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INNOVATION MEASUREMENT IN SMALL AND MEDIUM ENTERPRISES: A LITERATURE REVIEW IN THE PERIOD 2014-2024[3]

This literature review explores how innovation is measured in Small and Medium-sized Enterprises (SMEs). We analyzed 30 highly cited articles from Scopus (2014-2024) to extract insights, identify trends, and evaluate measurement methods. A comprehensive review of Scopus literature focused on innovation evaluation in SMEs was conducted. After accessing databases, relevant information including publication year, research techniques, major findings, and innovation metrics was collected. The review showcases various innovation categories studied, such as product, process, marketing, organizational, and technological innovation. Assessment tools used included Likert scales, empirical models, and surveys.

Keywords: innovation measurement; innovation types; SMEs; methodologies; organizational characteristics
JEL: Q31; Q32; Q33; L26

1. Introduction

Innovation helps Small and Medium-sized Enterprises (SMEs) expand and prosper in competitive marketplaces (Brunswicker, Vanhaverbeke 2015). It empowers businesses to maintain their edge adapt to market changes and uncover avenues, for value generation (Mouelhi, Ghazali 2021). The significance of measuring innovation cannot be overlooked as it enables companies to evaluate the impact of their endeavours and make informed choices (Dziallas, Blind 2019). Through the measurement of innovation, organizations can monitor their advancements pinpoint areas needing enhancement, and allocate resources wisely (Ter Haar, 2018).

According to Drucker (1998), innovation is a multifaceted concept that encompasses the generation, adoption, and implementation of new ideas, products, or processes within an organization. In the context of SMEs, understanding and measuring innovation is essential for gauging their capacity for adaptation and advancement. Authors such as Bessant & Tidd

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(2007) have proposed frameworks that categorize innovation into incremental and radical types, shedding light on the diverse spectrum of changes that SMEs may pursue. Furthermore, the concept of open innovation, as introduced by Chesbrough (2003) emphasizes the significance of leveraging external ideas and collaborations in the innovation process, which is particularly relevant for SMEs seeking to thrive in competitive markets. Therefore, exploring the dimensions and measurement of innovation within SMEs is paramount for comprehending their innovative capabilities and potential for success.

This article examines how small and medium-sized enterprises (SMEs) quantify their innovation. Innovation is challenging and critical to the success of SMEs. Our analysis looks at 30 high-citation papers indexed in Scopus from 2014 to 2024.

The primary goal is to extract essential insights, detect trends, and critically evaluate the approaches used to measure innovation within the SME environment. There has been extensive research into innovation management. However, small and medium-sized enterprises (SMEs) receive little attention when it comes to quantifying innovation. SMEs confront unique difficulties, opportunities, and resource constraints as compared to large corporations. As a result, we require a thorough investigation into how to quantify SMEs' creativity. This is vital for designing specific strategies and plans.

The literature review was chosen as the research strategy because of its usefulness in condensing and arranging material. This method allows for an analysis of the breadth and depth of research findings on assessing innovation in small and medium-sized firms (SMEs), providing a comprehensive picture of the current state of the field. Scopus is home to nume-rous research studies. It assists us in locating significant papers discussing SME innovation.

We aim to find common topics, methods, and gaps in this research. We will look at the papers closely. This lets us see how researchers measure SME innovation. We want to know key measures, signs, and structures for assessing innovation. Also, we will review the challenges and limitations they mention. This reveals areas needing more research. Our goals include identifying recurring themes, approaches, and flaws in the literature. A thorough reading of these selected publications will reveal the different approaches taken in assessing innovations in SMEs. This section will cover the frameworks, measures, and indicators that are used to measure innovation.

The report takes a systematic way. It helps readers understand this investigation better. It has a detailed literature search, careful data removal, and quality checks of chosen works. Biases and limits may happen in the review process. So, being thorough and clear is very important.

2. Literature Review

Innovation is a multifaceted concept that plays a pivotal role in the evolution of societies, economies, and organizations. Rogers et al. (2014) extends this perspective, emphasizing the role of innovation not only in responding to market demands but also in proactively shaping industry landscapes. Tidd & Bessant (2009) have proposed frameworks that categorize innovation into incremental and radical types, highlighting the spectrum of changes

organizations may pursue. Furthermore, the concept of open innovation, as introduced by Chesbrough (2003), underscores the importance of using external ideas and collaborations in the innovation process. Schumpeter (2013) envisioned innovation as the engine of economic development, introducing the concept of "creative destruction" to highlight the role of entrepreneurs in disrupting existing markets through the introduction of novel products and processes.

Rogers et al. (2014) shifted the focus to the societal aspect of innovation, emphasizing the diffusion process and categorizing adopters into innovators, early adopters, early majority, late majority, and laggards. Rogers' framework has been instrumental in understanding how innovations are accepted and spread within communities. More recently Chesbrough (2003) challenged traditional notions of innovation by advocating for organizations to look beyond their boundaries for external collaboration. Chesbrough argues that open innovation can enhance an organization's ability to bring new ideas to market more effectively. Freeman (1987) introduced the concept that innovation is not solely confined to individual organizations but is embedded in the broader societal context, emphasizing the interplay between institutions, organizations, and individuals in shaping a nation's innovative capacity.

Additionally, Vincent-Lancrin et al. (2019) emphasized the importance of measuring innovation systematically within organizations and educational settings, stating that "monitoring systematically how pedagogical practices evolve would considerably increase the international education knowledge base". Their research highlights how assessing changes in innovation practices helps policymakers and institutions improve strategic decisions, aligning innovation efforts with measurable educational and organizational outcomes.

Furthermore, recent discussions on innovation measurement have highlighted the need to incorporate gender-disaggregated data into established innovation indicators. Incorvaia, et al. (2023) argue that innovation indicator platforms often overlook gender considerations, with only two out of five major platforms addressing this dimension. They emphasize that integrating sex, gender, and intersectional analysis into innovation measurement can enhance evidence-based policymaking and promote more inclusive innovation practices.

3. Methodology

The examination of existing literature was carried out systematically. The literature review was chosen as the appropriate research methodology in this paper as there is an overarching need to bring the modern-day perspective on evaluating innovation in SMEs into the spotlight. The parameters were established by concentrating on publications listed in Scopus, particularly focusing on highly cited articles published between 2014 and 2024. Criteria for inclusion and exclusion were consistently applied, prioritizing relevance in the context of innovation measurement in SMEs, empirical studies, and publications with high citation rates.

Data extraction involved a systematic process wherein key information, including publication year, methodologies, main findings, and innovation metrics, was extracted from the selected

articles. The extracted data were organized and categorized to facilitate a comparative analysis of themes and trends. No specific tools or software were employed for data management.

The quality assessment of selected articles was guided by predetermined criteria, considering relevance, reliability, and validity. The review considered established frameworks and guidelines to ensure a comprehensive evaluation of each article's quality. Potential biases or limitations in the selected articles were addressed through a transparent and systematic assessment, acknowledging the inherent limitations of individual studies.

Emphasis was placed on rigour and transparency throughout the review process. The limitations of the methodology were acknowledged, and efforts were made to mitigate these limitations through careful study selection and transparent reporting.

Ethical considerations included adherence to proper citation practices and the avoidance of plagiarism. The review followed ethical guidelines by giving proper credit to the original authors of the chosen articles during the literature review.

This methodology ensures a systematic and transparent approach to exploring innovation measurement in SMEs, providing a robust foundation for the subsequent analysis and synthesis of the selected literature.

4. Literature Search and Selection Criteria

The primary database chosen for the literature search was Scopus, selected for its comprehensive coverage of scholarly articles. Scopus was deemed suitable for capturing a diverse range of publications relevant to the field of innovation measurement within SMEs. The literature search focused on articles published between 2014 and 2024.

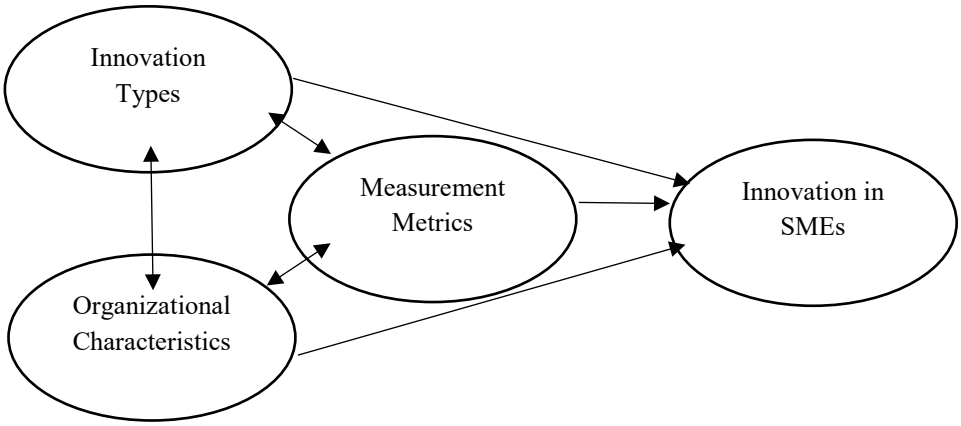
Scopus was selected as the primary database for conducting a literature search due to its extensive coverage of scholarly articles. Its suitability for capturing a wide variety of publications relevant to innovation measurement within SMEs was acknowledged. The scope of the literature search was limited to articles published between 2014 and 2024 to ensure the incorporation of recent and influential contributions to the evolving field of innovation measurement within SMEs. The inclusion of articles was contingent upon meeting specific criteria such as relevance to innovation measurement in SMEs, empirical research nature, and high citation counts denoting impact. Emphasis was placed on research articles and reviews that provided valuable insights into the subject matter. The exclusion of certain articles was deliberate, based on factors like lack of relevance to innovation measurement in SMEs, non-empirical nature, and presence of biases or limitations.

The rationale for exclusions was systematically applied to maintain the focus on high-quality and impactful research. The literature search employed a targeted search strategy, utilizing key terms and keywords related to innovation measurement and SMEs. Boolean operators, truncations, and filters were strategically applied to refine the search results, ensuring the identification of articles directly aligned with the research objectives.

The screening process involved a meticulous step-by-step approach. Initial screening was based on titles and abstracts, followed by a thorough review of full-text articles. The selection criteria were consistently applied to make informed decisions on the inclusion of articles in the final review. To enhance the reliability of the screening process, multiple researchers were involved in the review. Any disagreements in article selection were addressed through discussions and consensus-building among the research team, ensuring consistency in the application of inclusion and exclusion criteria.

The initial search identified a comprehensive pool of articles, with subsequent screening leading to the exclusion of articles that did not meet the specified criteria. The final selection comprised 30 high-citation articles that form the basis of this literature review.

Figure 1. Conceptual Framework



Source: Created by the author.

The conceptual framework presented in Figure 1 outlines the integral components and their interrelationships in understanding and measuring innovation within Small and Medium-sized Enterprises (SMEs). This framework serves as the foundation for exploring how innovation is generated, implemented, and measured in SMEs, providing insights into the factors that influence innovation success.

Innovation Types: Variables representing different types of innovation (product, process, and organizational innovation) that interact with each other to shape the innovation process in SMEs.

Organizational Characteristics: SME attributes represent individual units of analysis associated with the size, structure, and industry of organizations, affecting innovation capacity and measurement: they represent distinct variables that differ from the combination of these variables in an organization.

Innovation Measurement Metrics: Key indicators and metrics used to establish quantification of innovation in SMEs. This can be both qualitative and quantitative.

Innovation in small to medium enterprises: The core principle covers the concept of generative and exploitative novelty in Small to Medium-sized Enterprises (SMEs).

Table 1. Literature Review: Innovation Measurement in SMEs

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
Abbas et al., 2020	Product Innovation, Process Innovation, Administrative Innovation	Survey questionnaire with a Five-point Likert scale.	Acquiring Knowledge, Distributing Knowledge, Interpreting Knowledge, Organizational Memory	The study focused on measuring knowledge management, organizational learning, and sustainable organizational innovation in SMEs in the garment industry.
Adam & Alarifi, 2021	External Knowledge, Organization Structures, Leadership, Regeneration and Employees' Activities	Five-point Likert-Scale (ranging from 5–strongly agree to 1–strongly disagree).		Innovation practices adopted by SMEs positively affect performance and business survival. External support strengthens the impact on business survival.
Afriyie et al., 2019	Product innovation, Process innovation, Marketing innovation, and Organizational innovation.	Likert-type scale of seven (7) levels (ranging from "1 strongly disagree" to "7 strongly agree").	Cooperation between units and departments, encouragement to disagree, encouragement to be multi-skilled, work well-being of employees, appreciation of employees	One of the highlighted important aspects is that innovation has a positive effect on marketing performance, while transformational leadership has a moderating effect on the relationship between innovation and marketing performance.
Ahn et al., 2015	Joint R&D, User involvement, M&A/Strategic alliance, Licensing-out, Spin-off, Open-sourcing	Survey data analysis	Technology and market-oriented OI modes	Positive impact on firm performance
Al-Jinini et al., 2019	Product/Service Innovation, Process Innovation	Questionnaire-based survey	Knowledge workers in SMEs in Jordan	The study explores the positive impact of intellectual capital dimensions on technical innovation and entrepreneurial orientation in SMEs in Jordan. It

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
				highlights the mediating role of entrepreneurial orientation in using intellectual capital for innovation.
Banu, 2018	Product Innovation, Management Innovation, Process Innovation, Methodological Innovation.	Key Performance Indicators (KPIs)		Importance of developing meaningful KPIs to measure innovation process performance
Brunswicker & Vanhaverbeke, 2015	Various types of external knowledge sourcing strategies: Direct Customer Sourcing, Indirect Customer Sourcing, Supplier Sourcing, Universities/Research Org. Sourcing, IPR experts sourcing, Network Partners Sourcing	Likert scale measuring intensity of interaction with various innovation partners on a 7-point scale.	Small and medium-sized enterprises (SMEs) engaging in external knowledge sourcing for innovation.	The study focuses on diverse types of external knowledge-sourcing strategies in SMEs and their impact on innovation performance.
Chesbrough & Bogers, 2014	Open Innovation		Distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model.	The concept of open innovation involves purposefully managing knowledge flows across organizational boundaries and discussing divergent views to foster greater consistency in research.
Clauss, 2017	Value creation, value proposition, value capture	Scale development approach	Rigorous scale development approach	Provides a hierarchical three-level scale for measuring business model innovation
Donate & De Pablo, 2015	Product innovation and knowledge management practice	Structural Equation Modeling (SEM) through PLS	A knowledge-based view of the firm, KM practices and technology industries	KM practices mediate the relationship between knowledge-oriented leadership and innovation performance.
Exposito & Sanchis-Llopis, 2019	Product, Process, Organizational	Perceived impact on sales increase, cost reduction,	Size, sector, managerial practices	Study acknowledges limitations in data

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
		productive capacity, quality improvement		dynamics and aims for future research on dynamic innovation-business performance relationships.
Fontana & Musa, 2017	Entrepreneurial Leadership, Innovation Process, Innovation Performance	Questionnaires (ELQ, IPQ, PQ)	Strategic: System understanding, strategic thinking, and decision-making flexibility. Communicative: Vision sharing, conflict management, and knowledge fostering. Motivational: Action influence and entrepreneurial spirit maintenance. Personal/Organizational: Creativity, stability, resource allocation, and discipline.	The study confirms that entrepreneurial leadership has a positive impact on the innovation process across industries. However, it does not support the relationship between the innovation process and performance.
Gault (2018)	Product innovation, Process innovation, Organizational innovation, Marketing innovation	Oslo Manual	Institutional units such as firms, public institutions, and non-profit institutions serving households, and households' Engagement in innovation activities like R&D, capital expenditure, human resource development, design, and market development	The paper reviews the history of innovation measurement using definitions in the Oslo Manual. It discusses the broadening of measurement, changing indicators, and implications for policy.
Ehrenberger et al., 2015	Own R&D, investment in technology, quality improvement, presence in foreign markets	Empirical model based on survey data from 1144 Czech SMEs	Size, target market, belonging to a cluster, age of equipment, competition, investment activities	Own R&D had the greatest impact on innovations, followed by investments in technology and quality. Barriers to innovation were not significant hindrances for SME innovation in the Czech Republic.
Hughes et al., 2018	Creativity, innovation	Surveys, behavioural assessments	Support for risk-taking, idea promotion culture	Need for new measurement tools to assess workplace creativity and

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
				innovation accurately. Calls for new psychometric scales, study designs, and nuanced measures to advance research in this field.
Hanaysha et al., 2021	Product, Service, Process, Marketing	Five-point Likert-Scale. To analyse the collected data, PLS-SEM software was used.	SMEs in various sectors in Saudi Arabia	Innovation capabilities positively affect business sustainability in SMEs.
Limaj & Bernroider, (2019)	Exploratory and Exploitative	PLS-SEM	Absorptive ability, Cultural balance	The study investigates the effects of absorptive abilities and cultural balance on exploratory and exploitative innovations in SMEs. Results show that cultural balance moderates the effects of absorptive abilities on innovation outcomes.
Mabenge et al., 2020	Product, Process, Marketing, Organizational	A questionnaire with the Likert scale	Firm age, Firm size based on annual sales turnover and number of employees	Marketing innovation significantly influences both financial and non-financial performance. Younger and larger firms benefit more from innovation compared to older and smaller firms.
Popa et al., 2017	Trademarks, licenses, royalty agreements, spin-offs	Self-reports, Likert scale	Commitment-based HR practices	Antecedents, moderators, and outcomes of innovation climate and open innovation in SMEs.
Potting et al., 2017	Technological innovation	Diagnostic questions	Socio-institutional inertia	Monitoring the CE transition process

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
	Product design innovation Revenue model innovation			for insights into new chain relationships, importance of innovation
Prajogo, 2016	Product innovation, Process innovation	Survey-based questionnaire	Labour factor quality, emotional capability	Study shows the impact of business environments on several types of innovation strategies and their effect on business performance.
Rahman et al., 2015	Product, process, marketing, organizational, and technological innovations	Combination of quantitative and qualitative methods, including surveys and interviews	Organizational characteristics include communication, knowledge management, culture, resource allocation, and strategic management capabilities	The study emphasizes the importance of assessing innovation sustainability based on organizational activities rather than just inputs or outputs like R&D expenditures or patents.
Saunila, 2017	Process Innovation, Innovation Outcomes	Quantitative and Qualitative Methods (use of surveys and interviews)		Innovation measurement should be integrated with the business performance measurement system
Saunila & Ukko, 2014	Product Innovation, Process Innovation, Market Innovation, Strategic Innovation	Five-point Likert-Scale (ranging from 5–strongly agree to 1–strongly disagree).	Supportive Culture – Employee Skills and Innovativeness – Employee Well-being – Leadership Practices – Idea Management Processes and Tools – Individual Knowledge Development – External Information Sources – Links to Strategic Goals	Firm size or industry does not significantly affect the firm's innovation ability.
Soto-Acosta et al., 2016	E-business, organizational innovation, firm performance	Partial least squares (PLS) structural equation modelling	Factors affecting e-business use and its effect on organizational innovation in manufacturing SMEs	Results suggest that e-business use contributes positively to firm performance through organizational innovation.

Author (Year)	Innovation types	Measuring Technique	Organizational Characteristics	Remarks
Taques et al., 2021	Product and service innovation, Process innovation, Marketing innovation, Organizational innovation	Patents, input and output indicators, trademarks, and survey	Need for different standards for manufacturing and service companies, as well as evaluating the results of innovation	The study identifies challenges in measuring innovation and the importance of using indicators to gain a competitive advantage in organizations
Ter Haar, 2018	Product Innovation Process Innovation Marketing Innovation Organizational Innovation Service Innovation	Input-Process-Output-Outcome (IPOO) Model Balanced Scorecard of Innovation Innovation Audit Research and Development (R&D)	Organizational characteristics include various dimensions of SME attributes, such as size, structure and industry.	A comprehensive review of existing approaches across various levels identifies gaps in team-level measurements and suggests frameworks for decision-makers.
Thormann, et al., (2021)	Bioeconomy, innovation in the chemical industry	Methodological approach for measuring innovations (Life Cycle Assessment, Techno-Economic Analysis)	Organizational characteristics of the chemical industry and circular economy	Focus on innovation measurement in bioeconomy and its impact on sustainability
Valencia et al., 2016	Product, process, organizational and marketing innovations	The measuring technique used for innovation involved 5-point scales for each type of innovation. These scales were combined by calculating the mean of the 5-point scales	Adhocratic, hierarchical, clan, market cultures	The study emphasizes the role of organizational culture in fostering or hindering innovation and performance. Adhocratic culture is identified as the best predictor of both innovation and performance.
Visnjic et al., 2014	Product innovation, Service business model innovation		Impact on the performance of firms transitioning to service-oriented business models	The study explores value creation through innovation and business model transitions.

5. Discussion

This paper review synthesizes a comprehensive understanding of measuring innovation within Small and Medium-sized Enterprises (SMEs), drawing on an analysis of 30 high-citation articles. The literature reveals a multifaceted approach to innovation, underlining the significance of knowledge management, external support, and transformational leadership in enhancing SME performance and fostering innovation (Abbas et al., 2020; Adam, Alarifi, 2021; Afriyie et al., 2019).

Studies by Ahn et al. (2015) & Al-Jinini et al. (2019) dive into the domains of open innovation and the impact of intellectual capital on technical innovation. These works underscore the significance of collaborative approaches and the strategic management of intangible assets to achieve innovative success. Similarly, Banu (2018), Brunswicker & Vanhaverbeke (2015) investigate the creation of significant performance indicators and methods for obtaining outside knowledge, stressing the need for strategic measurement and collaborations in SMEs' innovation landscape navigation. Clauss (2017) adds to the discussion by evaluating the various approaches used in innovation measurement, indicating a growing recognition of innovation's complex character. To achieve a complete view of innovation performance, more nuanced and multidimensional techniques to assessment must be used, considering both inputs, such as investment in collaborative projects, and outputs, such as market success for new products.

Clauss (2017) contributes to the discourse by scrutinizing the diverse methodologies employed in innovation measurement, revealing an expanding acknowledgement of innovation's complex nature. This necessitates more nuanced and multidimensional approaches to measurement, considering both the inputs, like investment in collaborative projects, and outputs, such as the market success of new products, to obtain a holistic view of innovation performance.

To broaden the scope of innovation measurement, Potting et al. (2017), Visnjic et al. (2016) investigate the dimensions of environmental and service innovation, respectively. Their findings indicate that SMEs' innovation is increasingly integrating sustainability and service innovation, which necessitates measures for complete evaluation.

The paper examines a wide range of innovation categories found in the literature, including product, process, marketing, organizational, and technological innovations. Likert scales, empirical models, and survey methodologies are used to measure these innovations, with structural equation modeling (SEM) and partial least squares (PLS) analysis providing robust quantitative methods for evaluating the interaction between innovation, organizational characteristics, and performance (Donate, De Pablo, 2015; Limaj, Bernroider, 2019; Soto-Acosta et al., 2016).

Organizational characteristics such as knowledge management, leadership styles, and culture are identified as pivotal determinants of innovation success. For instance, Afriyie et al. (2019) emphasize the importance of inter-unit cooperation and employee well-being in promoting innovation, while Valencia et al. (2016) identify adhocratic cultures as particularly conducive to innovation and performance enhancement.

Despite these insights, challenges remain in accurately measuring innovation within SMEs. Hughes et al. (2018), and Taques et al. (2021) highlight the need for innovative measurement tools and standards tailored to SMEs' unique nature. The dynamic relationship between innovation and business performance calls for continuous monitoring and adaptation of measurement approaches (Exposito, Sanchis-Llopis, 2019).

6. Conclusion

The literature reviewed in this paper illustrates a diverse array of innovation types explored, ranging from product and process innovation to marketing, organizational, and technological innovation. Moreover, the methodologies employed to measure these innovations exhibit notable variation, encompassing Likert scales, empirical models, and various survey methodologies (Donate, De Pablo, 2015; Limaj, Bernroider, 2019; Soto, Popa et al., 2017). This diversity in measurement techniques is instrumental in fostering a nuanced understanding of innovation within SMEs and elucidating its implications for organizational performance and longevity.

Furthermore, the literature identifies several organizational characteristics as crucial determinants of innovation and its subsequent performance. Notably, organizational culture, transformative leadership, interdepartmental collaboration, and investments in technology and research and development (R&D) emerge as key drivers of innovation and organizational success (Clauss, 2017; Adam, Alarifi, 2021; Ahn et al., 2015).

A salient point emphasized in the reviewed literature pertains to the importance of innovation measurement specifically within the context of SMEs. Highlighted in various studies is the imperative for more sophisticated tools and methodologies to evaluate innovation within these organizations comprehensively. Notably, there is a call for adaptable methods capable of elucidating the intricate relationship between innovation and financial performance, competitiveness, and business sustainability within SMEs (Prajogo, 2016; Exposito, Sanchis Llopis, 2019; Saunila, 2017). This underscores the pressing need for continued research and development in the domain of innovation measurement tailored to the unique challenges and opportunities encountered by SMEs.

Innovation measurement in SMEs is a complex yet essential endeavour that requires a multifaceted approach considering various innovation types, measurement techniques, and organizational characteristics. By understanding these nuances, policymakers and practitioners can develop tailored strategies to support SMEs in fostering innovation and driving sustainable growth.

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