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Innovation Performance Measurement in Entrepreneurial Business: A Comparative Study between Start-ups and More Established Enterprises

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ABSTRACT

Innovation performance measurement is an important aspect of understanding and improving entrepreneurial success, which has implications for economic development, organizational growth, and community welfare. This study uses comprehensive bibliometric analysis to systematically review and analyze the literature on innovation performance measurement in entrepreneurial business. The research covers startups and established companies, aiming to uncover key themes, influential works, and an ever-evolving research landscape in this dynamic field. His methodological approach integrates bibliometric analysis and visualization using VOSviewer, which provides a holistic view of the intellectual structure in the domain. Key findings include the identification of thematic groups, influential authors, and important works, which provide valuable insights for academics, practitioners, and policymakers involved in fostering innovation and entrepreneurship.

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1. INTRODUCTION

Innovation plays an important role in contemporary business, especially in the context of entrepreneurship. Innovation is a key driver of entrepreneurial success, influencing aspects such as opportunity recognition, innovation capabilities, and competitive advantage [1]–[4].

One aspect of the relationship between innovation and entrepreneurial success is the mediating role of entrepreneurial opportunity recognition (EOR) and innovation capability (IC). A study on micro, small and medium enterprises (MSMEs) in Malaysia found that entrepreneurial leadership (EL) significantly impacts entrepreneurial success (ES), but this effect depends on the mediating role of EOR and IC. The study shows that entrepreneurial leaders who manage resources strategically and emphasize opportunity- and profit-seeking behaviors are more likely to encourage innovation, exploration, and exploitation in their businesses [5]. Innovation also plays an important role in the context of green entrepreneurship. A study on medium

and large companies in Greece found that green entrepreneurship positively influences green product innovation and green process innovation. The study also confirms the mediating role of corporate strategy in the relationship between green entrepreneurship, green innovation, and competitive advantage [6].

Innovation beliefs, innovation mindsets, and innovation beliefs were also found to significantly impact the need for achievement and entrepreneurial success among women entrepreneurs in South Africa. The study also found that entrepreneurship education had a positive and significant moderating effect on the relationship between the need to excel and women's entrepreneurial success [7]. In addition, business strategy has been found to have a positive impact on competitive advantage, with performance and innovation mediating the relationship between business strategy and competitive advantage. This suggests that improving performance and innovation capabilities can strengthen competitive advantage [8].

Innovation, once seen as a fringe concept, has now emerged as a major force shaping the trajectory of businesses around the world. Whether in the early stages of a startup or the mature stage of an established company, the ability to innovate is considered a strategic imperative. The entrepreneurial ecosystem, characterized by its agility, risk-taking propensity, and disruptive potential, emphasizes the importance of innovation as a catalyst for growth. However, the very nature of innovation makes its measurement a challenging endeavor [9]–[11].

The urgent need to assess and measure innovation performance stems from the imperative to justify investment, guide strategic decisions, and foster a culture of continuous improvement. Despite this importance, the methodologies used to measure innovation performance vary across industries, organizational sizes, and developmental stages. This diversity in measurement approaches encourages critical investigation of the current state of knowledge—what metrics are used, how methodologies are chosen, and what challenges still exist in evaluating the effectiveness of innovation efforts.

2. LITERATURE REVIEW

2.1 Innovation Performance Measurement

Innovation performance measurement is a complex and multifaceted field, with a wide variety of conceptual frameworks and perspectives. It is critical to improving a company's value and decision-making processes, and is considered one of the key drivers of productivity performance [12]. Key dimensions of innovation performance that are often explored in the literature include financial indicators, market share, customer satisfaction, and the ability to adapt to changing market conditions. However, there are also other dimensions that are considered important in assessing a company's innovation capabilities. These include innovation strategy, knowledge management, organization and culture [13], and intellectual capital [14].

A comprehensive understanding of innovative performance systems and an appropriate set of indicators is still being developed1. Measurement of innovation performance needs to reflect the nature of the industry and market, business goals and strategies, capabilities and strengths, and access to innovation [15]. In addition, innovation performance measurement is not only about output but also about process. It is important to track not only the inputs of innovations but also the quality of the processes between them [16]. This multidimensional perspective of innovation has not been adequately represented in terms of measurement, presenting challenging issues that need to be addressed [16]. In addition, there are also other factors that can affect the performance of innovation. For example, the innovativeness of business models and companies can say something about future results [17]. Intellectual capital, which includes human, structural, and

relational capital, also plays an important role in innovation performance [14].

2.2 Start-ups and Innovation Performance Measurement

Startups, characterized by agility, risk-taking courage, and the pursuit of disruptive ideas, present a unique set of challenges and opportunities in the realm of innovation performance measurement. The literature reflects a recognition of the fickle and uncertain nature of start-up environments, where traditional metrics may fall short. Researchers have been exploring new indicators, including speed of innovation, adaptability, and ability to pivot in response to market feedback [18]–[21].

Metrics tailored for startups often include: Early stage ndicators such as prototype development, proof of concept, and customer validation. In addition, the literature underscores the importance of qualitative assessment, which recognizes that the early phases of innovation may not yield immediate financial gains. Challenges in measuring innovation in startups include the volatility of performance metrics, the absence of historical data, and the need for adaptable measurement frameworks that align with the unique trajectory of these ventures [22]–[25].

3. METHODS

To conduct a bibliometric analysis, a systematic search of academic databases is performed. Inclusion criteria will ensure the selection of scientific articles that substantially contribute to the discourse of measuring innovation performance in entrepreneurial business. The timeframe for inclusion will be determined to capture the latest developments, reflecting the dynamics of the field. Scopus' major academic databases are systematically searched for relevant literature. Search strings will be carefully crafted to capture the diversity of literature on innovation performance measurement in entrepreneurial businesses. Table 1 shows how the research data metrics with the help of Publish or Perish (PoP) software accessed on August 07, 2023.

Table 1. Metrics Data

Publication years	1942-2024
Citation years	81 (1942-2024)
Papers	980
Citations	260750
Cities/year	3219.14
Cities/paper	266.07
Cities/author	162450.79
Paper/ Authors	525.25
Authors/paper	2.41
h-index	248
g-index	490
hI,norm	181
hI,annual	2.23
hA-index	70
Paper with ACC >= 1,2,5,10,20:959,920,798,587,365	

Source : PoP (2023)

Analyzes Data

VOSviewer is a powerful visualization tool that facilitates the creation of maps to represent bibliometric data [26], [27]. Its use in this study improves the interpretation and presentation of complex bibliometric results. Uses of VOSviewer include: Creating visual representations of authorship networks, citation networks, and keyword co-occurrence networks. Identify clusters of related publications and authors, providing a dynamic visualization of intellectual structures. Use color coding to represent different clusters or themes in the network. Utilize density maps to highlight areas with higher concentrations in the network, indicating the intensity of collaboration or citations.

4. RESULTS AND DISCUSSION

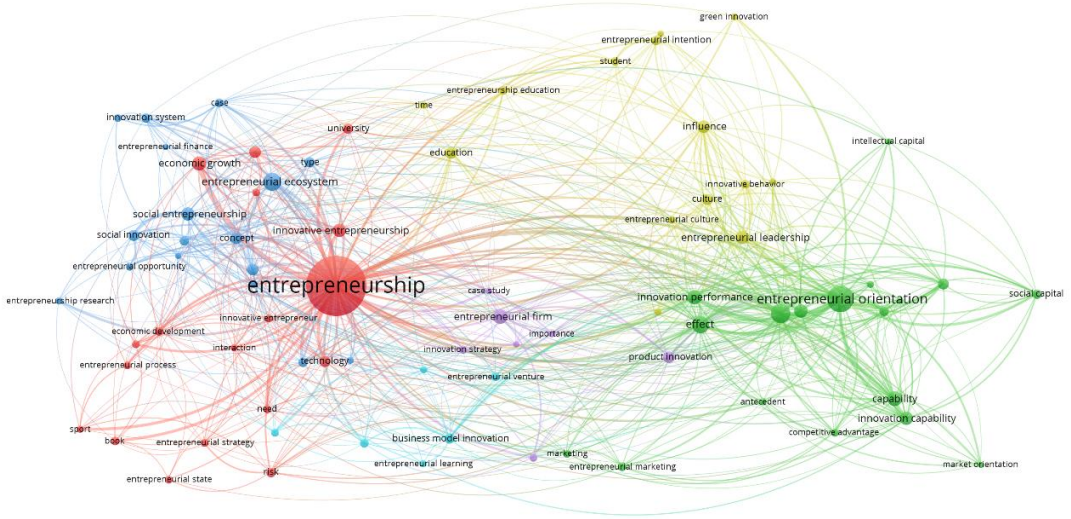

Figure 1. Mapping Results from Vosviewers

The growth trends seen in Figure 1 identify periods of high interest and emerging themes. The distribution of publications across this period highlights the evolution of research focus, potentially reflecting changing technological landscapes, economic climates, or shifts in scholarly attention.

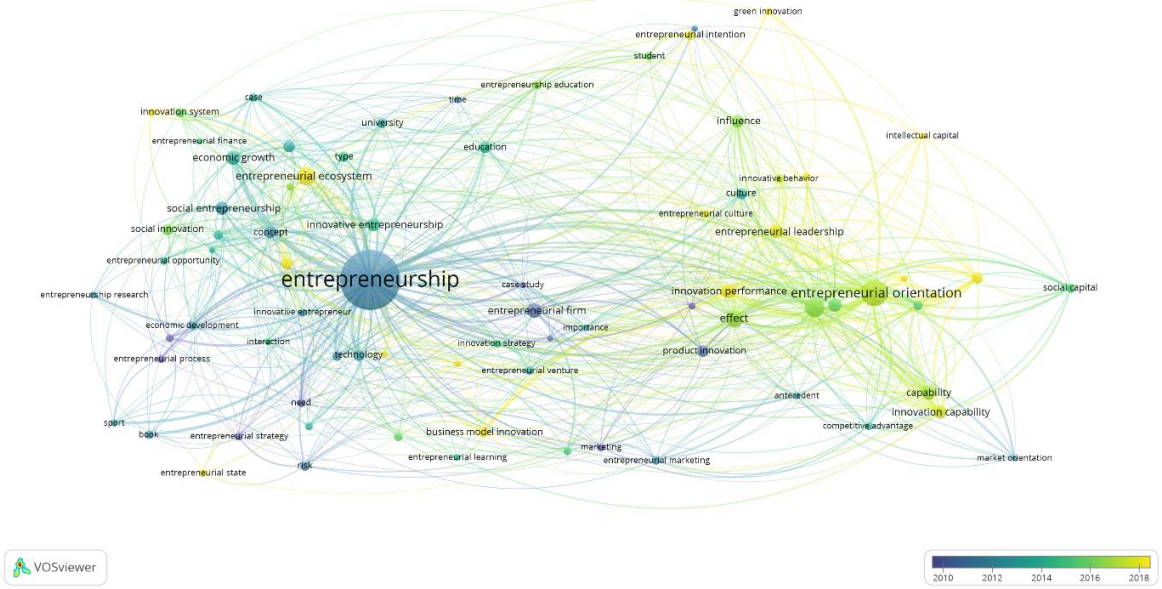

Figure 2. Research Trends

Analysis of publication trends shows the dynamic nature of research in innovation performance measurement. Over the years, there has been a marked increase in the number of publications, which indicates a growing interest in this topic. The initial stages of the analysis show a spike in research results, which may correlate with important events or shifts in the global business landscape.

Figure 3. Cluster Mapping

We studied the cluster analysis results in Figure 3, presenting an overview of the identified clusters, total items, and keywords that appear most frequently within each cluster. The discussion will focus on the thematic coherence of each cluster, highlighting salient topics and their relevance to the measurement of innovation performance in entrepreneurial business.

Table 2. Cluster Identification

Cluster	Total Items	Most frequent keywords (occurrences)	Keyword
1	11	Economic development (20), entrepreneurship (25), innovative entrepreneurship (15), technology (20)	Economic development, economic growth, entrepreneurial process, entrepreneurial state, entrepreneurial strategy, entrepreneurship, innovative entrepreneurship, innovative entrepreneurial, interaction, risk, technology
2	9	Culture (15), entrepreneurial leadership (20), radical innovation (25)	Culture, enterpreneurial behavior, entrepreneurial culture, entrepreneurial leadership, firm performance, importance, innovation strategy, innovation behavior, radical innovation
3	9	Entrepreneurial ecosystem (25), innovation ecosystem (20), social entrepreneurship (15), start-up (20)	Entrepreneurial ecosystem, entrepreneurial opportunity, entrepreneurship research, innovation ecosystem, innovation management, innovation system, social entrepreneurship, social innovation, startup
4	8	Competitive advantage (20),	Capability, competititve advantage, entrepreneurial competition, entrepreneurial

		market orientation (25), performance (30)	marketing, innovation capability, market orientation, marketing, performance
5	7	Entrepreneurial intention (20), university (20), entrepreneurial education (15)	Education, entrepreneurial attitude, entrepreneurial intention, entrepreneurial university, entrepreneurship education, student, university
6	6	Business model (20), sustainable entrepreneur (25)	Business model, business model innovative, entrepreneurial learning, entrepreneurial venture, sustainability, sustainable entrepreneur
7	6	Entrepreneurial orientation (20), Intellectual capital (15), social capital (25)	Entrepreneurial orientation, green innovation, innovation performance, intellectual capital, smes, social capital
8	5	Entrepreneurial finance (20), product innovation (25)	Entrepreneurial finance, entrepreneurial firm, internationalization, practice, product innovation

The clusters identified collectively provide a rich picture of the various dimensions of innovation performance measurement in entrepreneurial business. Cross-theme insights can emerge when we consider intersections between clusters. For example, exploration of the entrepreneurship and innovation ecosystem (Cluster 3) may intersect with an examination of business models and sustainability (Cluster 6), revealing how ecosystem dynamics affect sustainable entrepreneurial ventures. In addition, understanding the relationship between competitive advantage and market orientation (Cluster 4) and entrepreneurial finance and product innovation (Cluster 8) can illuminate the financial strategies used by entrepreneurial ventures to gain competitive advantage through innovative product offerings.

The coexistence of clusters related to radical culture and innovation (Cluster 2) and entrepreneurial orientation and intellectual capital (Cluster 7) demonstrate the potential relationship between organizational culture, strategic orientation, and intellectual assets in driving radical innovation. These clusters collectively contribute to a nuanced understanding of innovation performance measurement, demonstrating the interdisciplinary nature of research in entrepreneurial business. Identified themes and keywords provide a foundation for practitioners, policymakers, and researchers to explore diverse dimensions of innovation in different entrepreneurial contexts.

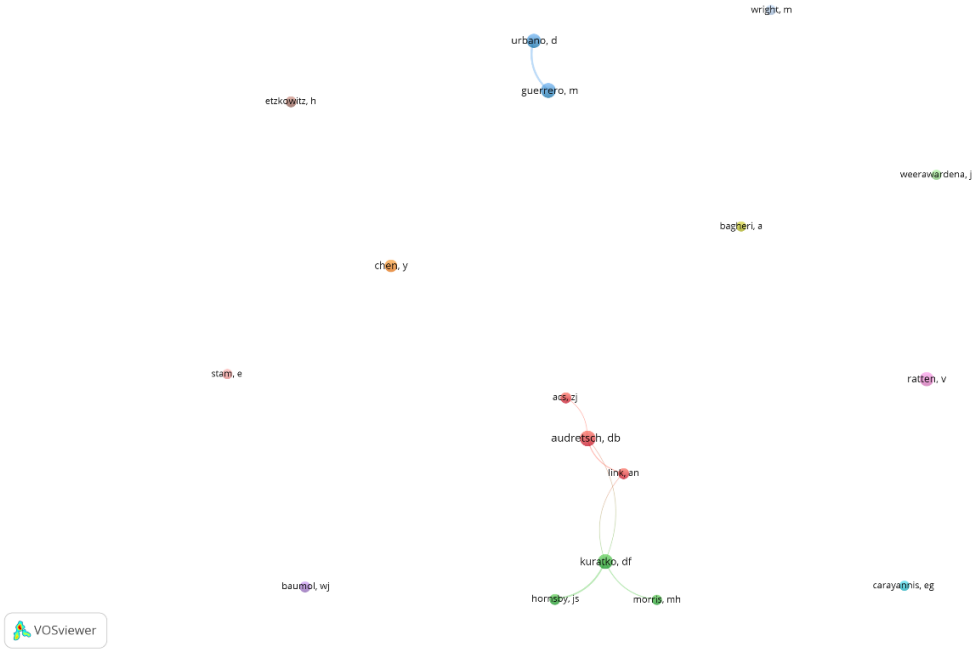

Figure 4. Author Collaboration

Examination of authorship patterns reveals key contributors and collaborative networks within this field. Influential writers, identified by the frequency of their contributions or the impact of their citations, emerge as thought leaders. Collaborative networks, visualized using co-authorship networks, provide insight into the collaborative dynamics that shape discourse.

Table 3. Quote Analysis

Authors	**Citation**	**Title**
P Drucker (2014)	20652	Innovation and entrepreneurship
M Mazzucato (2011)	6964	The entrepreneurial state
HH Stevenson, JC Jarillo (2007)	5755	A Paradigm of Entrepreneurship: Entrepreneurial Management*
D Miller, PH Friesen (1982)	4690	Innovation in conservative and entrepreneurial firms: Two models of strategic momentum
H Etzkowitz, C Zhou (2017)	3769	The triple helix: University–industry–government innovation and entrepreneurship
JT Eckhardt, SA Shane (2003)	3178	Opportunities and entrepreneurship
PP McDougall, BM Oviatt (2000)	2848	International entrepreneurship: the intersection of two research paths
WD Bygrave, CW Hofer (1992)	2677	Theorizing about entrepreneurship
WB Gartner (1990)	2530	What are we talking about when we talk about entrepreneurship?
JG Covin, MP Miles (1999)	2476	Corporate entrepreneurship and the pursuit of competitive advantage

Collectively, these works provide diverse perspectives, from conceptualizing entrepreneurship to exploring the international dimension and theorizing about its nature. Practitioners and researchers can draw on these important works to inform their approach to entrepreneurial endeavors.

The discussion of influential works underscores the diverse and multifaceted nature of the field of innovation and entrepreneurship. Each work contributes unique insights, shapes discourse and guides scientific and practical endeavors. These influential works offer a foundation for further exploration and provide valuable resources for individuals who wish to deepen their understanding of the intricate relationship between innovation and entrepreneurship.

Table 4. Keywords Analysis

Most occurrences		Fewer occurrences	
Occurrences	**Term**	**Occurrences**	**Term**
833	Entrepreneurship	14	Entrepreneurial culture
162	Entrepreneurial orientation	13	Entrepreneurship research
86	Performance	13	Innovation management
73	Entrepreneurial ecosystem	13	Sustainability
53	Capability	13	Interaction
53	Entrepreneurial firm	13	Entrepreneurial competency
49	Innovation performance	13	Importance
47	Economic growth	13	Entrepreneurial behavior
44	Innovative entrepreneurship	12	Entrepreneurial learning
44	Smes	12	Green innovation
42	Entrepreneurial leadership	11	Market orientation
41	Innovation capability	11	Entrepreneurial attitude
40	Social entrepreneurship	11	Radical innovation
35	Entrepreneurial university	10	Entrepreneurial finance
33	Innovation ecosystem	10	Intellectual capital

Analysis of the co-emergence of keywords provides insight into thematic groups in the literature on innovation performance measurement in entrepreneurial businesses. The discussion below explores terms with the most occurrences and terms with fewer occurrences, explaining the main themes and their interrelationships.

Most Appearances

The prominence of the term "Entrepreneurship" underscores its central role in literature. The term most likely covers a broad spectrum of studies that explore various aspects of entrepreneurial activity, ranging from individual behavior to organizational strategy. "Entrepreneurial Orientation" signifies a focus on the strategic orientation and behavior of the organization towards entrepreneurship. The term denotes a large body of literature investigating how companies develop an entrepreneurial mindset and integrate it into their overall strategy.

The term "Performance" reflects a key dimension examined in the literature—how innovation and entrepreneurship contribute to overall organizational performance. This most likely includes studies that examine financial performance, market results, and other leading indicators. The "Entrepreneurship Ecosystem" highlights the interconnected networks and elements that influence and support entrepreneurship. The term most likely includes research that explores the role of external factors, such as government policies, in fostering an environment conducive to entrepreneurial activity. The term "capability" denotes a focus on organizational capacity and competence that drives entrepreneurial success. This may include studies that explore how companies

develop and improve their ability to innovate and compete.

Fewer Occurrences:

"Entrepreneurial Culture" is a term that appears fewer but indicates a particular focus on aspects of culture within organizations that encourage or inhibit entrepreneurial behavior. This can include studies that explore the impact of organizational culture on risk-taking, innovation, and adaptability. The term "Entrepreneurship Research" reflects a specialized area within the broader field, emphasizing the methods, trends, and challenges associated with entrepreneurial research. This may include meta-analyses, methodological discussions, and critical reflection on the state of entrepreneurial research.

"Innovation Management" denotes a focus on the systematic processes and strategies that organizations use to manage and maintain innovation. The term most likely includes studies that explore frameworks, models, and best practices for effectively managing innovation initiatives. The term "Sustainability" denotes a section of literature that explores how entrepreneurial activities align with and contribute to sustainable development. This may include the study of environmentally conscious entrepreneurship and the integration of sustainability principles into business practice. "(Interaction)" implies a focus on the dynamic relationships and collaborations that make up entrepreneurial ventures. This can include studies that explore the interactions between entrepreneurs, organizations, and external stakeholders in the innovation process.

Comparative Analysis: Start-ups vs Established Companies

Based on individual analyses of publication trends, authorship patterns, citation networks, and keyword co-emergence, the results are synthesized to offer a comparative perspective between startups and established companies.

In terms of publication trends, differences can appear in the temporal distribution of research results, reflecting the different challenges and opportunities faced by startups and established companies at different points in their life cycle.

Authorship patterns can reveal variations in collaborative dynamics between academics and research groups focused on startups versus those concentrating on established companies. Understanding these dynamics is critical to appreciating the interdisciplinary nature of innovation performance measurement.

Citation networks can highlight more prominent influential works in literature related to one context than another. The identification of these works helps in recognizing the main theoretical foundations that shape research in each setting.

Keyword co-emergence analysis is essential in comparing thematic emphases in literature related to startups and established companies. Variations in keyword groups can signal contextual nuances and emphasize certain aspects of innovation performance measurement that are more relevant to one type of entrepreneurial business.

Implications of Keywords:

The emergence of terms such as "Entrepreneurship," "Entrepreneurial Orientation," and "Performance" indicates an integrative approach in the literature, which examines how entrepreneurial activities and orientations contribute to organizational outcomes. The emphasis on terms such as "Entrepreneurial Ecosystem" and "Capability" indicates a holistic exploration of the external and internal factors that influence entrepreneurial success.

Less emerging terms highlight specialized niches within the field, such as "Entrepreneurial Culture", "Entrepreneurial Research", and "Innovation Management". These specialized areas contribute profoundly to the overall understanding of innovation performance measurement, offering culturally, methodologically, and managerially nuanced insights.

Researchers and practitioners can leverage these findings to explore specific dimensions of innovation and

entrepreneurship based on their interests and goals. The presence of terms related to sustainability and interaction indicates an increasing awareness of the broader social and collaborative dimensions of entrepreneurial activity.

CONCLUSION

In conclusion, this study contributes to a nuanced understanding of innovation performance measurement in entrepreneurial business through rigorous bibliometric analysis. The identified clusters, which feature themes such as economic development, culture, and entrepreneurial ecosystems, offer a comprehensive view of the dimensions that shape innovation in both startups and established companies. Influential works, including classics such as "Innovation and Entrepreneurship" by Peter F. Drucker and contemporary contributions such as "The State of Entrepreneurship" by Mariana Mazzucato, became basic pillars in this field. Keyword emergence analysis highlights the central role of terms like "Entrepreneurship" and "Entrepreneurial Orientation," as well as uncovering specialized areas like "Sustainability" and "Entrepreneurship Research."

Practical implications abound for entrepreneurs, managers, policymakers, and researchers. These findings provide a roadmap for informed decision-making, emphasizing the importance of developing an entrepreneurial culture, understanding the dynamics of entrepreneurial ecosystems, and embracing sustainability principles. The research also underlines the evolving nature of the field, with new themes such as sustainability and interaction increasingly prominent.

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