International Journal of Innovation Studies 8 (2024) 313–333

Contents lists available at ScienceDirect

International Journal of Innovation Studies

journal homepage: www.keaipublishing.com/en/journals/international-journal-of-innovation-studies

Innovation capabilities and their dimensions: A systematic literature review

António Moreira [a,b,c,d,e,*], Eurico Navaia [f], Cláudia Ribau [b,g]

[a] Department of Economics, Management, Industrial Engineering and Tourism, University of Aveiro, 3810-193, Aveiro, Portugal
[b] GOVCOPP—Research Unit on Governance, Competitiveness and Public Policies, University of Aveiro, 3810-193, Aveiro, Portugal
[c] INESCTEC—Institute for Systems and Computer Engineering, Technology and Science, 4200-465, Porto, Portugal
[d] NECE-UBI—Research Center for Business Sciences, Universidade da Beira Interior, Covilhã, Portugal
[e] CICEE—Research Center in Business and Economics, UAL, Portugal
[f] Faculdade de Ciências Sociais e Humanidades, Universidade Zambeze, Beira, 369, Sofala, Mozambique
[g] Instituto Superior de Contabilidade e Administração, University of Aveiro, 3810-193, Aveiro, Portugal

ARTICLE INFO

Keywords:
Innovation capability
Innovation
Systematic literature review
Competitiveness

ABSTRACT

Innovation capabilities (ICs) represent a crucial source of competitive advantage for firms. However, the literature on ICs is extensive, leading to a diverse understanding of their nature and measurement. A notable gap exists in delineating the dimensions constituting ICs. This article aims to address this gap by identifying and pinpointing the various dimensions of ICs through a systematic literature review (SLR). The initial step involves identifying the diverse dimensions used in ICs, providing a distinctive insight for assessing their metrics. Notably, this SLR stands out as the only comprehensive analysis of various ICs dimensions, organizing them coherently. Examining 103 articles from the Web of Science and Scopus databases spanning from 2001 to 2022, the results reveal an amalgam of scales and associated approaches for IC measurement. This study contributes to the literature by systematically identifying and analyzing the main dimensions employed by researchers to measure ICs. Additionally, it highlights the foundational theoretical approaches of the identified studies. In practical terms, the study consolidates and presents the identified dimensions and metrics in integrative tables, offering researchers and companies valuable insights into diverse innovation paths that impact performance.

1. Introduction

Innovation is an essential catalyst of economic growth, progress, and competitive advantages in today's rapidly changing world. Firms increasingly leverage innovation as a strategic tool to outperform competitors (Alon et al., 2015; Pisano, 2015). As recent and rapid changes in technology, consumer behavior and market conditions demand firms to hinge their survival and success on their ability to be innovative (Iddris, 2016), firms must prioritize innovation capabilities (ICs) as important sources of competitive advantage (Guan and Ma, 2003; Reichert et al., 2016; Saunila, 2016; Wang and Ahmed, 2004), firm growth (e.g., Saunila et al., 2014; Teece et al., 1997), innovative performance (Reichert et al., 2016), and export performance (e.g., Guan and Ma, 2003; Moreira et al., 2022; Ribau et al., 2017).

The literature delineates specific forms of innovation: product or process innovation (Arshad and Arshad, 2019; Fahim and

* Corresponding author.
E-mail addresses: amoreira@au.pt, amoreira@ua.pt (A. Moreira).

https://doi.org/10.1016/j.ijis.2024.07.001
Received 29 December 2022; Received in revised form 27 April 2024; Accepted 7 May 2024
Available online 10 July 2024

Baharun, 2017; Liao et al., 2015; Mahmud et al., 2017; OECD/Eurostat, 2018; Stelmaszczyk, 2020; Sulistyo and Ayuni, 2020; Verma and Rao, 2016; Vu, 2020; Wang, Yang et al., 2020; Wonglimpiyarat, 2009) and radical or incremental innovation (Le, 2020). However, this segmented approach tends to overlook the comprehensive nature of innovation within the company (Damanpour, 1991; OECD, 2005), which encompasses the entire value system, incorporating activities such as purchasing, production, marketing, commercial operations, organizational processes, distribution channels, strategic definitions, and resource development, among others. These activities stem from ICs so that companies can continuously transform knowledge and innovative ideas into new products and processes while competing successfully in the market.

The literature extensively explores the concept of ICs, yielding different perspectives grounded in distinct theoretical frameworks (Akman and Yilmaz, 2008; Guan and Ma, 2003; Hogan et al., 2011; Lawson and Samson, 2001; Mendoza-Silva, 2020; Saunila, 2016, 2020; Zawislak et al., 2012). These frameworks offer various viewpoints and interpretations of ICs. As a construct, ICs share a common denominator: the emphasis on continuous transformation skills derived from the firm's internal (organizational and behavioral focus) and external (product success, market, marketing) experiences. However, different dimensions of ICs, based on different metrics, are used to measure these skills and their impact on firm, innovation and export performance.

There are various perspectives with different underlying theoretical frameworks and interpretations of ICs. They stem from a variety of constructs used to interpret diverse concepts and differing dimensions of ICs (e.g., Daronco et al., 2023; Guan and Ma, 2003; Lawson and Samson, 2001; Mendoza-Silva, 2020; Saunila, 2020; Vicente et al., 2015; Zawislak et al., 2012). Moreover, several literature reviews have sought to address how ICs are understood (e.g., Blommerde, 2023; Mendoza-Silva, 2020; Saunila, 2020; Tavares et al., 2021), interpreting ICs differently. Saunila (2020) analyzed 39 articles (2001–2018) with an emphasis on the characteristics of ICs in SMEs. She found that innovation types are normally related to innovation in products, processes, and the organization. Additionally, the study supported the influence of both internal (e.g., prior work experience, education) and external sources (e.g., suppliers, customers) on product innovation capability. Saunila (2020) further demonstrated a positive association between technological intensity and product innovation with the resource-based view (RBV) of the firm.

Mendoza-Silva (2020) analyzed the determinants and consequences of ICs and proposed an integrated framework examining the determinants and consequences of IC. Internal determinants (process and organizational innovativeness) and external determinants (product and marketing innovativeness) influence IC, which is aligned with the classical OECD/Eurostat (2018) functional innovation framework. These IC determinants are further shaped by interorganizational (such as external relations, resource management, work climate, ideation and organizational structure, know-how development, individual activity and informal networks) and knowledge characteristics (knowledge ambiguity, complexity and intensity). Finally, Mendoza-Silva (2020) claims that environmental conditions (market conditions, competitive intensity and institutional support) moderate both innovation and firm performance.

Mapping ICs in industry clusters, Tavares et al. (2021) propose that the main enablers of ICs in industrial clusters are network collaboration, knowledge creation and transfer, technology development, market influence and proximity. Although based on an industrial environment, the paper is focused on very specific factors, such as geographical proximity, absorptive capacity and knowledge exchange, that influence the performance of firms in industrial clusters, emphasizing an external perspective of the firm, which clearly differs from the ones analyzed above.

From a service-based perspective, Blommerde (2023) argues that ICs specific to services are not well-understood. There is a lack of consensus on their definitions, antecedents, outcomes, and dimensions. However, client-focused and marketing-focused ICs are identified as essential for service firms to achieve success. Additionally, Blommerde (2023) emphasizes the importance of cultural aspects that support innovation, such as entrepreneurial orientation, market orientation, and a culture of continuous learning. Three key dynamic capabilities are highlighted: sensing (identifying opportunities), seizing (selecting and pursuing opportunities), and transforming (implementing new service concepts). He further underscores the need for firms to adopt technology and leverage it for innovative service development. Finally, he recommends a focus on co-creating services with customers to better meet their needs and enhance satisfaction.

Despite several literature reviews addressing ICs, a lack of consensus persists regarding their theoretical frameworks, dimensions, and metrics. To address this issue, a comprehensive analysis of the literature is necessary. This analysis should identify existing disparities in the terminology and dimensions used for ICs. Furthermore, a holistic view should be provided by integrating the various dimensions found, ensuring coherence between these dimensions and their associated constructs. This undertaking necessitates a well-founded and systematic search strategy within the existing literature.

According to what is presented above, it can be concluded that innovation capability remains a loose concept. Consequently, the dimensions used to assess ICs and their associated metrics are very plural, with consequences for what is truly meant and measured by ICs. To address this issue, two main research questions are formulated: What are the different dimensions associated with ICs? and what are the main metrics found in the literature for measuring ICs?

In order to identify the different ICs metrics – dealing with the previous questions – it is important to understand the multidimensional nature of the different understandings of ICs. As such, it is crucial to identify the dimensions associated with ICs to make the results of research more credible, especially at the comparative level, since several authors treat ICs with completely different concepts, dimensions and/or metrics. One of the consequences of identifying ICs is the greater comparability of results, which may have different impacts on the business, export, or innovation performance levels. This study was designed using the systematic literature review (SLR) methodology, with the objective of identifying the various dimensions and metrics of ICs found in the literature and analyzing the trends of the different approaches.

The paper surveys the studies published until 2022, seeking to identify the different dimensions and the metrics used in identifying and measuring ICs in the literature. This paper seeks to fill an existing gap in the literature that, through an SLR, analyzes how ICs are addressed and identifies and compares the various dimensions and metrics, without any restriction on the time or journal impact

factor, or researcher status. Other studies that addressed ICs have been identified in the literature.

This SLR follows the following structure. After the introduction, Section 2 presents the conceptual understanding of ICs. Section 3 describes the systematic review protocol used to identify the most relevant articles on innovation capability. Section 4 presents a description and synthesis of the results, i.e., the description of the sample and metrics. Section 5 presents the discussion and conclusion, and Section 6 presents the implications of the results, limitations, and future directions of the research.

2. Theoretical background of innovation capabilities

Lawson and Samson (2001) are among the pioneers using the construct of innovation capabilities; therefore, they are a target of inspiration for researchers (e.g., Hogan et al., 2011; Mir et al., 2016). Guan and Ma (2003) are the most cited authors in the Scopus database. According to Lawson and Samson (2001), ICs are the ability to continuously transform knowledge and innovative ideas into new products, production processes and systems for the benefit of the firm and its stakeholders. Conceived as distinctive assets, ICs may be tacit and deeply entrenched in internal and external experiences (Guan and Ma, 2003). They are also considered a firm's ability to develop new products through the combination of innovative behaviors, strategic capabilities, and internal technological processes (Wang and Ahmed, 2004). They represent the firm's internal capabilities for continuously achieving innovations and adding value for the firm and its stakeholders (Saunila, 2016). ICs can also be understood as the result of organizational culture, promotional activities, and abilities to perceive and cope appropriately with the external environment (Akman and Yilmaz, 2008). As a construct, an all-encompassing understanding of ICs emerges, encapsulating their transformative role in facilitating the continuous evolution of organizational knowledge into tangible innovations, thereby fostering the firm's competitive advantage and contributing to its enduring success. However, when analyzing the dimensions used to encapsulate innovation capabilities, the reality is complex.

Lawson and Samson (2001) present seven dimensions of ICs, namely: (1) vision and strategy; (2) leveraging the skill base; (3) organizational intelligence; (4) creativity and idea management; (5) organizational structure and systems; (6) culture and climate; and (7) technology management. According to the framework delineated by Lawson and Samson (2001), vision and strategy assume a pivotal role in shaping the configuration of resources, products, processes, and systems that firms adopt in uncertain environments. The strategic deployment of resources is further underscored through the dimension of leveraging the skill base, wherein the effective alignment of capabilities ensures optimal resource allocation. Organizational intelligence is the ability to process, interpret, encode, manipulate, and access goal-oriented information to increase adaptive potential in the environment in which it operates. Creativity and idea management emerge as integral components of IC, representing a structured process of idea generation guided by knowledge and vision. Organizational structures and systems are composed of organizational structures, compensation systems, and goals for innovation. Culture and climate are vitally important factors for successful innovation. The components underlying the culture and climate construct are tolerance for ambiguity, empowered employees, creative time, and communication. Finally, technology management is important for organizations seeking to engage with external networks and fortify their corporate knowledge base. Clearly, the multifaceted dimensions of ICs, as delineated by Lawson and Samson (2001), provide a comprehensive framework for understanding and optimizing the internal resources within organizations, thereby contributing to their sustained adaptability and innovation in dynamic environments.

According to Guan and Ma (2003), ICs have seven dimensions, each with a unique contribution. First, learning capability is the firm's ability to identify, assimilate and leverage knowledge internally and in the external environment. R&D capability refers to the integration of R&D strategy formulation, project implementation and project portfolio management. Third, manufacturing capability refers to the ability to transform R&D results into market-responsive products, aligning market needs, design requirements and production economics. Marketing capability reflects a firm's ability to advertise and sell products by comprehensively understanding consumer needs, competitive positioning, cost-benefit analysis, and acceptance of innovation. Fifth, resource exploitation capability ensures that the company has sufficient capital, skilled professionals, and technological resources for effectively engaging in innovation processes. Organizational capability, as the sixth dimension, refers to the harmony between departments, the organization's responsiveness to opportunities, organizational culture, mechanisms, and management methods. Finally, strategic capability encapsulates the firm's ability to understand all kinds of external relationships and adapt to the external environment. Guan and Ma (2003) distinguish these dimensions according to their importance to the firm, delineating two overarching groups within ICs. The first, denoted as core capabilities, is linked to the firm's operational process (such as R&D, manufacturing, and marketing); the second, denoted as supplementary (learning, organizational, resource exploitation and strategic capability) capabilities, collectively contributes to the holistic tapestry of ICs.

There are clear differences between these two approaches. It is possible to claim that Lawson and Samson's (2001) approach is primarily internal to the firm, characterized by a distinct emphasis on capability-based thinking. In contrast, Guan and Ma's (2003) approach exhibits a more systemic structure and a pronounced external, strategically-oriented perspective. While both approaches share relative proximity in their competence-based perspective, they are constituted by entirely distinct dimensions. Furthermore, the IC scale proposed by Guan and Ma (2003) has been extensively employed, while Lawson and Samson's (2001) approach was based on a qualitative study, where no scale was used to gauge ICs.

Akman and Yilmaz (2008) adopt a distinctive approach to measuring ICs by employing specific items rather than dimensions. Their measurement encompasses several key facets within the firm: a supportive organizational culture and management that fosters innovation; efficient and rapid knowledge use, from diverse sources, for product development activities; a capacity to swiftly integrate market changes, such as evolving customer preferences and competing products, into the company's own products and processes; encouragement and support for employees' participation in activities such as product development, innovation process enhancement, and generation of new ideas; continuous evaluation and incorporation of novel ideas originating from customers, suppliers, and other

sources into product development activities; and the ability of companies to adapt to environmental changes through timely and appropriate improvements and innovations in products and processes.

Saunila and Ukko (2013) propose a comprehensive measurement framework for ICs encompassing multiple dimensions: leadership culture, ideas and organization structure, work climate and well-being, know-how development, regeneration, external knowledge, and individual activities. Participative leadership culture, which is directly or indirectly related to organizational culture, supports innovation by fostering an overall organizational environment and leadership culture that supports, motivates and facilitates innovation. The dimension ideas and organization structures is related to the organizational structures and systems required for successful innovation, covering the entire innovation process from idea generation to the organization of work tasks. Work climate and well-being represent employee well-being and a conducive work climate for innovation development, incorporating elements of collaboration and values. Know-how development highlights the expertise of employees as pivotal contributors to innovation capability, encompassing the utilization of knowledge and the enhancement of human resource skills. The regeneration dimension measures the organization's ability to learn from previous experiences and leverage this knowledge to foster innovations and enhance operational effectiveness. The external knowledge dimension highlights the importance of harnessing external networks and knowledge to bolster overall organizational innovation capability. The individual activity dimension expresses the human-based ICs of employees as necessary components to form the overall innovation capability of the organization, considering the characteristics associated with a higher level of innovation capability and employee motivation. This comprehensive framework provides a nuanced understanding of ICs across diverse organizational dimensions.

It is clear that the abovementioned studies deal with ICs very differently. Contrary to the approaches put forward by Lawson and Samson (2001) and Guan and Ma (2003), Akman and Yilmaz (2008) and Saunila and Ukko (2013) use a more organizationally-driven perspective using different dimensions to encapsulate the concept of ICs. As such, they are hardly comparable even though they use the same name: innovation capabilities.

Zawislak et al. (2012), in contrast, claim that ICs depend upon four key capabilities: technology development, operations, management, and transactions. Moreover, they also claim that firms are primarily technological- or transactional-based and, in a later stage, they become operational- or managerial-based. Finally, although firms possess all four capabilities, one of them may predominate over the others (Zawislak et al., 2012).

Based on the theoretical model of Zawislak et al. (2012), Alves et al. (2017) tested the technology development, operations, management, and transaction capabilities by proposing metrics for these four capabilities and concluded that operations capability is the least dynamic of all four capabilities influencing innovation. Complementarily, management, development, and transaction capabilities better explain firms' dynamics and innovative performance. As such, operations capabilities are called 'ordinary capabilities.' However, a close analysis reveals that those ordinary capabilities are not tuned to Guan and Ma's (2003) core capabilities.

Without being exhaustive, there is a diversity of IC concepts that have evolved over time, as presented in Table 1. We consider that all of them encompass multiple dimensions of ICs, referring to the abilities of continuous transformation coming from internal and external experiences of the company. Moreover, there are various interpretations of what ICs truly are and what their main dimensions are, as functional, organizational, operational, technological or strategic frames are used to frame ICs. If initially, the focus was on knowledge transformation (Lawson and Samson, 2001) so that ICs are used for converting ideas into innovation outputs, Guan and Ma (2003) and Akman and Yilmaz (2008) emphasize the intangible and experience-based nature of ICs by introducing the role of the organizational perspective and responsiveness to the external environment to increase a firm's competitive advantages. Hogan et al. (2011), Zawislak et al. (2012) and Alves et al. (2017) are more attuned to the importance of technological absorption and transformation for innovation. Finally, ICs are seen as internal determinants driving continuous innovation and value creation (Saunila and Ukklo, 2013; Saunila, 2016).

This evolutionary perspective highlights how the understanding of ICs has become more nuanced and multifaceted over time, with a focus shifting from internal processes to a more holistic view encompassing external factors, competition and technology. Moreover, ICs have evolved to be complex intangible assets built on experience and knowledge, i.e., dynamic capabilities that evolve over time through learning and adaptation. Furthermore, as a consequence, there is also a lack of clarity of the general metrics used to measure

Table 1
Concept of innovation capabilities.

Author	Concept
Lawson and Samson (2001)	Ability to continuously transform knowledge and ideas into new products, processes, and systems for the benefit of the company and its stakeholders.
Guan and Ma (2003)	It is a special asset of a company. It is tacit and unchangeable and is closely correlated with internal experiences and experimental acquisition.
Akman and Yilmaz (2008)	It is a crucial element that facilitates the culture of an organization, the distinctiveness of internal promotional activities, and the ability to understand and respond appropriately to the external environment.
Hogan et al. (2011)	The ability of a company, relative to its competitors, to apply collective knowledge, skills and resources to innovation activities related to new product systems, processes, services or management, marketing, or work organization in order to create added value for the company or its stakeholders.
Zawislak et al. (2012); Alves et al. (2017)	An overall capability encompassing the ability to absorb, adapt and transform technology into specific management, operations and transaction routines to support innovation.
Saunila (2016)	It is the internal capability that aims to describe the determinants that affect an organization's ability to continuously achieve innovations and add value to the organization and its stakeholders.

Source: Own elaboration.

those different dimensions of ICs (e.g., Guan and Ma, 2003; Lawson and Samson, 2001; Mendoza-Silva, 2020; Saunila, 2020; Zawislak et al., 2012), as those measures need to be tuned to the diverse dimensions used to frame ICs.

3. Methodology

Given the multifaceted and fragmented nature of the concept of ICs, which is widely used in academia, it was decided to adapt the thematic analysis of Jones et al. (2011). This fragmentation results from the varied interpretations and thematic areas explored by researchers, resulting in a sometimes-inconsistent use of terminology and its associated measurement. Following Jones et al. (2011) and Chandrasekaran et al. (1999), and using a qualitative-interpretative ontological approach, an integrative perspective was crafted to encompass the diverse dimensions of the underlying conceptualizations of ICs. Finally, based on Sinkovics (2018), we followed a pattern-matching typology perspective, using a systematic inductive approach combined with a deductive reflective perspective to segment the various dimensions of ICs.

For this study, the basic guidelines of an SLR based on Tranfield et al. (2003) were adopted. This method consists of identifying, selecting, analyzing, and synthesizing existing research on a given topic, presenting it in a clear way to understand what is known and unknown. The systematic review process consisted of three steps:

i) Planning the review, which includes defining the purpose of the review (the different dimensions associated with ICs and the main metrics found in the literature for measuring ICs);
ii) Conducting the review, a comprehensive phase involving identifying, selecting, assessing quality, extracting, monitoring progress, and synthesizing relevant literature using explicit and reproducible criteria for inclusion and exclusion;
iii) Report writing and dissemination, which includes the reporting, recommendations, and gathering of evidence in practice.

This process unfolded in two stages, as shown in Fig. 1. The first stage involved identifying relevant articles to answer the research questions. For this purpose, the Web of Science and Scopus databases were defined as the sources of the search, covering articles published until the end of 2022. In this search, "innov*" AND "capabil*" were initially defined as search words in the title, abstract and keywords. Subsequently, the search used a series of filters to refine the selection of articles meeting the criteria, focusing on the areas of business, management and accounting. The selection was restricted to 'article OR review' scientific articles. We used the following keywords: "Innovation Capability" OR "Innovative Capability" OR "Innovation Capabilities". The subsequent stage involved choosing the publication sources and selecting only articles published in journals. Finally, the last filter was related to the language restriction of "English", resulting in 910 publications, 328 from the Web of Science, and 582 from the Scopus database. After that, we removed 208 duplicated articles, resulting in 702 remaining articles. Clearly, the main purpose was to include only English-written, peer-reviewed

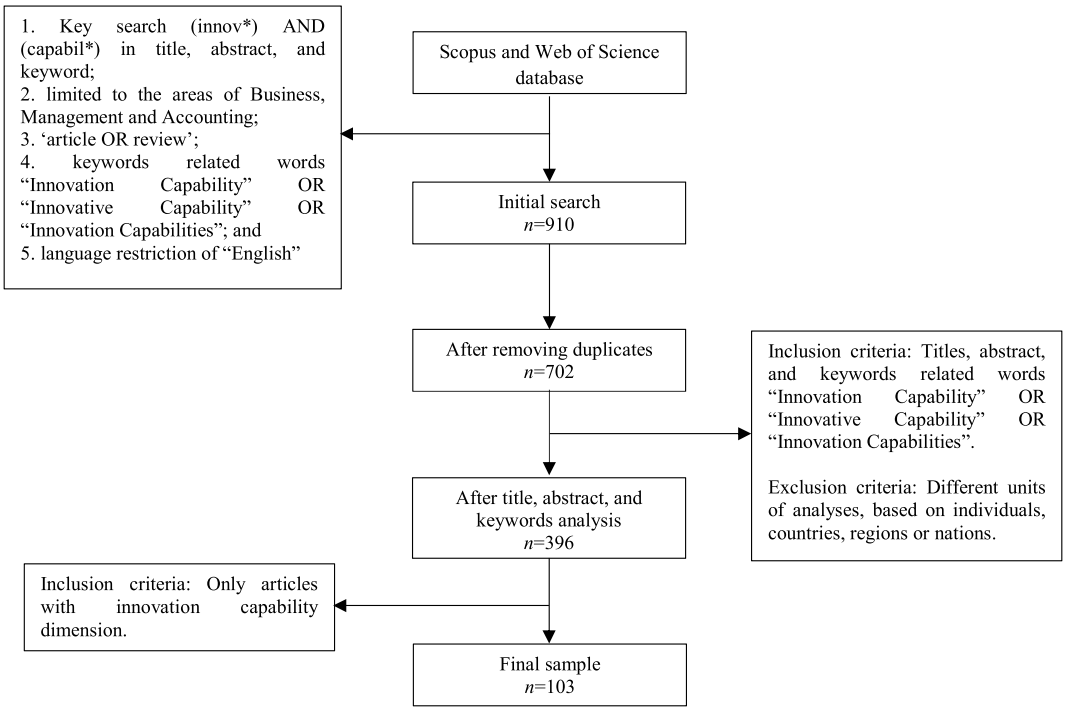

Fig. 1. Search and selection process.
Source: own elaboration

journal articles that included innovation capabilities as the main content topic.

The second stage of this study encompassed the analysis process, determining the inclusion and exclusion criteria of the 702 articles for further analysis. To increase the reliability of the selection, we adhered to the criteria outlined by Tranfield et al. (2003), involving simultaneous assessments by three researchers, with discussions to resolve doubts and disagreements until a consensus was reached. The first phase of this stage consisted of reviewing the titles, abstracts, and keywords, with a focus on including articles that distinctly analyzed innovation capabilities. Following Jones et al. (2011) and Tranfield et al. (2003), when those ICs were marginally referred and were not the clear focus of the analysis, for example, generically mentioning the innovation capabilities of individuals, industries or nations, those articles were excluded. Moreover, we followed a qualitative-interpretive ontological stance, as we looked for articles that were related to innovation capabilities at the firm level, somehow related to the above referred frameworks or that denoted the same underlying conceptualization. This approach not only allowed the construction of integrative frameworks that supported the organization of the different frameworks, constructs/dimensions but also helped to set aside articles that did not support our objective (Bouncken et al., 2021). As such, only 396 articles were included for further analysis. The subsequent stage entailed a thorough examination of these articles to determine their relevance to the following research question: what are the different dimensions associated with ICs, and how are they measured? Case studies, studies emphasizing innovation management, innovation performance, and innovation projects not explicitly addressing firm-based innovation capabilities were excluded. This process resulted in the selection of 103 articles for detailed analysis.

4. Results

The data extraction process included gathering details from the information source, including title, authors, main theories, topics and publication details. Additionally, other intrinsic aspects of an SLR were considered, such as population characteristics, study context, and the assessment of methodological quality for each article, as outlined by Tranfield et al. (2003). All 103 articles were compiled into a table with additional information pertaining to the authors, publication year, journal identification, theories used, company details (branch, industry and firm size), type of study (longitudinal or cross-sectional) and methodology used (analytical approach, data collection methods and techniques).

4.1. Sample description

This SLR began with a description of the sample with the aim of quantitatively analyzing the selected articles and finding group patterns and trends on the time scale in which the 103 articles were located. Table 2 presents the results of the number of articles, publication period, geographical location of the studied companies, activity sector framework, company size and methodological approaches employed in the research.

An analysis of the publication period revealed a notable upswing in research studies on ICs since 2003: 92 out of 103 articles were published between 2011 and 2022, corresponding to 89% of the publications (Table 3).

Asia accounted for 52% of the publications. Regarding the sample characteristics identified in the analysis of the 103 articles, companies in the manufacturing industry predominate (45 of the 103 articles, corresponding to 44%), spanning diverse sectors, such as consumer goods, automotive, equipment, food, pharmaceutical and chemical industries. Only 16 articles, representing 16% of the total analyzed, exclusively examined the reality of service companies. In terms of the size of the companies targeted by IC research, researchers have not systematically addressed how companies of different sizes handle IC issues. As such, 64% of the articles (66 of the 103 articles) feature samples from companies of varying sizes, while only 25% (26 articles) focus on small and medium-sized enterprises (SMEs). The results also highlighted a predominance of quantitative (88 of 103 articles, corresponding to 85%) and empirical studies (92 of 103 articles, corresponding to 87%) on ICs. Questionnaire-based research, primarily targeting executives, entrepreneurs, and/or top managers, was prevalent and often facilitated through online platforms to streamline responses. The analysis also revealed a greater percentage of cross-sectional studies than of longitudinal studies (94% vs. 6% of the 103 articles examined).

4.2. Main journals

The articles included in this systematic review were drawn from 70 scientific journals, indicating a broad distribution of publication channels. Table 4 shows the presence of three main journals in which the analyzed articles were published, namely, the *International Journal of Innovation Management*, *International Journal of Technology Management* and *European Journal of Innovation Management*. The subject of ICs is strongly associated with the core of innovation and technology management, a top 3 segment of the most used publication journals. On the other hand, of the four journals, 12 articles were published three times. Of the remaining 63 journals, 12 journals were referenced twice, and 51 journals were referenced only once.

4.3. Innovation capabilities. Theorical perspectives utilized

Sixteen different theories were identified in the analyzed articles. The RBV, comprising 32%, was the most referenced one among the 103 articles, followed by the dynamic capabilities, comprising 25% (Table 5).

Table 2
Location, firm type, and methodologies.

Year	Number of Articles	Geographic Location					Industry			Firm size			Analytical Approach			Type of study	
		Asia	Africa	Europe	America	Oceania	Manufacturing	Service	Others	SME	Large	N.A.	Quantitative	Qualitative	Mixed	Empirical	Conceptual
2003	1	1					1					1	1			1	
2004	1	1							1			1	1			1	
2005	1	1							1			1	1			1	
2006	3	3					1		2			3	3			3	
2008	2			1			1		1			2	1			1	2
2009	3	3						2	1			3	2		1	3	
2010	1	1					1					1	1			1	
2011	4	2		1		1	2	1	1	1		3	3		1	4	
2012	4	1					1					1	1	2		1	2
2013	5	2		3			1		4	2		3	4		1	5	
2014	6	1		4				2	3	2		3	4	2		5	1
2015	1	1					1					1	1			1	
2016	13	3	2	4	2	1	5	2	5	1		11	11	1	1	12	1
2017	9	5		3	1		5	2	2	5		4	9			9	
2018	5	3	1		1		3	1	1	2	1	2	5			5	
2019	9	4		2			5		4	5		4	9			8	1
2020	17	11	1	2	1		10	2	3	5		10	15	1	1	15	2
2021	7	4	2		1		4	2	1	1	2	4	7			7	
2022	11	5		1	3		4	2	4	2		8	9	1	1	9	2
		52	6	21	9	2	45	16	34	26	3	66	88	7	6	92	11
Total	**103**	**90**					**95**			**95**			**101**			**103**	

Note: N.A.- information not available.

Table 3
Number of publications per year.

Year	Nr. Articles
2003–2007	5
2008–2010	6
2011–2013	14
2014–2016	20
2017–2019	23
2020–2022	35

Source: Own elaboration

Table 4
Scientific journals.

Scientific journals	No. of articles per journal
International Journal of Innovation Management	6
International Journal of Technology Management	5
European Journal of Innovation Management	5
International Journal of Productivity and Performance Management	3
Journal of Business and Industrial Marketing	3
Journal of Engineering and Technology Management - JET-M	3
Technovation	3
Baltic Journal of Management	2
Innovation: Organization and Management	2
International Journal of Innovation Science	2
Journal of Asian Finance, Economics and Business	2
Journal of Business Research	2
Journal of Knowledge Management	2
Management Science Letters	2
RAE Revista de Administracao de Empresas	2
Research Policy	2
TQM Journal	2
Total Quality Management and Business Excellence	2
Technology Analysis and Strategic Management	2

Source: Own elaboration

Table 5
Theorical perspectives used.

Theories	No. of articles
Resources Based-View	33
Dynamic Capability	26
Knowledge-Based theory	3
Institutional theory	3
Social network theory	3
Transaction value approach	2
Strategic-fit paradigm	2
Management and employee perspective	1
Organizational routine framework and agency theory	1
Market-oriented organizational culture	1
Contingency theory	1
Industry base-view	1
Neo-Schumpeterian approach	1
Social capital theory	1
Social exchange theory	1
Fuzzy set theory	1

Source: Own elaboration

4.4. Dimensions of innovation capabilities

The results indicate four main types or approaches on the most referenced innovation dimensions in the 103 selected articles. The first approach, presented in Table 6, pertains to various dimensions of ICs: learning, R&D, manufacturing, marketing, and organizational, strategic and resource exploitation capabilities. These dimensions have been used in several studies to measure ICs (e.g., Guan and Ma, 2003; Jeng and Pak, 2016; Ribau et al., 2017, 2019; Yeşil and Doğan, 2019; Zimmermann et al., 2020a; Zimmermann et al., 2020b). In the study on international competitiveness, Ma and Liao (2006) use the same dimensions as Guan and Ma (2003); a new

Table 6
First approach: capability-based approach.

Author	Dimension							
	Manufacturing	R&D	Organizational	Resource exploitation	Learning	Marketing	Strategic	Other
Chen et al. (2020)	X	X	X	X	X	X	X	
Guan and Ma (2003)	X	X	X	X	X	X	X	
Guan et al. (2006)	X	X	X	X	X	X	X	
Jeng and Pak (2016)		X						
Lau et al. (2013)	X	X	X	X	X	X	X	
Lau and Lo (2019)	X	X	X	X	X	X	X	
Ma and Liao (2006)	X	X	X	X	X	X	X	X
Ribau et al. (2017)	X	X	X	X	X	X	X	
Ribau et al. (2019)	X	X	X	X	X	X	X	
Wang et al. (2008)	X	X				X		X
Yam et al. (2004)	X	X	X	X	X	X	X	
Yam et al. (2011)	X	X	X	X	X	X	X	
Yeşil and Doğan (2019)			X		X		X	
Zimmermann et al. (2020a)	X	X	X	X	X	X	X	
Zimmermann et al. (2020b)	X	X	X	X	X	X	X	

Source: Own elaboration

organization is verified by grouping them into three subgroups, namely: a) technological capability (R&D and manufacturing capability); b) management capability (organization, marketing, and strategy capabilities); and c) resource exploitation capabilities (learning technology, human resources, and financial resources capabilities).

Table 7 presents the second approach on the dimensions of ICs. This approach encompasses seven dimensions, namely: participatory leadership culture; ideation and organization structures; work climate and well-being; development of know-how; regeneration; external knowledge; and communication (Pekkola et al., 2014; Sahoo, 2019; Saunila, 2016, 2017; Saunila and Ukko, 2013, 2014; Ukko et al., 2016).

The third approach, shown in Table 8, encompasses the following dimensions: product innovation; process innovation; management innovation; marketing innovation; service innovation; administrative innovation; organizational innovation; strategic innovation; customer innovation; and technological innovation (e.g., Arias-Perez et al., 2017; Barkat et al., 2018; Dogbe et al., 2021; Fahim and Baharun, 2017; Gyedu et al., 2021; Hadj, 2019; Hogan et al., 2011; Indarti, 2017; Iranmanesh et al., 2021; Liao et al., 2015; Liao et al., 2021; Lin et al., 2010; Mahmud et al., 2017; Migdadi, 2021; Siahaan and Tan, 2020; Stelmaszczyk, 2020; Sulistyo and Ayuni, 2020; Taneo et al., 2017; Wang et al., 2020a; Verma and Rao, 2016; Vu, 2020). This approach is rooted in the categorization of innovation types as defined by the OECD (2005), although complemented with other dimensions. Moreover, Table 9 presents a diverse set of dimensions related to ICs, aligning closely to those developed by Lawson and Samson (2001) and Guan and Ma (2003), where a pronounced emphasis on the flow of innovation is evident.

The diverse approaches are clearly characterized by differing theoretical perspectives. According to Lawson and Samson (2001), who emphasize the typical RVB of the firm yielding from the firm's capability-based perspective, Guan and Ma (2003) use a more

Table 7
Second approach: Organizational-based approach.

Author	Dimension						
	Participative leadership culture	Ideation and organization structures	Work climate and well-being	Development of know-how	Regeneration	External knowledge	Communication
Pekkola et al. (2014)	X	X	X	X	X	X	X
Sahoo (2019)	X	X	X	X	X	X	X
Saunila (2016)	X	X	X	X	X	X	X
Saunila (2017)	X	X	X	X	X	X	X
Saunila and Ukko (2013)	X	X	X	X	X	X	X
Saunila and Ukko (2014)	X	X	X	X	X	X	X
Saunila et al. (2014)	X	X	X	X	X	X	X
Ukko et al. (2016)	X	X	X	X	X	X	X

Source: Own elaboration

Table 8
Third approach: OECD-based approach.

Autor	Dimension									
	Organizational innovation	Product innovation	Process innovation	Marketing innovation	Administrative innovation	Management innovation	Service innovation	Strategic innovation	Technological innovation	Customer innovation
Ali et al. (2020)	X	X	X	X						
Aljanabi (2022)						X			X	
Arias-Perez et al. (2017)	X			X					X	X
Arshad and Arshad (2019)		X	X	X	X		X			
Barkat et al. (2018)		X	X							
Dogbe et al. (2021)		X	X							
Donate et al. (2022)			X				X			
Fahim and Baharun (2017)	X	X	X	X		X				
Gyedu et al. (2021)	X	X	X	X	X		X			
Hadj (2019)		X	X							
Hanaysha (2020)		X	X	X			X			
Hogan et al. (2011)	X			X					X	X
Hudnurkar et al. (2022)		X	X			X				
Ilmudeen et al. (2020)		X	X			X				
Indarti (2012, 2017)		X	X							
Iranmanesh et al. (2021)	X	X	X	X						
Liao et al. (2015)	X	X	X	X	X		X			
Liao (2021)	X	X	X	X						
Lin et al. (2010)	X	X	X	X	X		X			
Mahmud et al. (2017)	X	X	X	X						
Migdadi (2021)	X	X	X	X	X		X			
Migdadi (2022a; 2022b)		X	X				X			
Siahaan and Tan (2020)	X			X					X	X
Stelmaszczyk (2020)		X	X			X		X		
Sulistyo and Ayuni (2020)	X	X	X	X	X		X			
Taneo et al. (2017)	X	X		X			X		X	
Verma and Rao (2016)		X	X							
Vu (2020)	X	X	X	X						
Wang, Yang et al. (2020)	X	X	X	X	X		X			
Wonglimpiyarat (2009)		X	X	X	X		X			

Source: Own elaboration

Table 9
Fourth: Other approaches.

Author	Dimension
Lawson and Samson (2001)	Vision and strategy, leveraging the skills base, organizational intelligence, creativity and idea management, organizational structure and systems, culture and climate, and technology management
Martínez-Román et al. (2011)	Knowledge, human factor and organization
Björkdahl and Börjesson (2012)	Innovation strategy, prioritization, culture, idea management, external environment and linkages, implementation, decision systems and rules, and organizational context and learning
Saunila and Ukko (2012)	Leadership and decision-making processes, organizational structures and communication, collaboration and external links, organizational culture and climate, and individual creativity and know-how
Dadfar et al. (2013)	Strategy, learning, linkages and organization
Iddris (2016)	Idea management, idea implementation, collaboration, and learning
de Vasconcelos and de Oliveira (2018), Reichert et al. (2016), Alves et al. (2017), Leo et al. (2022), Pufal and Zawislak (2022)	Development capability, operations capability, management capability, and transaction capability
Taghizadeh et al. (2018)	Innovation quality and innovation speed
Raghuvanshi et al. (2019)	Resource, process, interactive environment, and organizational attributes
Le (2020)	Radical and incremental innovation
Kolbe et al. (2021)	Innovation, strategic capability, and technology capability
Jalil et al. (2022)	Strategic planning, leadership management, and knowledge management
Dhliwayo and Chebo (2022)	Process, product, marketing, R&D and knowledge ICs
Daronco et al. (2023)	Strategy, leadership, structure and system, and culture
Kolbe et al. (2022)	New product development, innovativeness, innovation strategy, and technological innovation

Source: Own elaboration

strategically-oriented perspective, closer to the dynamic capabilities perspective. Using core and supplementary capabilities, firms can identify and perceive market opportunities and customer needs (Sensing) and capitalize on opportunities to develop innovative products, services or processes (Seizing) and reconfigure their internal resources to adapt to changing conditions through continuous learning, experimentation and adaptation to foster an innovation-oriented organization (Reconfiguring). Saunila and Ukko (2013) and Saunila (2017, 2020) use a more organizationally-driven perspective, which is particularly based on sensing and reconfiguring capabilities.

The OECD ICs perspective focuses on four key dimensions of innovation—product, process, marketing and organizational innovation—resembling an operational perspective. In this framework, marketing innovation aims to enhance market presence and brand perception, and product innovation strives to enhance product quality, enabling the firm to outpace competition through the introduction of new or improved products, services, or technologies. Organizational innovation aims to improve agility, efficiency and adaptability, fostering creativity and risk-taking behavior. Process innovation aims to reduce costs and increase operational efficiency. Unlike the perspectives exhibited in Tables 6 and 7, this approach acknowledges the dynamic nature of innovation by adopting a rather functional perspective. Finally, seeking to understand the managerial perspective, in developing innovation, several authors have resorted to technology-driven and business-driven capabilities to support technological, operational, managerial, and commercial capabilities (e.g., Alves et al., 2017; de Vasconcelos and de Oliveira, 2018; Leo et al., 2022; Pufal and Zawislak, 2022; Reichert et al., 2016).

4.5. Metrics of innovation capabilities

The constructs analyzed in the 103 identified articles exhibited considerable variability in the scales used for assessing ICs. Some metrics employ first-order dimensions containing specific items, while others rely solely on a set of items. The metrics are outlined in Appendix 1. Moreover, it is clear that the several dimensions referred to in Tables 6–9 use four different frameworks based on homogeneous items. Consequently, the analysis of IC measures was approached in two distinct manners. The first, termed "dimensions," involves considering various items that compose those dimensions as metrics for first-order IC dimensions. Tables 6–9 present ICs-structured first-order dimensions, based on the frameworks presented in the previous subsection. They covered 74 articles in our sample. The second involved analyzing the IC constructs that were based on a set of items treating a collection of questions found in the questionnaires or variable descriptions as units used to measure IC. Twenty-nine articles were included in our sample, as shown in Appendix 1.

The items represent specific descriptions relevant to a particular innovation capability, although they may not capture the essence of a first-order or higher-order construct, dimension or variable. Appendix 1 shows that 28% (29 out of the 103) of the analyzed articles utilized specific items as metrics to measure ICs. A variety of items were identified, ranging from two to fourteen.

For example, without exploring extensively into the analysis of the 29 articles that do not fit the four previously presented approaches, Parida et al. (2016) used three items to address ICs following a pioneering perspective when introducing new products/services to the market. Ganguly et al. (2019) analyze innovativeness as an outcome using six items. Racela and Thoumrungroje (2019) use a five-item metric to analyze organizational-based capabilities. Acosta-Prado et al. (2020) employed a 12-item scale to address innovation capabilities when acquiring/internalizing new technologies or R&D capabilities. Wang et al. (2020b) use 10 items

to address product, process and business model outcomes as proxies of ICs. By analyzing the aforementioned articles, it is possible to claim that some of those metrics can be associated with products, processes, and business models, which are outcomes of the innovation process. Therefore, ICs themselves are not explicitly measured. Similarly, some of the metrics represent the firm's innovation dynamism, as exemplified by the pioneering perspective posited by Parida et al. (2016), which implicitly measures ICs. However, they do not convey a seizing, sensing or reconfiguring perspective of firms regarding ICs.

Only one set of similar items was cited by four articles (Yang, 2011, 2012; Yang et al., 2006; Kurniawan et al., 2020): our knowledge and skill base are accumulating at the right pace; our company has placed emphasis on creativity through substantial investment in R&D; our company is able to identify and create new value for customers; and our company has leveraged organizational intelligence and managed technology to enhance innovation.

The results clearly indicate that ICs are evaluated not only through various dimensions but also through different items, but there are also numerous articles that eschew specific dimensions, opting instead for specific items to assess ICs. This contributes to a discourse in which innovation capabilities carry diverse meanings and metrics, leading to different understandings and realities. Moreover, on certain occasions, it is questionable whether the use of single items or untested and validated loose items could constitute a robust IC metric.

5. Discussion and conclusions

According to the findings of this SLR on ICs and in alignment with previous studies (Mendoza-Silva, 2020; Saunila, 2020), research on ICs has been growing, particularly since 2013. There is an increasing interest in innovation capabilities as a key factor for gaining competitive advantages and fostering economic and social prosperity (Guan and Ma, 2003; Lawson and Samson, 2001; Saunila, 2016, 2020; Wang and Ahmed, 2004).

Among the 103 articles reviewed, the two most prevalent theoretical approaches revolved around the RBV and dynamic capabilities, both of which are intricately linked to how innovation capabilities contribute to a firm's strategy. The RBV posits that the effective and efficient application of a firm's valuable resources plays a crucial role in determining its competitive advantage (Barney, 1991). On the other hand, the dynamic capabilities perspective supports that to attain new forms of competitive advantage, firms need to continually renew their capabilities to thrive in dynamic business environments (Eisenhardt and Martin, 2000; Teece et al., 1997). Although with different perspectives, both approaches share a common objective—maximizing a firm's competitive advantages through the effective application of resources and leveraging the firm's capabilities. This foundational understanding is reinforced by Eisenhardt and Martin (2000) and Teece et al. (1997), who assert that firms acquire and deploy their ICs as core factors contributing to superior performance.

In contrast, given the constant pace of technological change and the escalating intensity of market competition, a firm must consistently build, adapt and reconfigure its internal and external capabilities at critical junctures (Teece et al., 1997). In essence, ICs encompass both external and internal resources of the firm, according to Teece et al.'s (1997) dynamic capabilities perspective. This finding substantiates the widely advocated principle in strategic management that firms must continually adapt to the external environment to foster growth.

Firms' competitiveness has been primarily explained through two distinct theoretical lenses: the RBV and the dynamic capabilities perspective. These perspectives diverge ontologically in their view of a firm's resources. The RBV emphasizes the strategic importance of existing resources, while the dynamic capabilities perspective highlights the continuous renewal of a firm's ICs to adapt to changing environments. Axiologically, both perspectives seek to understand the knowledge that drives a firm's competitive advantage. However, their focus differs: the RBV emphasizes the static value of resources, while the dynamic capabilities perspective highlights the development and adaptation of capabilities for sustained competitiveness.

The results reveal a diverse set of IC dimensions, categorized into four approaches representing the most frequently referenced ICs. The first approach, rooted in Guan and Ma (2003), encompasses learning, R&D, manufacturing, marketing, organizational, resource exploitation and strategic capabilities (Guan and Ma, 2003; Jeng and Pak, 2016; Ribau et al., 2017; Ribau et al., 2019; Yeşil and Doğan, 2019; Zimmermann et al., 2020a; Zimmermann et al., 2020b). This approach aligns ICs with the dynamic capabilities developed by Teece et al. (1997) and provides a broader scope and more detailed description of both internal and external ICs. It distinguishes between core capabilities (R&D, manufacturing, and marketing) and supplementary (learning, organizational, resource exploitation and strategic capability) capabilities that contribute to sustained competitive advantage.

Through a dynamic capabilities lens, sensing involves identifying and understanding market opportunities and customer needs, internalized through learning and organizational capabilities. Firms achieve this by drawing upon strategic and marketing capabilities to fine-tune customer needs and technological awareness. The second stage, seizing, capitalizes on these opportunities by developing and producing innovative products. This stage requires R&D, production and resource exploitation capabilities. Finally, the reconfiguring stage involves adapting internal resources to sustain innovation. This is achieved through continuous learning, experimentation and organizational change management capabilities. This cyclical process is fostered by an innovation-oriented culture within the organization, which intertwines core and supplementary capabilities.

The second approach, derived from Saunila and Ukko (2013), includes participatory leadership culture, idea and structure organization, work climate and well-being, know-how development, regeneration, external knowledge and individual activities (Pekkola et al., 2014; Sahoo, 2019; Saunila, 2016, 2017; Saunila et al., 2014; Saunila and Ukko, 2013, 2014; Ukko et al., 2016). The focus of the ICs approach based on Saunila and Ukko (2013) centers on organizational analysis, with individuals at the forefront. In this approach, ICs concentrate on internal capabilities to add value to the organization, including its stakeholders (Saunila, 2016). This approach emphasizes internal resources and capabilities such as leadership culture, employee well-being, and knowledge development that

contribute to the pool of internal resources that underpin a firm's competitiveness. However, they are important, and although they mention knowledge development, continuous renewal or reconfiguration of capabilities, which is a key feature of dynamic capabilities, are not at the heart of this approach. As such, although marginally referring to regeneration and external knowledge, it is closer to the RBV of the firm due to its focus on leveraging internal organizational resources effectively.

The third approach, based on OECD (2005), pertains to the types of innovation, indicating the incidence or outcome of innovation. However, many researchers often employ innovation types as dimensions of ICs, such as product, process, administrative, marketing and service innovation, to assess ICs (Barkat et al., 2018; Fahim and Baharun, 2017; Indarti, 2017; Liao et al., 2015; Lin et al., 2010; Mahmud et al., 2017; Stelmaszczyk, 2020; Sulistyo and Ayuni, 2020; Taneo et al., 2017; Wang et al., 2020; Verma and Rao, 2016; Vu, 2020). However, according to OECD (2005), this approach encompasses four types of innovation, namely: product; process; marketing; and organizational innovation. Product innovation involves significant changes in the capabilities of products or services, including entirely new goods and services and significant improvements in existing ones. Process innovation represents significant changes in production and delivery methods. Organizational innovation refers to the implementation of new organizational methods, encompassing changes in business practices, workplace organizations, or external relationships. Marketing innovation involves the implementation of new marketing methods, including changes in product design, packaging, promotion, placement and pricing goods and services. Mendoza-Silva (2020) classifies these innovations based on their focus as internal (product and process innovation) and/or external (marketing and organizational innovation).

The third approach, drawing on OECD (2005) and types of innovation, overlaps with both the RBV and dynamic capabilities perspectives. Categorizing innovation by outcome (product, process, marketing, or organizational) emphasizes adapting internal capabilities to create new or improved products and processes. It also highlights reconfiguring internal (organizational) and external (marketing) relationships for better performance. While this approach does not directly address the inherent value of existing resources, a core concept of RBV, it is possible to argue that dynamic capabilities are implicitly present. The framework attempts to capture the ongoing nature of innovation through different types (product, process, marketing and organizational). Additionally, Mendoza-Silva's classification (internal vs. external) partially aligns with the dynamic capabilities perspective, as it highlights the need for firms to adapt their capabilities (product, process) and external relationships (marketing, organizational) for successful innovation. However, this third approach does not fully clarify how sensing, seizing and reconfiguring activities, which are at the gist of the dynamic capabilities perspective, influence innovation types (product, process, marketing, organizational).

The fourth approach represents a diverse set of innovation capability dimensions. However, its foundation assumes that innovation and its outcomes are the firm's main competitive strategy. These ICs involve reinforcing practices and processes within the firm (Björkdahl and Börjesson, 2012; Dadfar et al., 2013; Iddris, 2016; Jalil et al., 2022; Kolbe et al., 2021; Lawson and Samson, 2001; Le, 2020; Martínez-Román et al., 2011; Reichert et al., 2016; Taghizadeh et al., 2018). While some studies adopt a structured perspective based on dynamic capabilities, including technical and business drivers (Alves et al., 2017; Reichert et al., 2016; Zawislak et al., 2012), other studies use certain dimensions that resemble functional activities such as strategy (Dadfar et al., 2013) or strategic planning (Jalil et al., 2022). Still others consider behavioral features such as creativity, culture, idea management or learning strategy.

Ontologically, IC-based approaches (Guan and Ma, 2003; Lawson and Samson, 2001; Saunila and Ukko, 2013) aim to represent knowledge in terms of specific capabilities and dimensions that contribute to a firm's innovation. In contrast, the OECD (2005) approach represents knowledge by categorizing innovation into different types, each involving specific changes or improvements. Moreover, while the perspectives of Guan and Ma (2003) and Lawson and Samson (2001) are more strategically focused, Saunila and Ukko's (2013) IC approach is more organizationally-based. This distinction has consequences as ICs approaches recognize that innovation capabilities encompass both internal and external resources of the firm, providing insights into how firms can build, adapt, and leverage capabilities for growth. Conversely, the OECD (2005) approach, based on types of innovation, acknowledges the diversity in innovation types and their impact on a firm's competitiveness.

Axiologically, the OECD (2005) approach represents knowledge by categorizing innovation into different types, each contributing value to the firm in various ways. In contrast, the IC-based perspective represents knowledge by valuing specific capabilities that contribute to innovation, reflecting the importance of these values in a firm's strategic objectives.

Crucially, only three approaches (1, 2, and 4) delineate the dimensions of ICs, the first based on Guan and Ma (2003), the second based on Saunila and Ukko (2013), and the fourth based on Lawson and Samson (2001). These three approaches indicate that the authors are not measuring the same innovation capability, reflecting a plurality of scales and metrics. The analytical framework of each article heavily relies on the concepts and interpretative approaches of the respective researchers, resulting in a differentiated character found in the literature, making comparisons challenging. This discrepancy can be attributed, in part, to the diversity of concepts in the literature on ICs (Mendoza-Silva, 2020), where no consensus exists among the research community regarding the use of dimensions and their intrinsic concepts. Additionally, contextual research factors may contribute to this variation (Vicente et al., 2015; Wang and Ahmed, 2004).

Compared to other SLRs, our SLR presents distinct results. Iddris (2016) conducted a systematic review aimed at synthesizing articles published between 2000 and 2015, developing a conceptual framework focusing on networked firms in the supply chain. The study identified knowledge management, organizational culture, organizational learning, leadership, collaboration, creativity, idea management, innovation strategy and trust as the main dimensions of ICs. These capabilities are based on firms' general capabilities. Our SLR shows that, regardless of the companies' areas of activity, the dimensions of ICs are not standardized, and a plurality of concepts and dimensions are identified in the studies that refer to ICs. This plurality is mainly due to individualized interests and the lack of an understanding and theoretical framework on what innovation capabilities are and how these capabilities can be measured.

Saunila (2020) performed a review of the empirical literature with the aim of broadening the understanding of ICs in small firms. The review highlighted that ICs are conceptualized either as a process or an outcome influencing firm performance. Although Saunila

(2020) did not categorize ICs, our SLR identifies and organizes ICs into distinct approaches identified in the literature, also encompassing conceptual studies. Additionally, Mendoza-Silva (2020) analyzed the determinants and consequences of ICs by identifying four dimensions—product, process, organizational and marketing innovation. However, our SLR concludes that these are types of innovation and not dimensions of ICs, showcasing a nuanced difference in the interpretation of innovation-related concepts.

Tavares et al. (2021) mapped the literature on ICs in industry clusters, emphasizing collaboration networks, knowledge creation and transfer, technology development, market influence and proximity as factors responsible for the emergence of ICs. From the analysis, we conclude that there is diversity regarding the ICs found in the literature, and our SLR studies further the identification of core, supplementary, and general capabilities.

The measurement of ICs, as observed in our SLR, involves numerous constructs, with a plethora of items, constructs, and dimensions, indicating a heterogeneous understanding among researchers. For example, several authors use different four-item IC metrics (Akhavan and Hosseini, 2016; Dogbe et al., 2020; Donate et al., 2016; Yang et al., 2006; Yang, 2011, 2012; Kurniawan et al., 2020; Mazzucchelli et al., 2019; Zhang and Merchant, 2019). However, a closer look reveals that Yang et al. (2006), Yang (2011, 2012) and Kurniawan et al. (2020) consider the following IC items: our team looks for new ways of doing things; new product introduction has increased in the past 5 years; our team often tries out new ideas; and our team is often the first to market new products and services. On the other hand, Akhavan and Hosseini (2016) use the following items of ICs: our knowledge and skill base are accumulating at the right pace; our company has placed emphasis on creativity through substantial investment in R&D; our company is able to identify and create new value for customers; our company has leveraged organizational intelligence and managed technology to increase innovation. Clearly, despite using the same number of items, they are not comparable because they not only differ from each other but also have different meanings.

The metrics associated with ICs not only lack uniformity in terms of constructs, items, and dimensions but also in terms of capturing different types of innovation (Kurniawan et al., 2020; Akhavan and Hosseini, 2016), but also highlight differences in item content. As such, one can argue that researchers are trying to capture distinct innovation aspects (e.g., exploration vs. exploitation, organizational issues, R&D focus) without introducing a dynamic capabilities perspective that identifies and perceives market opportunities, capitalizing and reconfiguring them through continuous learning, experimentation and adaptation. Although most of those metrics seek to capture some innovation capabilities, they fail to capture a consistent perspective of an innovation-oriented organization.

As ontological and axiological perspectives are very pluralistically used, the associated metrics are the results of a plural understanding of the different theoretical perspectives, strategically- and organizationally-based capabilities and types of innovation. Moreover, ontological and axiological perspectives are absent, as seen from the simplistic metrics sometimes used to address ICs. Clearly, more research is needed.

Quantitative methods and questionnaires are predominantly used in empirical data collection and analysis, aligning with similar findings in studies by Iddris (2016), Mendoza-Silva (2020), and Saunila (2020). The prevalence of cross-sectional studies over longitudinal studies is noted, with the latter offering greater value in understanding temporal variations in firms' behavior regarding innovation capabilities.

Firms located in Asia, particularly China, dominate the literature, reflecting the geographical origins of the conceptualization of IC approaches. However, we found articles that studied firms located in the United States, Sweden and Finland (Iddris, 2016), Finland and China (Saunila, 2020), and Spain (Mendoza-Silva, 2020). Other studies that review the literature on ICs confirm that the Asian continent is the most studied continent (e.g., Iddris, 2016; Mendoza-Silva, 2020; Saunila, 2020), and studies that diversify geographies and make trend comparisons of IC levels across continents are needed to establish patterns of innovation easily perceived by managers and researchers that are unanimously accepted in the scientific community. A lack of studies in emerging countries is identified, particularly in Africa, due to the economic priorities focusing on immediate survival rather than on proactive long-term sustainability strategies.

This study also verifies a predominance of manufacturing firms from the most varied industrial sectors, such as the consumer goods, automotive, equipment, food, pharmaceutical, and chemical industries. Only 14 articles, accounting for 17% of the total articles analyzed, exclusively examined the reality of service companies. This trend is also evident in the conclusions of other literature reviews (e.g., Mendoza-Silva, 2020; Saunila, 2020; Tavares et al., 2021) and strongly reflects the reductionist association of the concept of innovation to the area of technological transformation and R&D, when this concept should be intrinsic to a broader scope that follows the lines of process, product, organizational, knowledge, marketing, R&D, production and business innovation. This reductionist perspective is also visible in the top 3 most used outlets of publication associated with the management of innovation and technology. More studies are therefore needed in the service area, especially with the rise of smart service firms, service-based innovation models and artificial intelligence, which can pave the way for a more transversal concept of ICs and its vital importance for any type of organization and business area. Firm size is not consistently addressed in IC research, with 64% of the articles (66 out of 103) presenting samples of firms of varied sizes, and only 25% (26 articles) focusing on SMEs. Comparative studies between large firms and SMEs could provide valuable insights into the impact on performance and innovation indicators across different firm types.

ICs are a relatively recent topic, with 89% of publications being located between the years 2011 and 2022. Perhaps because of this fact, there is still no consensus on the use of this concept and the dimensions identified for IC metrics. It is urgent that this uniformity is found in the scientific community to better support companies in finding their innovation path with greater impact on superior performance.

6. Implications and limitations

This study contributes to the literature on ICs because it identifies and analyzes the main dimensions used to measure innovation

capabilities and identifies the main theoretical approaches used as a basis in research on ICs. This study took a different approach than previous SLRs. To our knowledge, this is the first study to conduct a holistic and systematic review of IC measures identified in the literature, as previous studies focused on specific IC concepts (Iddris, 2016; Mendoza-Silva, 2020; Saunila, 2020). Thus, this study contributes to a clearer understanding of the multifaceted perspectives of IC measures in the literature, covering 103 articles. It also identifies the main theories that underlie research on ICs and opens avenues for debate within the scientific community about systematization to promote a single conceptualization of ICs, as well as regarding the most relevant dimensions for measuring IC, without any biases or particularities of each study. Only with a common base will it be possible to perform comparative studies, allowing real innovation capabilities to be gauged, which is crucial for creating a theoretical framework, not only for the conceptualization of ICs but also for the identification of their dimensions. This debate is not only aimed at theoretical contributions, as it is meant to support decision-makers of what is truly core when investing in ICs. Finally, this SLR helps to balance the few conceptual articles found in the literature on ICs, bringing to the forefront a long overdue theoretical discussion on ICs.

Pragmatically, this study reveals diverse dimensions for assessing ICs, and firms can embrace various innovation strategies that impact their overall performance. The use of IC dimensions varies, indicating that there is no one-size-fits-all formula for the effective deployment of ICs. Decision-makers must be able to discern which specific innovation capability aligns with the requirements of their businesses and leads to success. Furthermore, recognizing the multifaceted nature of ICs is beneficial for helping firms attain their optimal performance levels.

Subsequent research efforts should explore the ontological and axiological dimensions surrounding the intricacies of the innovation capability domain. An enhanced understanding could be gained by examining the diverse metrics employed to measure ICs and how these metrics align with the theoretical foundations of strategic management. There is a need to emphasize the importance of distinguishing between industrial and service-based firms. Future research should explore how distinct business and economic contexts, industries, or regions exert influence on the various dimensions and metrics involved in measuring ICs.

Comparative studies could address not only the ontological and axiological foundations of ICs across industrial and service-based firms. This could lead to integrative approaches that link specific ICs to various innovation types, acknowledging the different interpretations and levels of ICs in the literature. This analysis should differentiate between dimensions (e.g., R&D, marketing), behavioral features (e.g., creativity, learning), and outcomes (e.g., product innovation).

Further exploration of core and supplementary capabilities in the context of ICs is mandatory. Identifying essential capabilities for successful innovation and those that complement them is crucial. This could be assessed not only across industries (industrial vs. service firms) but also within them. Such research would contribute significantly to a more comprehensive understanding of service-based ICs, given the existing manufacturing and industrial focus. Expanding this research among emerging economies and service-based firms, while analyzing trends and patterns in ICs across different geographical regions, could underpin valuable cross-cultural and geographic comparisons. Such investigations could significantly contribute valuable insights into how IC-based competitive advantages are achieved across diverse industries.

Finally, future studies could explore the impact of firm size on ICs and how ICs influence performance differently across large firms and SMEs. Considering the rapidly changing business environment, it would be of added value to analyze how concepts such as open innovation, artificial intelligence and platform-based economies might influence the development and management of ICs.

The main limitation of this paper is that the sample size limited the richness of the discussion on the different perspectives and topics on the topic of innovation capabilities. Another limitation of our research is the lack of information detected in some articles on the dimensions of innovation capabilities, which made it difficult to identify the ICs of the companies studied.

Ethics statement

Not applicable because this work does not involve the use of animal or human subjects.

Declaration of competing interest

The authors declare that they have no known competing financial interestsor personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The authors are indebted to the editor and reviewers for their constructive comments.

Appendix 1. Metrics of innovation capability

Metrics of CIs		Author
Items	Technical innovation, based on research results, is readily accepted Management actively seeks innovative ideas Innovation is readily accepted in program/project management	Luo et al. (2005)

(*continued on next page*)

(*continued*)

Metrics of CIs	Author
People are penalized for new ideas that don't work	
Innovation is perceived as too risky and is resisted.	
Our knowledge and skill base are building up at the right pace	(Kurniawan et al., 2020; Yang, 2011, 2012;
Our firm placed emphasis on creativity through substantial investment in R&D	Yang et al., 2006)
Our firm is able to identify and create new value for customers	
Our firm has harnessed organizational intelligence and managed technology to increase innovation	
Our firm has an organizational culture and a management comprehension that support and encourage innovation	Akman and Yilmaz (2008)
At our firm, knowledge from different resources is used for product development activities efficiently and rapidly	
Our firm is able to reflect changes at market conditions (such as changes from customer wants, competitors' products, etc.) to own products and processes as soon as possible	
Workers of our firm are supported and encouraged to participate in activities such as product development, innovation process improvement and to produce new ideas such topics	
New ideas that come from customers, suppliers, etc., are evaluated continuously and try to include into product development activities	
Our firms could be adapted to environmental changes easily and in the short time by making suitable improvements and innovations at its products and processes	
Exploring best methods to achieve corporate goals	(Yang et al., 2009)
Regularly improve company's operational systems	
Entering into newer service routes	
Service quality management system	
Employee reward system for innovative ideas	
The development of researchers	Numprasertchai et al. (2009)
The number of publications/patents/copyrights	
The number of commercialized, industrialized products	
The number of new processes/products/services	
The success level of your research when compared with other research units	
The success level of your research when compared with your goals	
Development of new products and services	(Talaja, 2013)
Development of new production methods	
Risk-taking by key executives	
Market innovation	
Firm's innovative strategic orientation	
The level of newness (novelty) of our firm's new products	Volchek et al. (2013)
The use of the latest technological innovations in our new products	
The speed of our new product development	
The number of new products our firm has introduced to the market	
The number of our new products that are first-to-market (early market entrants)	
The level of newness (novelty) of our firm's new services	
The use of the latest methods in our new services	
The speed of our new service development	
The number of new services our firm has introduced to the market	
The number of new services that are first-to-market (early market entrants)	
The technological competitiveness of our company	
The speed with which we adopt the latest technological innovations in our processes	
The up-to-datedness or novelty of the technology used in our processes	
The rate of change in our processes, techniques, and technology	
Our organization frequently tries out new ideas and thoughts	Yesil (2014)
Our organization seeks new ways of doing things	
Our organization is creative in its operations	
Our organizations frequently provide new services	
Innovation is not favored in our organizations and is resisted (reversed coded)	
New service introduction has increased during the last five years in our organization	
Ability to develop new product/service ideas	Huhtala et al. (2014)
Exploitation of new business models	
Utilizing external stakeholders and networks in product development	
Cross-functional collaboration and information sharing	
Rapid commercialization of ideas	
Number of product/service innovations	
Ability to successfully launch new products/service	
Return on R&D investments.	
Our team seeks out new ways to do things capability	Akhavan and Hosseini (2016)
Our new product introduction has increased over the last 5 years	
Our team frequently tries out new ideas	
Our team is often the first to market with new products and service	
We have ability to take advantages of new knowledge	Singhry et al. (2016)
We have ability to work effectively with individuals within and outside our organization and internationally	
We have ability to apply continuous improvement and customer focus concepts	

(*continued on next page*)

(*continued*)

Metrics of CIs	Author
We have ability to understand the interconnectedness of supply chain management with other disciplines	
We have ability to manage incremental improvements and changes to products, processes and systems	
We have the process to adopt technological innovations to produce new products/services offerings	Yuan et al. (2016)
We have abilities to cultivate R&D activities to collect scientific research assets to develop new solutions; and We are ready to accept and apply process innovations across the functions in the organization	
We are often first to introduce new ways of working	Parida et al. (2016)
We often introduce new products and services which are at the cutting-edge of technology	
We are often first to market new products and services	
Development of new products obtained in the last 3 years	Donate et al. (2016)
Innovation in manufacturing process developed in the last 3 years	
Product improvements developed in the last 3 years	
Innovation in marketing techniques and methods developed in the last 3 years	
My company applies creative techniques in freight movement and distribution	Wang (2016)
My company regularly improves company's operational systems	
My company adopts technologies and innovative solutions for problem solving	
My company provides a parcel tracing service	
My company applies simplification of operations	
My company applies standardization of operations	
My company applies protection for freight safety and risk	
Our company frequently tries out new ideas	Shou et al. (2017)
Our company seeks out new ways to do things	
Our company is creative in its methods of operation	
Our company is often the first to market with new products and services	
Our new product/service introduction has increased over the last 5 years	
The introduction/development of new products, intermediate products or components	Delbufalo (2017)
The interventions where the technology for production or the supply of goods and services	
To seek new ways of doing things	Park et al. (2018)
To be creative in firm's operating methods	
To develop new products and services	
Perception of innovation as not risky and therefore acceptable	
Increasing introduction of new products in the last five years	
Ability to support and drive new ideas and their implementation	Agyapong et al. (2018)
Capability to apply the appropriate processes to produce new product and services	
Ability to adapt product/service and process technologies to meet future needs	
Our firm uses knowledge from different resources for product development activities efficiently and rapidly	Zhang and Merchant (2019)
Our firm supports and encourages workers to participate in activities such as product development, innovation process improvement, and idea generations	
Our firm continuously evaluates new ideas that come from customers, suppliers, etc., and include them into product development activities	
Our firm can adapt to environmental changes easily by making suitable improvements and innovations in a short time	
Our firm has the ability to gradually improve existing products/services	Dogbe et al. (2020)
Our firm has the ability to completely change existing process flow	
Our firm has the ability to rapidly provide new products/service	
Our firm has the ability to completely change existing products/services	
In the last three years, my organization's rate of introduction of new product/service has increased	Ganguly et al. (2019)
In the last three years, my organization has commercialized new product/service ideas	
In the last three years, my organization has been creative in its methods of operation	
In the last three years, my organization has developed new techniques/processes for product/service development	
In the last three years, my company has often been the first to the market with new products and services	
In the last three years, my organization has often been the first to market with new products and services	
My firm/research center has developed new products in the last three years	Mazzucchelli et al. (2019)
My firm/research center has developed innovations in manufacturing process in the last three years	
My firm/research center has developed products improvements in the last three years	
My firm/research center has developed innovations in marketing and methods in the last three years	
Develop better product designs	Racela and Thoumrungroje (2019)
Implement new ideas and changes to work	
Implement new administrative processes	
Use new ways to manage employees' productivity and morale	
Be innovative	
The firm uses the technological knowledge obtained from its relations with other firms (through cooperation agreements, alliances, research contracts, etc.)	Acosta-Prado et al. (2020)
The firm acquires knowledge through the qualified personnel hired	
The firm uses technological knowledge from databases, patents, technical reports, scientific publications, etc.	
The firm has the required hardware and software capacity to store the required technological knowledge	
The firm has the means required to codify the technological knowledge required (manuals, formulas, etc.)	
The firm obtains support from research and development centers (universities, public or private research	

(*continued on next page*)

(*continued*)

Metrics of CIs	Author
entities, etc.)	
The firm combines interdependent resources (technologies, people, etc.) to produce the required technological knowledge	
The firm invests in the acquisition of the knowledge used in its specified field(s) of action	
The technological knowledge acquired involves high degrees of novelty for the firm	
The firm uses its knowledge to develop technological products and services	
The firm's knowledge is used to develop innovative products and services	
The firm has alliances with other firms to develop new products and services	
We have expanded the number of new types around leading products over the past year	(Wang et al., 2020b)
We have improved our existing leading product process technology in the past year	
We have improved our business model from the past year	
Our business project can be used to solve problems in the target market	
The proposed business solution is able to meet the needs of the market	
We have developed new leading products in the past year	
We have developed new technologies in the past year	
We have used a lot of new technologies in the production of our products	
We have abandoned the original leading products	
Our business model has major innovations	

Sources: Own elaboration

References

Acosta-Prado, J.C., Severiche, A.K., Tafur-Mendoza, A.A., 2020. Conditions of knowledge management, innovation capability and firm performance in Colombian NTBFs: a measurement scale. VINE J. Inf. Knowl. Manag. Syst. 51 (2), 218–235. https://doi.org/10.1108/VJIKMS-09-2019-0142.

Agyapong, A., Mensah, H.K., Ayuuni, A.M., 2018. The moderating role of social network on the relationship between innovative capability and performance in the hotel industry. Int. J. Emerg. Mark. 13 (5), 801–823. https://doi.org/10.1108/IJoEM-11-2016-0293.

Akhavan, P., Hosseini, S., 2016. Social capital, knowledge sharing, and innovation capability: an empirical study of R&D teams in Iran. Technol. Anal. Strateg. Manag. 28 (1), 96–113. https://doi.org/10.1080/09537325.2015.1072622.

Akman, G., Yilmaz, C., 2008. Innovative capability, innovation strategy and market orientation: an empirical analysis in Turkish software industry. Int. J. Innovat. Manag. 12 (1), 69–111. https://doi.org/10.1142/S1363919608001923.

Ali, H., Hao, Y., Aijuan, C., 2020. Innovation capabilities and small and medium enterprises' performance: an exploratory study. J. Asian Financ. Econ. Bus. 7 (10), 959–968.

Aljanabi, A.R., 2022. The role of innovation capability in the relationship between marketing capability and new product development: evidence from the telecommunication sector. Eur. J. Innovat. Manag. 25 (1), 73–94. https://doi.org/10.1108/EJIM-04-2020-0146.

Alon, A., Elron, D., Jackson, L., 2015. Innovation: clear vision, cloudy execution, accenture 2015 US innovation survey. Available at: https://www.accenture.com/t20180705t112257z_w_/usen/_acnmedia/pdf-10/accenture-innovation-research-execsummary.pdf.

Alves, A.C., Barbieux, D., Reichert, F.M., Tello-Gamarra, J., Zawislak, P.A., 2017. Innovation and dynamic capabilities of the firm: defining an assessment model. RAE-Rev. Adm. Empres. 57 (3), 232–244. https://doi.org/10.1590/s0034-759020170304.

Arias-Perez, J., Perdomo-Charry, G., Raos, C.C., 2017. Not-Invented-Here syndrome and innovation performance: the confounding effect of innovation capabilities as organisational routines in service firms. Int. J. Innovat. Manag. 21 (1), 1750036 https://doi.org/10.1142/S1363919617500360.

Arshad, M.Z., Arshad, D., 2019. Internal capabilities and SMEs performance: a case of textile industry in Pakistan. Manage. Sci. Lett. 9 (4), 621–628. https://doi.org/10.5267/j.msl.2019.1.001.

Barkat, W., Beh, L.-S., Ahmed, A., Ahmed, R., 2018. Impact of intellectual capital on innovation capability and organizational performance: an empirical investigation. Serb. J. Manag. 13 (2), 365–379. https://doi.org/10.5937/sjm13-16997.

Barney, J., 1991. Firm resource and sustained competitive advantage. J. Manag. 17 (1), 99–120. https://doi.org/10.1177/014920639101700108.

Björkdahl, J., Börjesson, S., 2012. Assessing firm capabilities for innovation. Int. J. Knowl. Manag. Stud. 5 (1/2), 171–184. https://doi.org/10.1504/ijkms.2012.051970.

Blommerde, T., 2023. Service innovation capability: a systematic literature review and research agenda. Serv. Ind. J. 43 (15/16), 1197–1227. https://doi.org/10.1080/02642069.2023.2249830.

Bouncken, R.B., Qiu, Y., Sinkovics, N., Kürsten, W., 2021. Qualitative research: extending the range with flexible pattern matching. Rev. Manag. Sci. 15 (2), 251–273. https://doi.org/10.1007/s11846-021-00451-2.

Chandrasekaran, B., Josephson, J.R., Benjamins, V.R., 1999. What are ontologies, and why do we need them? IEEE Intell. Syst. Appl. 14 (1), 20–26. https://doi.org/10.1109/5254.747902.

Chen, Q., Wang, C.H., Huang, S.Z., 2020. Effects of organizational innovation and technological innovation capabilities on firm performance: evidence from firms in China's Pearl River Delta. Asia Pac. Bus. Rev. 26 (1), 72–96. https://doi.org/10.1080/13602381.2019.1592339.

Dadfar, H., Dahlgaard, J.J., Brege, S., Alamirhoor, A., 2013. Linkage between organisational innovation capability, product platform development and performance: the case of pharmaceutical small and medium enterprises in Iran. Total Qual. Manag. Bus. Excel. 24 (7–8), 819–834. https://doi.org/10.1080/14783363.2013.791102.

Damanpour, F., 1991. Organizational innovation: a meta-analysis of effects of determinants and moderators. Acad. Manag. J. 34 (3), 555–590. https://doi.org/10.2307/256406.

Daronco, E.L., Silva, D.S., Seibel, M.K., Cortimiglia, M.N., 2023. A new framework of firm-level innovation capability: a propensity–ability perspective. Eur. Manag. J. 41 (2), 236–250. https://doi.org/10.1016/j.emj.2022.02.002.

de Vasconcelos, R.B., de Oliveira, M.R., 2018. Determinants of innovation in micro and small enterprises: a management approach. RAE-Rev. Adm. Empres. 58 (4), 349–364. https://doi.org/10.1590/s0034-759020180402.

Delbufalo, E., 2017. The effects of suppliers' trust on manufacturers' innovation capability: an analysis of direct versus indirect relationships. Prod. Plann. Control 28 (14), 1165–1176. https://doi.org/10.1080/09537287.2017.1350766.

Dhliwayo, S., Chebo, A.K., 2022. A framework for sustainable technological innovation capability: a research and policy direction. Eur. J. Innovat. Manag. https://doi.org/10.1108/EJIM-02-2022-0085.

Dogbe, C.S., Bamfo, B.A., Pomegbe, W.W., 2021. Market orientation and new product success relationship: the role of innovation capability, absorptive capacity, green brand positioning. Int. J. Innovat. Manag. 25 (3), 1–30. https://doi.org/10.1142/S136391962150033X.

Dogbe, C.S., Tian, H.-Y., Pomegbe, W.W., Sarsah, S.A., Otoo, C.O., 2020. Market orientation and new product superiority among small and medium-sized enterprises (SMEs): the moderating role of innovation capability. Int. J. Innovat. Manag. 24 (5) https://doi.org/10.1142/S1363919620500437.
Donate, M.J., González-Mohíno, M., Paolo Appio, F., Bernhard, F., 2022. Dealing with knowledge hiding to improve innovation capabilities in the hotel industry: the unconventional role of knowledge-oriented leadership. J. Bus. Res. 144, 572–586. https://doi.org/10.1016/j.jbusres.2022.02.001.
Donate, M.J., Peña, I., Sánchez de Pablo, J.D., 2016. HRM practices for human and social capital development: effects on innovation capabilities. Int. J. Hum. Resour. Manag. 27 (9), 928–953. https://doi.org/10.1080/09585192.2015.1047393.
Eisenhardt, K., Martin, J., 2000. Dynamic capabilities: what are they? Strat. Manag. J. 21 (10/11), 1105–11121. https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E.
Fahim, N.A., Baharun, R., 2017. Analyzing the mediating effect of innovation capability on strategic orientations in agricultural Malaysia. WSEAS Trans. Bus. Econ. 14, 253–262.
Ganguly, A., Talukdar, A., Chatterjee, D., 2019. Evaluating the role of social capital, tacit knowledge sharing, knowledge quality and reciprocity in determining innovation capability of an organization. J. Knowl. Manag. 23 (6), 1105–1135. https://doi.org/10.1108/JKM-03-2018-0190.
Guan, J.C., Yam, R.C.M., Mok, C.K., Ma, N., 2006. A study of the relationship between competitiveness and technological innovation capability based on DEA models. Eur. J. Oper. Res. 170 (3), 971–986. https://doi.org/10.1016/j.ejor.2004.07.054.
Guan, J., Ma, N., 2003. Innovative capability and export performance of Chinese firms. Technovation 23, 737–747. https://doi.org/10.1016/S0166-4972(02)00013-5.
Gyedu, S., Tang, H., Ntarmah, A.H., Manu, E.K., 2021. The moderating effect of environmental turbulence on the relationship between innovation capability and business performance. Int. J. Innovat. Sci. 13 (4), 456–476. https://doi.org/10.1108/IJIS-10-2020-0189.
Hadj, T.B., 2019. What matters most for innovation capability of SMEs: structural or cognitive features of networking? Int. J. Innovat. Technol. Manag. 23 (7), 1950063 https://doi.org/10.1142/S1363919619500634.
Hanaysha, J.R., 2020. Innovation Capabilities and authentic leadership: do they really matter to firm performance? J. Asia Pac. Bus. 21 (4), 271–290. https://doi.org/10.1080/10599231.2020.1824523.
Hogan, S.J., Soutar, G.N., McColl-Kennedy, J.R., Sweeney, J.C., 2011. Reconceptualizing professional service firm innovation capability: scale development. Ind. Market. Manag. 40 (8), 1264–1273. https://doi.org/10.1016/j.indmarman.2011.10.002.
Hudnurkar, M., Ambekar, S., Bhattacharya, S., Sheorey, P.A., 2022. Relationship of total quality management with corporate sustainability in the MSME sector: does innovation capability play a mediating role? TQM J, 1754–2731. https://doi.org/10.1108/TQM-03-2022-0095.
Huhtala, J.-P., Sihvonen, A., Frösén, J., Jaakkola, M., Tikkanen, H., 2014. Market orientation, innovation capability and business performance. Baltic J. Manag. 9 (2), 134–152. https://doi.org/10.1108/bjm-03-2013-0044.
Iddris, F., 2016. Measurement of innovation capability in supply chain: an exploratory study. Int. J. Innovat. Sci. 8 (4), 331–349. https://doi.org/10.1108/IJIS-07-2016-0015.
Ilmudeen, A., Bao, Y., Alharbi, I.M., Zubair, N., 2020. Revisiting dynamic capability for organizations' innovation types: does it matter for organizational performance in China? Eur. J. Innovat. Manag. 24 (2), 507–532. https://doi.org/10.1108/EJIM-06-2019-0144.
Indarti, N., 2012. Does knowledge stickiness affect a firm's innovation capability? Empirical evidence from Indonesian furniture. Gadjah Mada Int. J. Bus. 14 (1), 17–33. https://doi.org/10.22146/gamaijb.5436.
Indarti, N., 2017. Impacts of external knowledge and interaction on innovation capability among Indonesian SMEs. Int. J. Bus. Innovat. Res. 13 (4), 430–450. https://doi.org/10.1504/IJBIR.2017.085100.
Iranmanesh, M., Mohan, K., Behzad, K., 2021. The impacts of organizational structure on operational performance through innovation capability: innovative culture as moderator. Rev. Manag. Sci. 15 (7), 1885–1911. https://doi.org/10.1007/s11846-020-00407-y.
Jalil, M.F., Ali, A., Kamarulzaman, R., 2022. Does innovation capability improve SME performance in Malaysia? The mediating effect of technology adoption. Int. J. Entrep. Innov. 23 (4), 253–267. https://doi.org/10.1177/14657503211048967.
Jeng, D.J., Pak, A., 2016. The variable effects of dynamic capability by firm size: the interaction of innovation and marketing capabilities in competitive industries. Int. Enterpren. Manag. J. 12 (1), 115–130. https://doi.org/10.1007/s11365-014-0330-7.
Jones, M.V., Coviello, N., Tang, Y.K., 2011. International entrepreneurship research (1989–2009): a domain ontology and thematic analysis. J. Bus. Ventur. 26 (6), 632–659. https://doi.org/10.1016/j.jbusvent.2011.04.001.
Kolbe, D., Calderón, H., Frasquet, M., 2021. Multichannel integration through innovation capability in manufacturing SMEs and its impact on performance. J. Bus. Ind. Market. 37 (1), 115–127. https://doi.org/10.1108/JBIM-04-2020-0204.
Kolbe, D., Frasquet, M., Calderon, H., 2022. The role of market orientation and innovation capability in export performance of small- and medium-sized enterprises: a Latin American perspective. Multinatl. Bus. Rev. 30 (2), 289–312. https://doi.org/10.1108/MBR-10-2020-0202.
Kurniawan, P., Hartati, W., Qodriah, S.L., Badawi, B., 2020. From knowledge sharing to quality performance: the role of absorptive capacity, ambidexterity and innovation capability in creative industry. Manage. Sci. Lett 10 (2), 433–442.
Lau, A.K., Baark, E., Lo, W.L., Sharif, N., 2013. The effects of innovation sources and capabilities on product competitiveness in Hong Kong and the Pearl River Delta. Asian J. Technol. Innovat. 21 (2), 220–236. https://doi.org/10.1080/19761597.2013.866313.
Lau, A.K., Lo, W., 2019. Absorptive capacity, technological innovation capability and innovation performance: an empirical study in Hong Kong. Int. J. Technol. Manag. 80 (1–2), 107–148. https://doi.org/10.1504/IJTM.2019.099750.
Lawson, B., Samson, D., 2001. Developing innovation capability in organisations: a dynamic capabilities approach. Int. J. Innovat. Manag. 5 (3), 377–400. https://doi.org/10.1142/S1363919601000427.
Le, P.B., 2020. How transformational leadership facilitates radical and incremental innovation: the mediating role of individual psychological capital. Asia-Pac. J. Bus. Adm. 12 (3/4), 205–222. https://doi.org/10.1108/APJBA-04-2020-0129.
Leo, R.M., Camboim, G.F., Avila, A.M., Reichert, F.M., Zawislak, P.A., 2022. Innovation capabilities in agribusiness: evidence from Brazil. RAUSP Manag. J. 57 (1), 65–84. https://doi.org/10.1108/RAUSP-02-2021-0019.
Liao, S.H., Hu, D.C., Shih, Y.S., 2021. Supply chain collaboration and innovation capability: the moderated mediating role of quality management. Total Qual. Manag. Bus. Excel. 32 (3–4), 298–316. https://doi.org/10.1080/14783363.2018.1552515.
Liao, S., Hu, D., Chen, C.-C., Lin, Y.-L., 2015. Comparison of competing models and multi-group analysis of organizational culture, knowledge transfer, and innovation capability: an empirical study of the Taiwan semiconductor industry. Knowl. Manag. Res. Pract. 13 (3), 248–260. https://doi.org/10.1057/kmrp.2013.46.
Lin, R.-J., Chen, R.-H., Chiu, K.K.-S., 2010. Customer relationship management and innovation capability: an empirical study. Ind. Manag. Data Syst. 110 (1), 111–133. https://doi.org/10.1108/02635571011008434.
Luo, X., Sivakumar, K., Liu, S.S., 2005. Globalization, marketing resources, and performance: evidence from China. J. Acad. Market. Sci. 33 (1), 50–65. https://doi.org/10.1177/0092070304265050.
Ma, N., Liao, M., 2006. A firm-level study of the international competitiveness: theoretical analysis and empirical findings. Int. J. Innovat. Technol. Manag. 3 (1), 21–41. https://doi.org/10.1142/s0219877006000685.
Mahmud, M., Aryanto, V.D., Hasyim, H., 2017. The effect of innovation capability and new product development on marketing performance of batik SMEs. Pol. J. Manag. Stud. 15 (2), 132–141. https://doi.org/10.17512/pjms.2017.15.2.12.
Martínez-Román, J.A., Gamero, J., Tamayo, J.A., 2011. Analysis of innovation in SMEs using an innovative capability-based non-linear model: a study in the province of Seville (Spain). Technovation 31 (9), 459–475. https://doi.org/10.1016/j.technovation.2011.05.005.
Mazzucchelli, A., Chierici, R., Tortora, D., Fontana, S., 2019. Innovation capability in geographically dispersed R&D teams: the role of social capital and IT support. J. Bus. Res. 128, 742–751. https://doi.org/10.1016/j.jbusres.2019.05.034.
Mendoza-Silva, A., 2020. Innovation capability: a systematic literature review. Eur. J. Innovat. Manag. 24 (3), 707–734. https://doi.org/10.1108/EJIM-09-2019-0263.

Migdadi, M.M., 2021. Knowledge management, customer relationship management and innovation capabilities. J. Bus. Ind. Market. 36 (1), 111–124. https://doi.org/10.1108/JBIM-12-2019-0504.
Migdadi, M.M., 2022a. Knowledge management processes, innovation capability and organizational performance. Int. J. Prod. Perform. Manag. 71 (1), 182–210. https://doi.org/10.1108/IJPPM-04-2020-0154.
Migdadi, M.M., 2022b. Social capital impact on mass customization capability and innovation capabilities: the mediating role of absorptive capacity. J. Bus. Ind. Market. 37 (12), 2488–2500. https://doi.org/10.1108/JBIM-06-2021-0312.
Mir, M., Casadesús, M., Petnji, L.H., 2016. The impact of standardized innovation management systems on innovation capability and business performance: an empirical study. J. Eng. Technol. Manag. 41, 26–44. https://doi.org/10.1016/j.jengtecman.2016.06.002.
Moreira, A.C., Navaia, E.C., Ribau, C., 2022. The importance of exploration and exploitation innovation in emerging economies. J. Open Innov Technol Mkt Complexity 8 (3), 140. https://doi.org/10.3390/joitmc8030140.
Numprasertchai, S., Kanchanasanpetch, P., Numprasertchai, H., 2009. Knowledge creation and innovation capability in the public university. Int. J. Innovat. Learn. 6 (5), 568–580.
OECD, 2005. Oslo Manual - Guidelines for Collecting and Interpreting Innovation Data. OECD Publising, Paris.
OECD/Eurostat, 2018. Oslo manual 2018: guidelines for collecting, reporting and using data on innovation. The Measurement of Scientific, Technological and Innovation Activities. OECD Publishing. https://doi.org/10.1787/9789264304604-en.
Parida, V., Oghazi, P., Cedergren, S., 2016. A study of how ICT capabilities can influence dynamic capabilities. J. Enterprise Inf. Manag. 29 (2), 179–201. http://www.tandfonline.com/doi/full/10.1080/09537325.2015.1095289.
Park, J.H., Kim, M.K., Paik, J.H., 2018. Factors influencing innovation capability of small and medium-sized enterprises in Korean manufacturing sector: facilitators, barriers and moderators. Int. J. Technol. Manag. 76 (3/4), 214. https://doi.org/10.1504/ijtm.2018.10012461.
Pekkola, S., Saunila, M., Sillanpää, V., Ukko, J., Parjanen, S., Salminen, J., Mäkimattila, M., Rantala, T., 2014. Value creation through measurement of innovation capability - an intellectual capital management perspective. Int. J. Intell. Enterprise 2 (2/3), 196–212. https://doi.org/10.1504/IJIE.2014.066675.
Pisano, G., 2015. You need an innovation strategy. Harv. Bus. Rev. 93, 44–54.
Pufal, N.A., Zawislak, P.A., 2022. Innovation capabilities and the organization of the firm: evidence from Brazil. J. Manuf. Technol. Manag. 33 (2), 287–307. https://doi.org/10.1108/JMTM-02-2021-0054.
Racela, O.C., Thoumrungroje, A., 2019. When do customer orientation and innovation capabilities matter? An investigation of contextual impacts. Asia Pac. J. Market. Logist. 32 (2), 445–472. https://doi.org/10.1108/APJML-03-2019-0143.
Raghuvanshi, J., Ghosh, P.K., Agrawal, R., 2019. Taxonomy of innovation capability framework with future directions. Int. J. Bus. Excel. 17 (3), 265–289. https://doi.org/10.1504/ijbex.2019.10019304.
Reichert, F.M., Torugsa, N.A., Zawislak, P.A., Arundel, A., 2016. Exploring innovation success recipes in low-technology firms using fuzzy-set QCA. J. Bus. Res. 69 (11), 5437–5441. https://doi.org/10.1016/j.jbusres.2016.04.151.
Ribau, C.P., Moreira, A.C., Raposo, M., 2017. SMEs innovation capabilities and export performance: an entrepreneurial orientation view. J. Bus. Econ. Manag. 18 (5), 920–934. https://doi.org/10.3846/16111699.2017.1352534.
Ribau, C.P., Moreira, A.C., Raposo, M., 2019. The role of exploitative and exploratory innovation in export performance: an analysis of plastics industry SMEs. Eur. J. Int. Manag. 13 (2), 224–246. https://doi.org/10.1504/ejim.2019.10018110.
Sahoo, S., 2019. Quality management, innovation capability and firm performance: empirical insights from Indian manufacturing SMEs. TQM J 31 (6), 1003–1027. https://doi.org/10.1108/TQM-04-2019-0092.
Saunila, M., 2016. Performance measurement approach for innovation capability in SMEs. Int. J. Prod. Perform. Manag. 65 (2), 162–176. https://doi.org/10.1108/JHOM-09-2016-0165.
Saunila, M., 2017. Innovation capability in achieving higher performance: perspectives of management and employees. Technol. Anal. Strateg. Manag. 29 (8), 903–916. https://doi.org/10.1080/09537325.2016.1259469.
Saunila, M., 2020. Innovation capability in SMEs: a systematic review of the literature. J. Innov. Knowl. 5 (4), 260–265. https://doi.org/10.1016/j.jik.2019.11.002.
Saunila, M., Pekkola, S., Ukko, J., 2014. The relationship between innovation capability and performance: the moderating effect of measurement. Int. J. Prod. Perform. Manag. 63 (2), 234–249. https://doi.org/10.1108/EL-01-2014-0022.
Saunila, M., Ukko, J., 2012. A conceptual framework for the measurement of innovation capability and its effects. Baltic J. Manag. 7 (4), 355–375. https://doi.org/10.1108/EL-01-2014-0022.
Saunila, M., Ukko, J., 2013. Facilitating innovation capability through performance measurement: a study of Finnish SMEs. Manag. Res. Rev. 36 (10), 991–1010.
Saunila, M., Ukko, J., 2014. Intangible aspects of innovation capability in SMEs: impacts of size and industry. J. Eng. Technol. Manag. 33, 32–46. https://doi.org/10.1016/j.jengtecman.2014.02.002.
Shou, Y., Shao, J., Chen, A., 2017. Relational resources and performance of Chinese third-party logistics providers. Int. J. Phys. Distrib. Logist. Manag. 47 (9), 864–883.
Siahaan, D.T., Tan, C.S., 2020. Antecedents of innovation capability and firm performance of Indonesia ICT SMEs. Asian J. Bus. Res. 10 (2), 45–71.
Singhry, H.B., Rahman, A.A., Imm, N.S., 2016. Information technology for supply chain performance: a mediated covariance modeling based on the dynamic capabilities theory. Int. Bus. Manag. 10 (9), 1768–1779.
Sinkovics, N., 2018. Pattern matching in qualitative analysis. In: Cassell, C., Cunliffe, A.L., Grandy, G. (Eds.), The Sage Handbook of Qualitative Business and Management Research Methods. Sage Publications, Thousand Oaks, US, pp. 468–485.
Stelmaszczyk, M., 2020. How absorptive capacity and organisational learning orientation interact to enable innovation capability? An empirical examination. Entrepr. Bus. Econ. Rev. 8 (1), 7–32.
Sulistyo, H., Ayuni, S., 2020. Competitive advantages of SMEs: the roles of innovation capability, entrepreneurial orientation, and social capital. Contaduría Adm. 65 (1), 1–18. https://doi.org/10.22201/fca.24488410e.2020.1983.
Taghizadeh, S.K., Rahman, S.A., Hossain, M.M., 2018. Knowledge from customer, for customer or about customer: which triggers innovation capability the most? J. Knowl. Manag. 22 (1), 162–182. https://doi.org/10.1108/JKM-12-2016-0548.
Talaja, A., 2013. Innovative capabilities, firm performance and foreign ownership: empirical analysis of large and medium-sized companies from all industries. Bus. Econ. Horiz. 9 (3), 69–78. https://doi.org/10.15208/beh.2013.14.
Taneo, S.Y., Setyaningsih, Y., Lindawati, A.S.L., 2017. Improving performance of small and medium-sized enterprises of processed food through competitive strategy, industry environment, innovation capability, and macroeconomic factors. J. Appl. Econ. Sci. 12 (4), 1175–1187.
Tavares, M.S., Gohr, C.F., Morioka, S., da Cunha, T.R., 2021. Systematic literature review on innovation capabilities in clusters. Innov. Manag. Rev. 18 (2), 192–220. https://doi.org/10.1108/INMR-12-2019-0153.
Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strat. Manag. J. 18 (7), 509–533.
Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review towards a methodology for developing evidence-informed management knowledge by means of systematic review. Brit. J. Manag. 14, 207–222. https://doi.org/10.1111/1467-8551.00375.
Ukko, J., Saunila, M., Parjanen, S., Rantala, T., Salminen, J., Pekkola, S., Mäkimattila, M., 2016. Effectiveness of innovation capability development methods. Innov.-Organ. Manag. 18 (4), 513–535. https://doi.org/10.1080/14479338.2016.1233824.
Verma, P., Rao, M.K., 2016. Organisational performance as a function of creativity components and innovation capability: an Indian perspective. Int. J. Bus. Perform. Manag. 17 (1), 44–64. https://doi.org/10.1504/IJBPM.2016.073330.
Vicente, M., Abrantes, J.L., Teixeira, M.S., 2015. Measuring innovation capability in export firms: the INNOVSCALE. Int. Market. Rev. 32 (1), 29–51. https://doi.org/10.1108/MRR-09-2015-0216.
Volchek, D., Jantunen, A., Saarenketo, S., 2013. The institutional environment for international entrepreneurship in Russia: reflections on growth decisions and performance in SMEs. J. Int. Entrep. 11 (4), 320–350. https://doi.org/10.1007/s10843-013-0115-z.

Vu, H.M., 2020. A review of dynamic capabilities, innovation capabilities, entrepreneurial capabilities and their consequences. J. Asian Financ. Econ. Bus. 7 (8), 485–494.
Wang, C.L., Ahmed, P.K., 2004. The development and validation of the organizational innovativeness construct using confirmatory factor analysis. Eur. J. Innovat. Manag. 7 (4), 303–313. https://doi.org/10.1108/14601060410565056.
Wang, C.-C., Yang, L.-R., Chang, H.-C., 2020a. Cloud platform to improve performance outcomes: role of customer relationship management and innovation capabilities. Int. J. Serv. Technol. Manag. 26 (6), 538–554. https://doi.org/10.1504/IJSTM.2020.110375.
Wang, C.-H., Lu, I.-Y., Chen, C.-B., 2008. Evaluating firm technological innovation capability under uncertainty. Technovation 28 (6), 349–363. https://doi.org/10.1016/j.technovation.2007.10.007.
Wang, L., Li, S., You, Z., 2020b. The effects of knowledge transfer on innovation capability: a moderated mediation model of absorptive capability and network reliance. J. High Technol. Manag. Res. 31, 1–13. https://doi.org/10.1016/j.hitech.2020.100372.
Wang, M., 2016. The role of innovation capability in the Australian courier industry. I Int. J. Innov. Manag. 20 (7), 1650070 https://doi.org/10.1142/S1363919616500705.
Wonglimpiyarat, J., 2009. Charting the innovation index. Int. J. Technol. Pol. Manag. 9 (4), 331–341. https://doi.org/10.1504/IJTPM.2009.032050.
Yam, R.C., Guan, J.C., Pun, K.F., Tang, E.P., 2004. An audit of technological innovation capabilities in Chinese firms: some empirical findings in Beijing, China. Res. Pol. 33 (8), 1123–1140. https://doi.org/10.1016/j.respol.2004.05.004.
Yam, R.C., Lo, W., Tang, E.P., Lau, A.K., 2011. Analysis of sources of innovation, technological innovation capabilities, and performance: an empirical study of Hong Kong manufacturing industries. Res. Pol. 40 (3), 391–402. https://doi.org/10.1016/j.respol.2010.10.013.
Yang, C.C., Marlow, P.B., Lu, C.S., 2009. Assessing resources, logistics service capabilities, innovation capabilities and the performance of container shipping services in Taiwan. Int. J. Prod. Econ. 122 (1), 4–20. https://doi.org/10.1016/j.ijpe.2009.03.016.
Yang, J., 2011. The determinants of corporate growth: evidence from Chinese high technology firms. Int. J. Technol. Manag. 56 (1), 40–52. https://doi.org/10.1504/IJTM.2011.042461.
Yang, J., 2012. Innovation capability and corporate growth: an empirical investigation in China. J. Eng. Technol. Manag. 29 (1), 34–46. https://doi.org/10.1016/j.jengtecman.2011.09.004.
Yang, J., Rui, M., Wang, J., 2006. Enhancing the firm's innovation capability through knowledge management: a study of high technology firms in China. Int. J. Technol. Manag. 36 (4), 305–317. https://doi.org/10.1504/IJTM.2006.010269.
Yesil, S., 2014. Exploring the links among organisational commitment, knowledge sharing and innovation capability in a public organisation. Eur. J. Int. Manag. 8 (5), 506–527. https://doi.org/10.1504/Ejim.2014.064602.
Yeşil, S., Doğan, I.F., 2019. Exploring the relationship between social capital, innovation capability and innovation. Innov.-Organ. Manag. 21 (4), 506–532. https://doi.org/10.1080/14479338.2019.1585187.
Yuan, X., Shin, S., He, X., Yong Kim, S., 2016. Innovation capability, marketing capability and firm performance: a two-nation study of China and Korea. Asian Bus. Manag. 15 (1), 32–56. https://doi.org/10.1057/abm.2015.17.
Zhang, M., Merchant, H., 2019. A causal analysis of the role of institutions and organizational proficiencies on the innovation capability of Chinese SMEs. Int. Bus. Rev. 29, 1–13. https://doi.org/10.1016/j.ibusrev.2019.101638.
Zawislak, P.A., Alves, A.C., Tello-Gamarra, J., Barbieux, D., Reichert, F.M., 2012. Innovation capability: from technology development to transaction capability. J. Technol. Manag. Innovat. 7 (2), 14–25. https://doi.org/10.4067/S0718-27242012000200002.
Zimmermann, R., Ferreira, L.M.D.F., Moreira, A.C., 2020a. How supply chain strategies moderate the relationship between innovation capabilities and business performance. J. Purch. Supply Manag. 26 (5), 100658 https://doi.org/10.1016/j.pursup.2020.100658.
Zimmermann, R., Moreira, A.C., Ferreira, L.M.D.F., 2020b. The effect of supply chain strategy on the relationship between innovation capabilities and business performance. A theoretical model. Int. J. Bus. Perform. Supply Chain Model. 11 (4), 291–307. https://doi.org/10.1504/IJBPSCM.2020.112722.