local and national levels (REDI, 2024). Our research concentrates explicitly on SMEs in Malang City. Malang City is recognized as an Innovation Hub, actively promoting innovation through university collaborations, technology parks, and youth entrepreneurship initiatives, creating a conducive research environment (REDI, 2024).

3.2 Data Collection and Measurement

Identifying the minimum sample size with a variable of fewer than five suggests that a sample size of at least 100 is adequate. This study involved 105 respondents. All variables in this research were assessed utilizing a seven-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The sample included owners and managers of small and medium enterprises (SMEs). Data were collected through a combination of online and offline methods. Most responses were collected via online questionnaires distributed through platforms like Google Forms, facilitating a broader geographic reach and efficient data collection. Data collection included face-to-face distribution of printed questionnaires in key SME areas to improve response rates and ensure representativeness, particularly from SME clusters in traditional or rural business centres. This hybrid approach facilitated inclusivity and enhanced data richness from various respondent profiles.

SmartPLS (Partial Least Squares) was employed for data analysis to investigate the relationships among variables, adhering to the conventional three-stage approach: assessment of the outer model, evaluation of the inner model, and hypothesis testing. Furthermore, fsQCA (Fuzzy-set Qualitative Comparative Analysis) was utilized as a supplementary approach to reveal intricate causal configurations and pathways that facilitate innovation success, providing a deeper insight into the interactions among components of entrepreneurial leadership (Pappas & Woodside, 2021a).

The minimum sample size for a variable of less than 5 is 100. All variables in this study were measured using a five-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The sample for this research consists of 105 respondents. Data analysis through Smart PLS (Partial Least Squares) involves three stages: evaluation of the outer model, assessment of the inner model, and hypothesis testing to elucidate the relationships between variables. fsQCA is an effective method for analyzing intricate causal relationships and pinpointing particular configurations that result in intended outcomes (Pappas & Woodside, 2021a).

Table 1. Definition and Measurement

Variable	**Operational Definition**	**Variable Measurement**	**Resource**
Entrepreneurial Leadership	Entrepreneurial leaders are proactive, innovative, and willing to take risks to achieve competitive advantage (Gupta et al., 2004)	EL1: My leader has a clear vision for the future of the company. EL2: My leader encourages the search for new opportunities. EL3: My leader supports experimentation and new ideas. EL4: My leader makes decisions despite uncertainty. EL5: My leader encourages the team to take risks. EL6: My leader has innovative thinking in solving problems. EL7: My leader inspires employees to work creatively. EL8: My leader is open to change	Gupta et al., 2004
Innovation process	Innovation process involves stages from ideation, selection,	IProc1: My company encourages the creation of new ideas.	Mokhber, Ismail, et al., 2018

Variable	Operational Definition	Variable Measurement	Resource
	development, and implementation of new ideas (Mokhber, Ismail, et al., 2018)	IProc2: There is an effective idea selection system. IProc3: We develop innovative ideas into real concepts. IProc4: We have a trial phase before implementing new ideas. IProc5: The product development process is carried out systematically. IProc6: We evaluate the innovation process. IProc7: Process innovation is carried out continuously. IProc8: There is strong teamwork in implementing the innovation process.	
Innovation Product	Product innovation enhances firm competitiveness by introducing novel or significantly improved goods and services (Gunday et al., 2011)	IProd1: My company often produces new products. IProd2: Our products are unique compared to competitors. IProd3: Our new products answer market needs well. IProd4: Product innovation helps improve the company's competitiveness. IProd5: The new products we make are well received by customers. IProd6: We continue to improve product quality through innovation.	Gunday et al., 2011
Innovation Performance	Innovation performance is the outcome of firms' innovation efforts reflected in new products, processes, or services (Wang & Ahmed, 2004)	IPer1: Innovation increases the efficiency of work processes in my company. IPer2: Our new products strengthen the company's market position. IPer3: The company is often the first to launch innovative products. IPer4: Innovation drives increased company profitability.	Wang & Ahmed, 2004

Variable	Operational Definition	Variable Measurement	Resource
		IPer5: Innovation speeds up response time to market changes. IPer6: Our innovations are consistent with customer needs	

4. Results and Discussion

4.1. Results

4.1.1 Respondent Characteristic

The data shows that the employee profile of SMEs is dominated by women aged 21-30 with 2-5 years of work experience and a high school education. There are more female employees than male employees. The age group of 21-30 years is the largest, followed by those above 30 and below 20 years. Most work experience ranges from 2-5 years, less than 2 years, and more than 5 years. The highest level of education is senior high school, followed by junior high school, the 'other' category, and elementary school.

Table 1. Respondent Characteristic

Respondent Characteristic	Total
Gender	
Male	44
Female	61
Age	
< 20 years	5
21 - 30 years	67
> 30 years	33
Working	
< 2 years	32
2 - 5 years	54
> 5 years	19
Education	
Elementary School	1
Junior High School	36
High School	64
Other	4

4.1.2 Measurement Model Results

Table 2 displays the evaluation of the measurement model for four constructs—Entrepreneurial Leadership (EL), Innovation Performance (IPer), Innovation Process (IProc), and Innovation Product (IProd)—according to essential reliability and validity metrics. All constructs exhibit satisfactory convergent validity, with AVE values surpassing the required threshold of 0.50, varying from 0.6145 (IProc) to 0.6939 (IPer). Internal consistency dependability is established, with Cronbach's Alpha values exceeding 0.70, ranging from 0.7221 (EL) to 0.8330 (IProc). Composite Reliability (CR) results demonstrate robust reliability, ranging from 0.8062 to 0.9041, indicating that the constructs consistently assess their intended dimensions. Moreover, rho_A values, regarded as a more precise measure of reliability, span from 0.8688 to 0.9318, strengthening the constructs' stability and consistency. In addition, the discriminant validity result employing the Fornell-Larcker criterion is shown in Table 3. The square root of all constructss' Average Variance Extracted (AVE), demonstrated by diagonal values, exceeds its correlations with other constructs indicated by off-diagonal values. Table 3 validates that each construct exhibits more significant variance with its respective indicators than others, fulfilling the

Fornell-Larcker criterion and demonstrating sufficient discriminant validity. The results collectively confirm that all assessment items exhibit strong reliability and validity, rendering the constructs appropriate for subsequent structural model analysis within leadership and innovation research.

Table 2. Loading Factor and AVE

Items	Loading Factor	AVE	Cronbach Alpha	Composite Reliability	rho_A
EL1	0.7522	0.6318	0.7221	0.8966	0.9318
EL2	0.7344				
EL3	0.7212				
EL4	0.8207				
EL5	0.8036				
EL6	0.8521				
EL7	0.8501				
EL8	0.8132				
IPer1	0.8174	0.6939	0.8326	0.9041	0.9308
IPer2	0.8811				
IPer3	0.9307				
IPer4	0.8857				
IPer5	0.7876				
IPer6	0.6691				
IProc1	0.6926	0.6145	0.8330	0.8062	0.8688
IProc2	0.7936				
IProc3	0.8255				
IProc4	0.8415				
IProc5	0.8286				
IProc6	0.7541				
IProc7	0.7479				
IProc8	0.7760				
IProd1	0.7687	0.6618	0.7941	0.8859	0.9213
IProd2	0.8727				
IProd3	0.8106				
IProd4	0.8402				
IProd5	0.7899				
IProd6	0.7945				

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

	EL	IPer	IProc	IProd
EL	***0.794***			
IPer	0.602	***0.833***		
IProc	0.550	0.588	***0.783***	
IProd	0.570	0.612	0.599	***0.813***

4.1.3 Hypotheses Test Results

Bootstrapping in PLS-SEM is a valuable technique for validating the robustness and significance of the model's parameters, especially in cases where traditional assumptions may not hold. It provides a more reliable assessment of the model's results by leveraging resampling methods to address sample size and data distribution issues. Therefore, the bootstrapping technique has been employed to evaluate the relationships between entrepreneurial leadership, innovation process, innovation product, and innovation performance. The results indicate that entrepreneurial

leadership significantly influences innovation performance directly (with a coefficient of 0.3678 and p-value of 0.0001). It also significantly impacts the innovation process (coefficient of 0.5213, t-statistic of 7.9392, and p-value of 0.0000) and innovation product (coefficient of 0.6513, t-statistic of 10.3481, and p-value of 0.0000).

Furthermore, the innovation process (coefficient of 0.2323, t-statistic of 3.383, and p-value of 0.0008) and innovation product (coefficient of 0.3567, t-statistic of 3.8768, and p-value of 0.0001) significantly enhance innovation performance. Additionally, entrepreneurial leadership indirectly affects innovation performance through the innovation process (coefficient of 0.1211, t-statistic of 3.5011, and p-value of 0.0005) and innovation product (coefficient of 0.2323, t-statistic of 3.4154, and p-value of 0.0007). These significant t-statistics and low p-values suggest that the relationships observed are robust and not due to random chance, confirming the stability and reliability of the model.

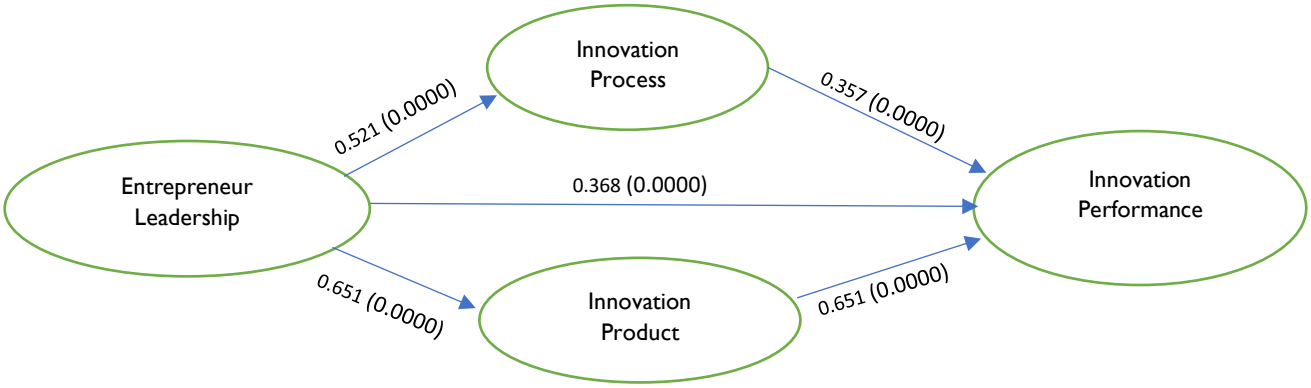

Figure 2. Bootstrapping results

Table 3. Hypotheses Test Result

Hypotheses	Coefficient	P Values	Result
H1: Entrepeneur Leadership → Innovation Performance	0.3678	0.0001	Supported
H2: Entrepeneur Leadership → Innovation Process	0.5213	0.0000	Supported
H3: Entrepeneur Leadership → Innovation Product	0.6513	0.0000	Supported
H4: Innovation Process → Innovation Performance	0.2323	0.0008	Supported
H5: Innovation Product → Innovation Performance	0.3567	0.0001	Supported
H6: Entrepeneur Leadership → Innovation Process → Innovation Performance	0.1211	0.0005	Supported
H7: Entrepeneur Leadership → Innovation Product → Innovation Performance	0.2323	0.0007	Supported

4.1.4 FsQCA Result

Fuzzy-set Qualitative Comparative Analysis (fsQCA) is a method that identifies combinations of variables (conditions) that are necessary and/or sufficient for a particular outcome (Pappas & Woodside, 2021b). In this context, the outcome is Innovation Performance (IPER_new), and the conditions considered are Entrepreneurial Leadership (EL_new), Innovation Process (IPROC_new), and Innovation Product (IPROD_new). The analysis involves determining the consistency and coverage of each condition and the combination of conditions leading to the outcome. Consistency measures the degree to which cases sharing a given combination of conditions exhibit the outcome. High consistency indicates a strong relationship. Coverage assesses the proportion of instances of the outcome explained by a combination of conditions. High coverage means the combination accounts for a significant portion of the outcomes of the cases (Pappas & Woodside, 2021a).

The consistency cutoff of 0.856146 filters out combinations of conditions that do not consistently lead to high Innovation Performance. Only combinations with consistency above this threshold are considered significant. The results highlight two main paths to achieving high Innovation Performance. The first path is characterized by strong Entrepreneurial Leadership (EL_new), with a raw coverage of 0.778441 and a unique coverage of 0.254545, showing that organizations with strong entrepreneurial leadership are likely to have high innovation performance. This path has a high consistency of 0.860218, reinforcing the strength of the relationship between entrepreneurial leadership and innovation performance.

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*********************
*TRUTH TABLE ANALYSIS*
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File:  C:/Users/LENOVO/Downloads/Penelitian Ajeng/Data/FSQCA_1.csv
Model: IPER_new = f(IPROC_new, EL_new, IPROD_new)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.856146
Assumptions:
                            raw        unique
                         coverage    coverage   consistency
                        ----------  ----------  ----------
EL_new                  0.778441    0.254545    0.860218
~IPROC_new*IPROD_new    0.595065    0.0711691   0.900904
solution coverage: 0.84961
solution consistency: 0.829361
```

Figure 3. FsQCA Result

The second path involves the combination of a weak or absent Innovation Process (IPROC_new) and a strong Innovation Product (IPROD_new). This combination has a raw coverage of 0.595065 and a unique coverage of 0.0711691, indicating that strong innovation products can still lead to high performance without a robust innovation process. The consistency of this path is 0.900904, suggesting a strong relationship between this combination and the outcome. FsQCA analysis reveals that high Innovation Performance can be achieved through strong Entrepreneurial Leadership or strong Innovation Products, even without a robust Innovation Process. Both pathways are significant, with high consistency and reasonable coverage, highlighting their importance in understanding how organizations can achieve high levels of innovation performance.

4.2 Discussion

4.2.1 Entrepreneurial Leadership Affects Innovation Performance, Innovation Process and Innovation Product

A substantial correlation exists between entrepreneurial leadership and innovation performance (Kozioł-Nadolna, 2020). SMEs leaders possessing entrepreneurial traits—such as a compelling vision, opportunity recognition, risk-taking daring, and team motivation skills—have directly enhanced the company's innovation performance. Leaders with an entrepreneurial mindset foster a creative and inventive work atmosphere, thereby generating new ideas and solutions essential for maximizing performance. The validation of this hypothesis indicates that entrepreneurial leadership substantially influences the innovation process among SMEs. Leaders possessing strong entrepreneurial skills can proficiently oversee and promote innovation (Fontana & Musa, 2017). They can cultivate a work culture that fosters innovation and experimentation, supplies essential resources, and encourages collaboration. Effective leadership in entrepreneurship facilitates a more effective transition of the innovation process from ideation to implementation. Consequently, SMEs directed by entrepreneurial executives typically exhibit a superior innovation process, enhancing their capacity for innovation.

Entrepreneurial leadership significantly influences the quality and success of new goods that SMEs develop. Leaders possessing entrepreneurial traits can guide teams in developing creative and market-relevant goods (Nag et al., 2020). They may identify industry trends and possibilities and inspire teams to develop innovative concepts that can be transformed into unique products. Leadership centered on innovation guarantees that generated products satisfy client requirements and provide substantial additional value. Consequently, SMEs led by competent entrepreneurial leaders are more inclined to generate creative goods that enhance innovation performance.

4.2.2 Innovation Process Affects Innovation Performance

The endorsement of this hypothesis indicates that a robust innovation process substantially influences the innovation performance of SMEs. The innovation process encompasses multiple stages, from idea generation to concept development, execution, and commercialization (Fitriani, 2017). Small and medium enterprises are more likely to achieve market success in innovation if they use a systematic and efficient innovation process. An effective innovation process mitigates the risks and expenses of developing new products. Consequently, SMEs that enhance their innovation processes might experience a considerable improvement in innovation performance, evidenced by new goods or services that are superior and more aligned with client needs.

4.2.3 Innovation Product Affects Innovation Performance

Innovative items directly impact the innovation performance of SMEs. The innovative items SMEs develop can be the principal factor influencing their market success. Innovative products, characterized by distinctive features, superior quality, or fulfilling specific client requirements, can enhance customer attraction and satisfaction (Ullah et al., 2021). This not only enhances sales and market share but also fortifies SMEs' reputation and brand image. Consequently, SMEs that effectively generate new goods generally experience enhanced innovation performance, fostering business growth and sustainability.

4.2.4 Innovation Process Mediates the Relationship between Entrepreneurial Leadership and Innovation Performance

This hypothesis acceptance indicates that the innovation process mediates the association between SMEs' entrepreneurial leadership and innovation performance. Entrepreneurial leadership significantly impacts innovation performance and influences it through the innovation process. Entrepreneurial leaders can cultivate and oversee efficient innovation processes, enhancing innovation performance (Fontana & Musa, 2017). Entrepreneurial leadership fosters an effective and productive innovation process, enhancing SMEs' innovation performance (Kozioł-Nadolna, 2020). This underscores the significance of the innovation process as a mediator in the relationship between entrepreneurial leadership and innovation performance.

4.2.5 Innovation Product Mediates the Relationship between Entrepreneurial Leadership and Innovation Performance

Innovative products facilitate the connection between entrepreneurial leadership and the innovation performance of SMEs (Asad et al., 2024). Entrepreneurial leadership directly impacts innovation performance and affects it through the innovative goods developed. Leaders prioritizing innovation can galvanize and drive teams to create new and highly competitive goods (Chang, Bai, & Juan, 2015). These innovative items subsequently serve as a crucial determinant that enhances the innovation performance of SMEs. Consequently, strong entrepreneurial leadership fosters the development of innovative products that enhance innovation performance, illustrating the significant role of innovative products as intermediaries in this relationship. The research demonstrates that entrepreneurial leadership, innovation methods, and novel goods significantly enhance the innovation performance of SMEs, contingent upon the acceptance of all three hypotheses. This research offers valuable insights for SME leaders to concentrate on cultivating entrepreneurial abilities and enhancing creative processes and products to attain superior performance.

Leadership is essential for cultivating and propelling innovation within businesses. Leaders can influence innovation by establishing an innovative culture, allocating resources and support, promoting risk-taking and learning from failures, exemplifying desired behaviors, and facilitating cooperation and knowledge exchange. Leaders are accountable for generating the atmosphere and fostering an environment conducive to innovation. Incorporating innovation into the strategic management agenda is a crucial initial step, indicating to employees that innovation is a priority and motivating them to share their ideas (Asbari et al., 2021). Leadership styles, including Transformational and Transactional Leadership, are crucial in cultivating this culture (Chang et al., 2015).

Innovation necessitates resources such as capital, time, and human capital. Leaders must efficiently distribute these resources and furnish the requisite support for innovative efforts. Kozioł-Nadolna (2020) emphasizes the significance of innovation leaders in utilizing internal and external resources to produce a consistent flow of commercial inventions. Leaders guarantee the sustainability of innovation initiatives by acquiring and overseeing resources for prolonged product development. Innovation intrinsically entails risk-taking. Leaders must establish a secure environment for experimenting and promote innovative thinking among staff, even at the risk of failure. A culture of innovation grounded in trust is crucial, enabling employees to articulate their ideas and collaboratively manage risk safely (Hoiron et al., 2019). This method fosters a psychologically secure atmosphere that encourages risk-taking and exchanging ideas.

The connection between leadership and innovation success is complex and substantial. Leaders actively affect an organization's capacity to produce and effectively implement innovative ideas through actions and decisions. By cultivating a culture that prioritizes experimentation, curiosity, and receptiveness to novel concepts, leaders establish a framework for innovation to thrive. According to Łukowski (2017), executives should formally incorporate innovation into the strategic management agenda, emphasizing its significance. Leaders are essential in distributing financial, human, and temporal resources for innovation efforts. Lee et al. (2021) assert that innovation leaders are tasked with acquiring and overseeing resources for sustained product development. Effective leaders identify and eradicate impediments to innovation, including bureaucratic procedures, insufficient communication, and reluctance to change. By eliminating these obstacles, leaders enable people to concentrate on innovation without superfluous impediments.

Diverse leadership styles profoundly influence innovation performance. Transformational leadership, defined by the ability to inspire a collective vision, empower individuals, and promote intellectual stimulation, has been associated with increased innovation (Changar & Atan, 2021). Illustrate Jack Ma as a transformational leader who cultivates innovation. Conversely, transactional leadership, typically linked to preserving the status quo, emphasizes explicit objectives and incentives, fostering gradual innovation and process enhancements. Transactional leadership can be crucial for process innovation (Edelbroek et al., 2019).

Leaders who demonstrate a visible commitment to innovation by active participation in brainstorming sessions and a willingness to acquire new knowledge establish a compelling model for their staff (Khan et al., 2020). Acknowledging and applauding innovative endeavors, regardless of their success, fosters a culture of experimentation and learning from errors. This methodology recognizes success and failure, emphasizing that each is vital for ongoing enhancement and innovation. Assessing and monitoring progress is essential for maintaining innovation efficacy. Leaders must define explicit criteria for evaluating innovation success, monitor advancement, and pinpoint opportunities for enhancement. Utilizing data and analytics to guide decisions concerning innovation strategy, resource allocation, and project selection is essential for optimizing the effect. This data-centric methodology guarantees that innovation initiatives are synchronized with organizational objectives and resources are utilized efficiently. Leadership is not only a component of innovation performance but also the catalyst. By fostering an optimal atmosphere, supplying essential support, adopting suitable leadership styles, and actively participating in innovation, leaders can unleash their organization's complete innovative potential and attain a considerable competitive advantage.

4.2.7 Discussion on Innovation Performance for SMEs Using fsQCA

Innovation performance is a vital factor influencing the development and growth of SMEs. The Fuzzy-set Qualitative Comparative Analysis (fsQCA) identifies two primary avenues for attaining superior innovation performance. Strong Entrepreneurial Leadership defines the initial pathway. This suggests that SMEs exhibiting robust entrepreneurial leadership are more inclined to achieve elevated innovation performance. The distinctive coverage further emphasizes the significant role of entrepreneurial leadership in elucidating a considerable fraction of high innovation performance occurrences (Fonias & Rocklind, 2021). The second pathway entails the interaction of a robust Innovation Product with a deficient or nonexistent Innovation Process. This combination demonstrates that SMEs can achieve high innovation despite lacking a solid innovation process, given that they possess strong innovative products. Although this pathway intersects with others, it uniquely elucidates specific cases of elevated innovative performance.

These findings hold considerable significance for SMEs. Primarily, cultivating robust entrepreneurial leadership is essential. Leaders who motivate, formulate strategies, and foster innovation can significantly improve their organization's performance (Naz et al., 2020). Investment in leadership training programs, mentorship, and leadership development activities is essential. Secondly, although a vigorous innovation process is advantageous, the research indicates that possessing superior innovative products can offset a deficient innovation process. Small and medium-sized enterprises (SMEs) must prioritize the creation of high-quality, creative goods that satisfy market demands, focusing on research and development (R&D), comprehension of customer needs, and ongoing product enhancement. While amalgamating a deficient innovation method and robust innovation products may yield elevated innovation performance, SMEs must not completely disregard the innovation process. An equitable strategy, enhancing innovation processes and products, is crucial for sustainable innovation performance.

SMEs should strategically invest in leadership development by fostering an entrepreneurial mentality among managers, implementing mentorship programs, and allocating resources for leadership training (Leitch & Volery, 2017). Leaders must emphasize consumer feedback in product creation, provide resources to research and development, and monitor market trends, which are essential for product innovation (Rehman et al., 2021). Incremental process enhancements, using techniques such as Lean or Six Sigma and technology to optimize innovation workflows, can further augment innovation processes. By concentrating on these domains, SMEs can utilize insights from fsQCA to attain sustainable growth and preserve a competitive advantage in their markets.

5. Conclusion

5.1 Theoretical Implications

This study demonstrates that entrepreneurial leadership, innovation processes, and innovative products significantly enhance SMEs' innovation performance. Entrepreneurial leadership significantly influences innovation performance and positively impacts the processes and products of innovation. Efficient innovation processes and innovative products are essential mediators in the relationship between entrepreneurial leadership and innovation performance. Consequently, SMEs who cultivate entrepreneurial skills, effectively manage the innovation process, and prioritize the development of innovative products are likely to attain superior innovation performance, thereby enhancing their competitiveness and fostering business growth. FsQCA indicates that strong entrepreneurial leadership is the primary determinant of the innovation performance of SMEs, exceeding the influence of innovation processes. The findings substantiate the RBV Theory, which asserts that unique, valuable, and inimitable internal resources, such as entrepreneurial leadership capabilities, are essential for achieving sustained competitive advantage. Within this study, entrepreneurial leadership is a strategic intangible asset that facilitates the effective orchestration of innovation activities, thereby converting organizational capabilities into successful innovations. This study enhances the literature by connecting RBV theory with the micro-level dynamics of leadership and innovation in SMEs.

5.2 Practical Implications

This study's practical implications offer actionable insights for SME practitioners, specifically in improving innovation performance via leadership development and management. The substantial impact of entrepreneurial leadership on innovation performance underscores the necessity for SME owners and managers to have entrepreneurial competencies, including visioning, opportunity recognition, risk-taking, and proactive decision-making. Customized training programs and leadership development workshops for SMEs can enhance these competencies. The evident influence of both the innovation process and the innovation product on innovation performance underscores the necessity of establishing practical innovation workflows and allocating resources to product development strategies that correspond with market demands.

Furthermore, as entrepreneurial leadership markedly impacts the innovation process and product development, SMEs ought to empower their leaders to drive internal innovation initiatives actively, fostering a leadership culture that promotes experimentation, cross-functional collaboration, and knowledge sharing. The mediating functions of the innovation process and product indicate that leadership alone is inadequate; it must be converted into systematic innovation initiatives to provide concrete results. Consequently, stakeholders in SMEs, both private and public, should contemplate integrated strategies that amalgamate leadership development, process innovation, and product innovation to enhance overall company performance and sustain long-term competitiveness. The consequences are especially pertinent for SMEs in emerging areas, where limited resources necessitate efficient and strategically directed innovation initiatives.

Although new goods may partially offset deficient processes, a balanced strategy emphasizing leadership development, product innovation, and process enhancement is crucial for enduring success. Investing in leadership training, prioritizing R&D and customer input, and optimizing innovation processes will enable SMEs to improve their innovation performance and secure a competitive advantage markedly. The role of innovative goods in moderating the relationship between entrepreneurial leadership and innovation performance is significant for organizational strategy and management practices. Organizations must acknowledge that entrepreneurial leadership alone is inadequate to enhance innovation performance; creating creative products is an essential intermediary stage. Leaders must concentrate on inspiring and motivating their people while actively investing in and supporting product innovation processes. They must provide a climate that fosters creativity, allocate sufficient resources for research and development, and remove obstacles that impede innovation. By doing so, leaders can guarantee that their visionary and proactive leadership results in concrete, marketable goods that improve the organization's competitive advantage and overall innovation efficacy.

5.3 Limitations and Future Research Agenda

This approach emphasizes the necessity of a comprehensive strategy that combines leadership development with effective innovation management strategies to attain enduring innovation success. Future studies should investigate the precise mechanisms by which entrepreneurial leadership affects innovation performance across various company environments. These mechanisms may encompass leadership-driven decision-making frameworks, employee empowerment initiatives, knowledge-sharing protocols, and aligning innovation objectives with strategic vision, each serving as micro-level conduits linking leadership behaviors to innovation results. Comprehending these routes is essential, especially for SMEs, where leadership frequently exerts a direct and unmediated influence on everyday operations and strategic innovation efforts. Furthermore, research might examine the interplay between external factors, including market conditions, government regulations, and technical breakthroughs, and internal leadership and innovation processes in influencing the innovation performance of SMEs. Furthermore, research could examine the interplay between external factors, such as market conditions, governmental policies, and technical improvements, and internal leadership and innovation processes in influencing the innovation performance of SMEs. Considering the distinctive dynamics of small and medium-sized enterprises, particularly in emerging markets, future research should account for contextual variations such as organizational size, industry classification, and cultural contexts to enhance the theoretical comprehension and practical significance of entrepreneurial leadership as a catalyst for innovation success.

Acknowledgment

Thank you to the University of Muhammadiyah Malang, which funded the research, and LPPM for the opportunity to research this year. We would like to thank the Faculty of Economics and Business, University Muhammadiyah Malang, for their technical support and all the contributors who helped in this study. Lastly, we would like to thank you, the respondent, for the answer.

Author Contribution

Author 1: conceptualization, writing original draft, data curation, formal analysis, investigation.
Author 2: review and editing, writing and editing, supervision, methodology, validation.
Author 3: writing original draft, validation, visualization, supervision.

Financial Disclosure
The University of Muhammadiyah Malang funded this research through its research funding program. Public, commercial, or non-profit organizations received no additional financial support.

Conflict of Interest
The authors declare that there are no potential conflicts of interest regarding this article's research, authorship, or publication. The research was conducted independently, without any influence from financial, personal, or professional interests that could bias the study's findings.

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