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Business ecosystem management: a capabilities-based view

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Abstract

The capabilities-based view is central to understanding ecosystems management. However, there is still a gap in the literature about the capabilities to manage ecosystems. This article aims to identify and map the capabilities applied to business ecosystems management. The methodology consisted of a systematic literature review gathering studies from Web of Science and Scopus databases. From 789 works analyzed, 89 connected capabilities and ecosystems. Content analysis was performed through coding, resulting in a cluster of 11 capabilities, one of which is dynamic and the other ten are operational. The results obtained include the identification, mapping and structuring of dynamic and operational capabilities for ecosystem management and their dispersion among ecosystem actors: focal firm, suppliers, and complementors. We have developed an ecosystem management capability framework, which presents dynamic capabilities as the central link and driver of the set of ecosystem capabilities, which include the capabilities for ecosystem alignment, the capabilities for sustaining the ecosystem, the capabilities for the growth of the ecosystem and the capabilities for sustaining companies in the ecosystem. The findings contribute to the management literature and practice by offering a structure of capabilities for ecosystem management, gathered in a framework that shows the implications of different capabilities in the ecosystem. In addition, the study presents suggestions for future research addressing each capability cluster.

Keywords: Ecosystems. Ecosystem management. Strategy. Dynamic capabilities. Operational capabilities.

Gestão de ecossistemas de negócios: uma visão baseada em capacidades

Resumo

A visão baseada em capacidades é central ao entendimento de como ecossistemas podem ser gerenciados. No entanto, apesar da relevância deste tema, ainda existe uma lacuna na literatura sobre as capacidades necessárias à gestão de ecossistemas. O objetivo desse artigo é identificar e mapear as capacidades aplicadas à gestão de ecossistemas de negócios. A metodologia consistiu em uma revisão sistemática da literatura considerando duas bases de dados: Web of Science e Scopus. No total, foram analisados 789 trabalhos; destes 89 fizeram a ponte entre capacidades e ecossistemas. A análise de conteúdo foi realizada por meio de codificação, resultando em um agrupamento de 11 capacidades – uma foi dinâmica e as outras dez foram operacionais. Os resultados obtidos incluem identificação, mapeamento e estruturação das capacidades dinâmicas e operacionais para a gestão do ecossistema, bem como para sua dispersão entre seus atores: firma focal, fornecedores e complementadores. Desenvolvemos um *framework* de gestão das capacidades do ecossistema, o qual apresenta a capacidade dinâmica como elo central e impulsionador do conjunto das capacidades do ecossistema, que incluem as capacidades para: o seu alinhamento, a sua sustentação, o seu crescimento e sustentação das empresas nele. Contribuímos com a literatura e prática gerencial ao apresentar uma estruturação de capacidades para gestão do ecossistema, agrupadas em um *framework* que mostra as implicações da presença das diferentes capacidades no ecossistema. Também contribuímos ao apresentar sugestões de pesquisas futuras para cada agrupamento de capacidades.

Palavras-chave: Ecossistemas. Gestão de ecossistemas. Estratégia. Capacidades dinâmicas. Capacidades operacionais.

Gestión del ecosistema empresarial: una visión basada en la capacidad

Resumen

La visión basada en capacidades es fundamental para comprender cómo se pueden gestionar los ecosistemas. Sin embargo, a pesar de la relevancia de este tema, aún existe un vacío en la literatura acerca de cuáles son las capacidades para gestionar los ecosistemas. El propósito de este artículo es identificar y mapear las capacidades aplicadas a la gestión de ecosistemas empresariales. La metodología consistió en una revisión sistemática de la literatura considerando dos bases de datos: Web of Science y Scopus. En total se analizaron 789 obras, de las cuales 89 hicieron el puente entre capacidades y ecosistemas. El análisis de contenido se realizó a través de la codificación, lo que resultó en una agrupación de 11 capacidades – una dinámica y diez operativas–. Los resultados obtenidos incluyen la identificación, mapeo y estructuración de capacidades dinámicas y operativas para la gestión del ecosistema y su dispersión entre los actores del ecosistema: empresa focal, proveedores y complementadores. Hemos desarrollado un marco de capacidades de gestión de ecosistemas, que presenta las capacidades dinámicas como el vínculo central e impulsor del conjunto de capacidades de los ecosistemas, que incluyen las capacidades para la alineación de los ecosistemas, las capacidades para sostener el ecosistema, las capacidades para el crecimiento del ecosistema y las capacidades para el sostenimiento de las empresas en el ecosistema. Contribuimos a la literatura y la práctica de gestión al presentar una estructuración de capacidades para la gestión de ecosistemas, agrupadas en un marco que muestra las implicaciones de la presencia de diferentes capacidades en el ecosistema. También contribuimos presentando sugerencias para futuras investigaciones para cada grupo de capacidades.

Palabras clave: Ecosistemas. Manejo de ecosistemas. Estrategia. Capacidades dinámicas. Capacidades operativas.

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INTRODUCTION

The growth of competition through ecosystems has implications for strategic thinking and innovation. A business ecosystem can be defined as the alignment structure of a multilateral set of partners that need to interact for a focal value proposition to materialize (Adner, 2017). In other words, ecosystems characterize collaborative interactions among their members and reinforce their co-specialization in different economic activities, which are orchestrated by a focal company (Nambisan, Zahra, & Luo, 2019). Ecosystems are oriented towards the joint creation and appropriation of value among different actors (Adner & Kapoor, 2010), enabling collaborative opportunities that significantly promote resource availability and utilization among participants (Nambisan, Lyytinen, Majchrzak, & Song, 2017). Their rise reflects a growing interest and concern for the interdependence between organizations and activities, with implications in the field of strategy and innovation, especially concerning organizational boundaries and capability development (Teece, 2020).

One problem with traditional approaches is that they do not consider competitive advantage in the context of the modern economy, where companies compete within structures of interdependence (Adner, 2017). Ecosystems offer a dynamic context, which requires the expansion of current theories (Nambisan et al., 2019). These changes make it necessary to reevaluate assumptions about competitive advantage. Therefore, analyzing business ecosystems from a capability-based view is relevant since, within an ecosystem, it is through capabilities - whether dynamic or operational (Teece, 2018; Winter, 2003) - that actors can leverage their own resources as well as those of the ecosystem through co-specialization (Kay, Leih, & Teece, 2018). This means that obtaining a competitive advantage currently demands that companies transcend their organizational boundaries and be capable of coordinating assets and capabilities throughout the ecosystem (Teece, 2020), which requires constant management and reconfiguration of complementarities (Pitelis & Teece, 2018).

The discussion of capabilities is relevant for ecosystem management. Despite its popularity in the field of organizational strategy (Teece, 2020), the capability-based view has not been deeply explored concerning ecosystem management (Farago & Borini, 2021). The literature indicates that through capabilities, companies can leverage their own resources and those of the ecosystem to gain a competitive advantage (Kay et al., 2018). This suggests that evolutionary fitness requires firms to maintain alignment with their ecosystem (Pitelis & Teece, 2018). It is observed, therefore, that capabilities are the mechanism through which it is possible to coordinate the strategic management of the ecosystem (Teece, 2020). However, the literature that bridges ecosystems and capabilities is still scarce and fragmented.

Additionally, the rise of ecosystems brings theoretical implications for the approach to strategy and innovation, especially concerning the capability-based view. While capabilities are relevant to understanding ecosystem management, the capability-based view requires new models. Competition through ecosystems occurs within structures of interdependence that the current theory does not fully cover (Adner, 2017; Nambisan et al., 2019). Therefore, it is necessary to identify and map capabilities in ecosystem management to adopt an expanded capability-based view that aligns with the new context of competition. In this case, to achieve a competitive advantage, companies need to articulate not only their internal capabilities but also those available within the ecosystem (Teece, 2020).

We also highlight the managerial implications that the capability-based approach brings to ecosystem management due to the practical relevance that ecosystems have for current competitiveness. The literature on ecosystems is still relatively recent (Adner, 2017) and lacks consolidated and effective models related to their management. The capability-based view provides a theoretical framework that can assist managers in formulating strategies (Teece, 2007) focused on the development of ecosystems that create and capture value. By developing this approach, it is possible to design methodologies and tools that facilitate executives' understanding of the role and relevance of different capabilities for ecosystem management.

Having said that, we present the research question that guided this article: What are the capabilities applied to the context of ecosystems? Based on this question, the objective of this article is to identify and map the capabilities applied to ecosystem management. This involves identifying the operational capabilities necessary for ecosystem management, as well as understanding the role of dynamic capabilities. At the same time, it is essential to map which actors are associated with the development of dynamic and operational capabilities. We employed a systematic literature review as the methodology.

The review considered two databases, Web of Science and Scopus, which yielded 89 relevant articles on the topic of capabilities and ecosystems. Based on this, a content analysis was conducted, resulting in the identification of 122 capabilities distributed among three ecosystem actors: focal firm, suppliers, and complementors. The identified capabilities were grouped into 11 categories – one being dynamic, and the remaining ten being operational capabilities.

THEORETICAL FRAMEWORK

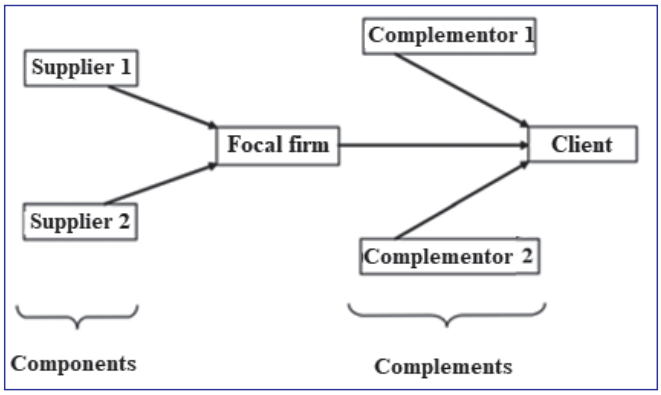
Business ecosystem

The concept of business ecosystems was initially proposed by Moore (1993) when he observed that the nature of competition is no longer company versus company but rather ecosystem versus ecosystem. There are many ways to define a business ecosystem. In general, they can be se en as an alignment structure of a set of multilateral partners that need to interact for a focal value proposition to materialize (Adner, 2017).

There are two approaches to understanding business ecosystems. The first is the "ecosystem as a structure," which adopts a view of interdependence, with configurations of activity defined by a value proposition (Adner, 2017). The second is the "ecosystem as affiliation," which is centered on communities of associated actors, defined by their networks and platform affiliations (Adner, 2017). In this article, ecosystems are understood from the perspective of the structural view, as it considers the interdependence relationships between organizations and their implications for strategy. The structural approach is more suitable for understanding the coevolution relationships between firms in an ecosystem, as it has a more holistic approach (Sant'Ana, Bermejo, Moreira, & Souza, 2020), which can explain the success of leading ecosystems (Rong, Patton, & Chen, 2018).

Business ecosystems are composed of various companies that cooperate (and compete) to create and sustain new markets and products (Teece, 2018). Ecosystems are characterized by the joint creation and appropriation of value among buyers, suppliers, complementors, and the focal firm (Adner & Kapoor, 2010). Figure 1 summarizes the ecosystem as a structure. According to Teece (2017), the focal firm is the most relevant actor as coevolution within the system often depends on its technological leadership. It provides a platform around which other members of the ecosystem align their investments and strategies, providing inputs and complementary goods. For this reason, well-established ecosystems are typically associated with a dominant focal firm (Gomes, Chaparro, Facin, & Borini, 2018). However, most innovations and value capture for customers do not occur in isolation, as suppliers and complementors play a key role (Adner, 2017).

Figure 1
Business ecosystem actors



Source: Adner and Kapoor (2010).

Understanding a firm's strategy, especially in complex, dynamic, and global environments, requires understanding the dynamic structure of its ecosystem (Basole & Park, 2018). These collaborative arrangements constitute the primary channel for combining individual firm capabilities among actors and generating solutions tailored to customer needs (Adner, 2006). In a business ecosystem, companies co-develop resources around a recent innovation: they work cooperatively and competitively to develop and support new products or services, incorporating complex innovations (Moore, 1993), so that the ecosystem can function as a means for companies to outsource their resources and production activities (Gomes, Facin, Salerno, & Ikenami, 2018).

Despite the prominence of business ecosystems in organizational strategy, the field is still emerging, and little is known about how this concept relates to theories in the field of strategy (Nambisan et al., 2017). The rise of ecosystems makes competitive advantage increasingly dependent on a firm's ability to transcend its organizational boundaries to generate value (Adner, 2006). Therefore, the analysis of business ecosystems through the capability-based view is important, as it can explain how actors develop and utilize ecosystem capabilities to gain a competitive advantage (Kay et al., 2018).

Capability-based view and business ecosystems

The capability-based view has its intellectual roots in the seminal work of Penrose (1959) and the Resource-Based View (RBV) (Barney, 1991). Originally proposed by Teece, Pisano, and Shuen (1997) in their article on dynamic capabilities, this approach was motivated by the attempt to explain how firms gain competitive advantage in turbulent environments characterized by rapid and unpredictable changes.

Capabilities can be divided into two categories: dynamic and operational (Teece, 2018). This notion stems from Winter's study (2003), which coined the term "operational capabilities" to describe the level zero capabilities through which the higher-level dynamic capabilities are conducted within firms. Operational capabilities pertain to the performance of specific organizational functions required for task accomplishment (Teece, 2007). They can be seen as high-level routines (or a set of routines) that give the organization a set of options aimed at producing a specific outcome (Winter, 2003). Several operational capabilities have been explored in the literature (Danneels, 2016); among the most common are marketing, production, human resources, and innovation capabilities. Dynamic capabilities, specifically, are necessary to transform the operational capabilities and resource base of the firm. In other words, they are responsible for renewing operational capabilities in terms of competitiveness (Teece et al., 1997; Winter, 2003).

Dynamic capabilities involve high-level activities that explain an organization's long-term competitive advantage (Teece & Leih, 2016). Teece (2007) advanced the concept of dynamic capabilities by decomposing them into three dimensions: (i) sensing: involving identification, diagnosis, development, and evaluation of the market; (ii) seizing: encompassing decision-making and resource mobilization; (iii) transforming: continuous renewal necessary to maintain competitive advantage. These three dimensions enable firms to have the ability to reconfigure their structure, processes, products, and business model to gain competitive advantage even in uncertain and rapidly changing environments (Teece & Leih, 2016).

The ability of orchestration required for coordinating assets and activities across the entire ecosystem is a critical dynamic capability (Teece, 2020). Dynamic capabilities are characterized as a systemic view of strategic management, encompassing processes for identifying, developing, and calibrating technological opportunities and managerial decision-making, asset reconfiguration, and sources of competitive advantage (Teece, 2018). Dynamic capabilities are broader and, as a result, require contextual specifications, have managerial implications, and can be applied at the unit of analysis of businesses, firms, and the ecosystem (Teece, 2020). This demands strategic alignment with the ecosystem, where complementarities need to be constantly managed and reconfigured as needed to achieve evolutionary fitness (Pitelis & Teece, 2018). Thus, "[...] firms with strong dynamic capabilities [...] not only adapt to business ecosystems but also shape them through innovation and collaboration with other companies, entities, and institutions [...]" (Teece, 2007, p. 1319). In summary, strong dynamic capabilities enable the firm to shape the surrounding business ecosystem to leverage new business models to the fullest (Schoemaker, Heaton, & Teece, 2018).

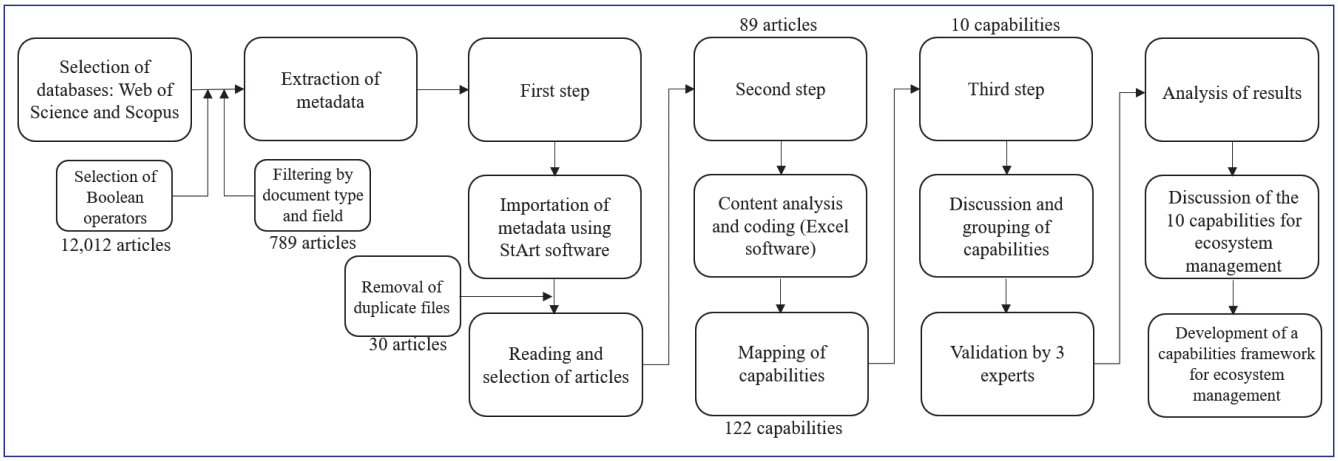
Thus, there is a relationship between capabilities and business ecosystems (Farago & Borini, 2021; Kay et al., 2018). Despite being relatively unexplored, this literature suggests that capabilities, especially dynamic capabilities, are essential for the strategic management of ecosystems (Hannah & Eisenhardt, 2018; Hou & Shi, 2020). Some scholars argue that new and specific capabilities must exist for the context of ecosystems (Farago, Borini, & Gomes, 2020; Gomes et al., 2021; Kay et al., 2018; Kolagar, Parida, & Sjödin, 2022; Teece, 2020). Under this line of investigation, it is asserted that value creation in ecosystems can be linked to specific capabilities that allow firms to transcend their organizational boundaries and collaborate, coordinate, and orchestrate with a set of external actors. However, there are open questions for understanding ecosystem management from the perspective of the capability-based view:

- What operational capabilities are essential for the management of the business ecosystem?
- What is the role of dynamic capabilities?
- Which actors within the ecosystem are associated with the development of dynamic and operational capabilities?

METHODOLOGY

This article is based on a positivist epistemology, as it adopts a view that reality is objective, and research should be based on empirical evidence (Serva, 2017). The selected methodology for this study was the systematic literature review (SLR). In this study, we understand that literature reviews allow us to identify gaps that have not yet been noticed, and research already conducted in different empirical situations and contexts can be used to propose new parameters to the research field (Matias & Farago, 2021). In this article, the proposal of a systematic literature review allows us to understand the parameters of the ecosystem management research field through the capability-based view. Thus, the intention was to cover as many published works as possible that address topics related to the subject under analysis (Matias, Silva, & Farago, 2020). To achieve this, we selected the two main international databases: Web of Science and Scopus. Both databases have a high level of scientific rigor, which provides greater quality and validity to the obtained articles. This allows us to identify trends in the field and the most cited and discussed subjects in the specialized literature. Figure 2 presents a summary of the adopted methodological procedures:

Figure 2
Adopted methodological procedures



Source: Elaborated by the authors.

During the initial stage, the terms “ecosystem” and “capabilities” were searched in English in both databases, and the Boolean operators “ecosystem*” AND “capabilit*” were also considered. In Web of Science, a topic search yielded 4,711 results. In Scopus, the search was limited to title, abstract, and keywords, returning 7,301 documents. Subsequently, a filtering process was conducted to include only peer-reviewed articles from the fields of Business, Management, Accounting, Finance, Economics, and Operations. As a result, 416 articles were selected from Web of Science, and 373 articles from Scopus, totaling a sample of 789 articles.

The first step of this study was conducted with the assistance of the State of the Art through Systematic Review (StArt) software, an open-source software developed by UFSCAR for systematic reviews. Its use is based on the fact that it allows working with considerable sample sizes, as in the case of this study. Within the software, a project was created with the results imported from the two databases. Initially, the software identified 30 duplicate articles, which were excluded from the sample. For each of the remaining 759 papers, the title, keywords, and abstract were analyzed to verify their relevance and pertinence to the topic. From the initial analysis, 89 articles were accepted and classified for the next stage. They were assigned the following levels of relevance: very low (little connection between capabilities and ecosystems); low; high; and very high. Thus, among the articles, 8 (9%) were classified as having very low relevance; 52 (58%) as low relevance; 17 (19%) as high relevance; and 12 (14%) as very high relevance. The remaining articles did not show indications of relevance to the topic of capabilities and ecosystems and were therefore eliminated from the sample.

In the second stage, the remaining 89 papers were read in full and underwent content analysis to map and extract capabilities (or indicators of) for ecosystem management. In this stage, the capabilities were coded (Krippendorff, 2018). After analyzing the 89 articles, 122 capabilities applied to ecosystems were identified, extracted from 38 articles.

Once this was done, a third and final stage was conducted with the aim of classifying and analyzing the results obtained. After discussion among the authors, the 122 identified capabilities were grouped into 11 aggregated capabilities: one characterized as dynamic, and the other 10 as operational. These capabilities were also classified according to the type of actor in the ecosystem to which they apply, following Adner and Kapoor (2010), namely, focal firm, suppliers, and complementors. The validation of the results of this content analysis was carried out by two experts in the literature of business ecosystems. During the coding stage of the articles, we observed a considerable fragmentation, meaning that different articles evaluated different capabilities from different perspectives and contexts. In light of this, we organized and categorized the literature into clusters to present basic information about the articles and the types of capabilities analyzed in the context of ecosystems.

RESULTS

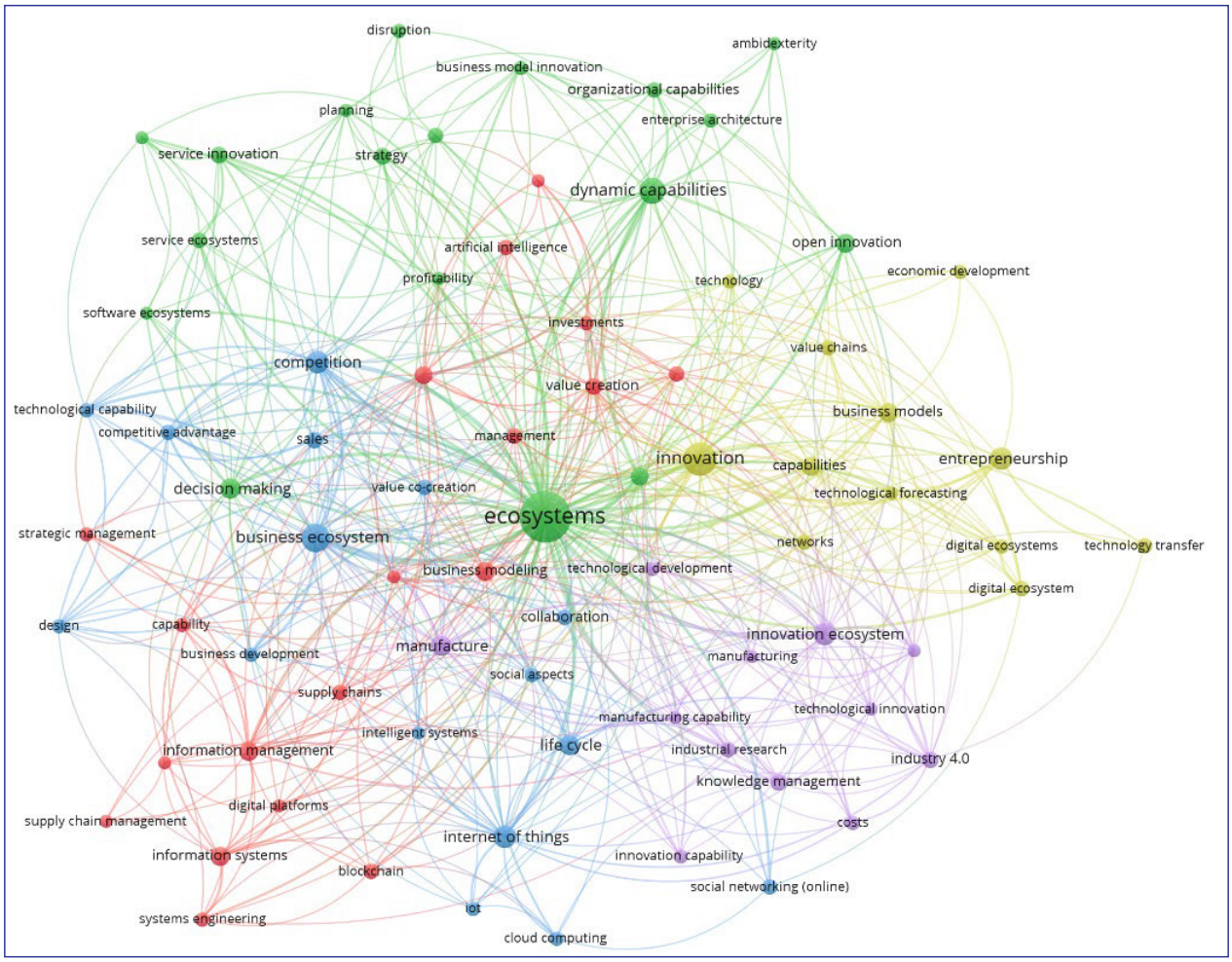
Initial mapping of capabilities for ecosystem management

We created a word map (Figure 3) of the 89 selected articles using VOSviewer software to gain an overall view of the literature and the main terms and concepts employed in the analyzed papers in our systematic review of capabilities and business ecosystems. We delimited a minimum of 10 citations for each keyword and 5 clusters to facilitate the visualization of the map.

The keywords are presented according to their frequency in the selected papers. “Ecosystem” appears at the center of the map in green, where “dynamic capabilities” can be seen as the second most frequent word, followed by other related terms such as “organizational architecture,” “innovation,” and “business model.” The blue cluster is more associated with technological capabilities, internet of things applications, and cloud computing. The red cluster is closer to production and collaboration capabilities, with terms such as information management, supply chains, and systems. The purple cluster is associated with knowledge management and value creation. Finally, in yellow, we can see words related to innovation, relationships, and entrepreneurship.

After this preliminary analysis, we present the results of the content analysis of the 89 papers from the SLR. This initial mapping was limited to our secondary objective, as it is a requirement for us to advance and define these capabilities in the context of companies operating within business ecosystem structures with interdependence, integration, and complementarity. The results of the mapping stage are presented in Table 1, which shows the capabilities extracted from the articles and their frequency by the type of actor they apply to. The first percentage in the table refers to the presence in the 89 analyzed articles, and the second percentage refers to the total of the column, showing the frequency of each capability.

Figure 3
Word map



Source: VOSviewer software using research data.

Table 1
Aggregated Capacities for Business Ecosystems

Capabilities	Focal firm	Suppliers	Complementors
Dynamic Capabilities	14 (15,7%; 23,0%)	4 (4,5%; 9,8%)	5 (5,6%; 10,6%)
Collaboration Capability	11 (12,4%; 18,0%)	6 (6,7%; 14,6%)	7 (7,9%; 14,9%)
Innovation Capability	4 (4,5%; 6,6%)	8 (8,9%; 19,5%)	10 (11,2%; 21,3%)
Knowledge Management Capability	6 (6,7%; 9,8%)	5 (5,6%; 12,2%)	5 (5,6%; 10,6%)
Financial Capability	5 (5,6%; 8,2%)	5 (5,6%; 12,2%)	5 (5,6%; 10,6%)
Organizational Capabilities	6 (6,7%; 9,8%)	4 (4,5%; 9,8%)	4 (4,5%; 8,5%)
Digital Capabilities	3 (3,4%; 4,9%)	3 (3,4%; 7,3%)	4 (4,5%; 8,5%)
Entrepreneurial Capabilities	2 (2,3%; 3,3%)	2 (2,3%; 4,9%)	3 (3,4%; 6,4%)
Production Capability	3 (3,4%; 4,9%)	2 (2,3%; 4,9%)	2 (2,3%; 4,3%)
Leadership Capability	4 (4,5%; 6,6%)	1 (1,1%; 2,4%)	1 (1,1%; 2,1%)
Market Capabilities	3 (3,4%; 4,9%)	1 (1,1%; 2,4%)	1 (1,1%; 2,1%)

Legend: The first percentage refers to the presence in the total number of articles analyzed in stage 3; the second refers to the total of the column.

Source: Elaborated by the authors.

Identifying operational and dynamic capabilities

Table 1 presents the aggregated capabilities ordered by the frequency in which they occur in the literature: dynamic capabilities; collaboration capability; innovation capability; knowledge management capability; financial capability; organizational capabilities; digital capabilities (IT); entrepreneurial capabilities; production capability; leadership capability; and market capabilities. It is possible to observe that some capabilities are more common to the focal firm (such as dynamic capabilities), while others are more present among suppliers or complementors (such as innovation capability).

Dynamic capabilities represent a firm's ability to constantly reconfigure and adapt its resource base within the ecosystem, allowing it to create more value than any individual firm could (Teece, 2007). Dynamic capabilities can explain how firms transcend their organizational boundaries (Kay et al., 2018). The dimensions of sensing, seizing, and transforming of dynamic capabilities are required in each of the four stages of an ecosystem's life cycle: birth, expansion, leadership, and self-renewal (Teece, 2017). These three dimensions are responsible for developing vibrant and entrepreneurial ecosystems (Roundy & Fayard, 2019).

Collaboration capability can be defined as an intentional, sustainable, and collaborative process of skill development among partners within an ecosystem (Hong & Snell, 2013). It enables access to and leverage of new resources, capabilities, and knowledge through the formation of partnerships between firms (Basole & Park, 2018). Collaboration capability is particularly relevant in gaining competitive advantage over competitors in rapidly changing environments by transforming business models (Wulf & Butel, 2016). One of the key characteristics of an ecosystem is its ability to provide new means of knowledge creation and partnerships for value creation and capture (Nambisan et al., 2019).

Innovation capability is also crucial in obtaining competitive advantage and can be defined as the ability to generate value through the application of knowledge to new products, services, processes, and systems (Helfat & Raubitschek, 2018). This capability enables achieving the technological parity required for building a competitive ecosystem and is especially relevant in resource-constrained economies and economic crises (Parente, Melo, Andrews, Kumaraswamy, & Vasconcelos, 2020).

Knowledge management capability can be defined as a process of building and sharing knowledge for value creation and capture within an ecosystem (Nambisan et al., 2019). Knowledge, as well as its sharing, is one of the most important resources as it enables firms to develop new capabilities and innovations, making its dissemination within the ecosystem vital (Wulf & Butel, 2016). The individual knowledge of each firm is an integral part of the ecosystem and can be leveraged through the collaborative capacity among companies (Shang, Chang, & Shi, 2012). The greater the aggregated knowledge and its sharing among members, the stronger the ecosystem becomes, and the faster it develops through its lifecycle (Song, Chen, & Ganguly, 2020).

Financial capabilities can be defined as the abilities of firms to acquire funding and make investments (Hannah & Eisenhardt, 2018). It is important to note that in an ecosystem, access to financial resources not only enables faster growth of a single company but also the entire cluster. Providing financial resources to the ecosystem is typically the responsibility of the focal firm, through financial cooperation agreements, as well as other public and private companies such as private equity firms, banks, cooperatives, and government credits (Parente et al., 2020). Financial capabilities are essential for funding new businesses, startups, and projects within the ecosystem, which can lead to the generation of innovations and inventions that may be transformed into new products and services (Velt, Torkkeli, & Saarenketo, 2018).

Organizational capabilities can be defined as the process in which companies perform activities, procedures, and practices that can trigger new capabilities (Lorenzen, 2019). These capabilities develop through learning, knowledge combination, integration, and collaboration among organizations (Hong & Snell, 2013). Social capital and culture within the ecosystem have been indicated as factors that stimulate the development of operational capabilities and entrepreneurship (Kahle, Marcon, Ghezzi, & Frank, 2020; Roundy & Fayard, 2019). Cooperation with a network of suppliers within an ecosystem would also stimulate the development of operational capabilities (Hong & Snell, 2013).

New digital technologies, such as those of Industry 4.0 (Internet of Things, artificial intelligence, digitalization, among others), have a disruptive nature and have been identified as key enablers for the development of business ecosystems and fostering their innovation (Hannibal, 2020). Digital capabilities can be defined as the ability of companies to engage in co-development and application of new digital technologies using the resources and capabilities of an ecosystem (Kahle et al., 2020). This capability has gained relevance, as technological innovation requires knowledge and capabilities that individual companies often do not possess, which highlights the importance of digital capabilities within ecosystems (Sklyar, 2019).

The density of entrepreneurs is an important indicator of the health of an ecosystem (Roundy & Fayard, 2019). Entrepreneurial capabilities refer to the overall ability of a company to detect, select, shape, and synchronize internal and external conditions and resources for the exploitation of opportunities (Abdelgawad, Zahra, Svejenova, & Sapienza, 2013). This capability also characterizes the talent to launch more innovative businesses, directly impacting the innovation ecosystem (Velt et al., 2018). Collaboration with universities contributes positively to the development of entrepreneurial and innovation capabilities within ecosystems (Schiuma & Carlucci, 2018).

Production capabilities encompass a set of processes, routines, and organizational resources that facilitate a firm's productive function. They can be defined as the routines and resources necessary for the efficient operation of a plant with a particular technology and its improvement over time, including quality control and productivity (Lorenzen, 2019). Within an ecosystem approach, there are three production capabilities: scalability, flexibility, and extensibility (Rong et al., 2018). The emergence of new technologies, such as 3D printing, has presented challenges to production systems and supply chains (Rong et al., 2018).

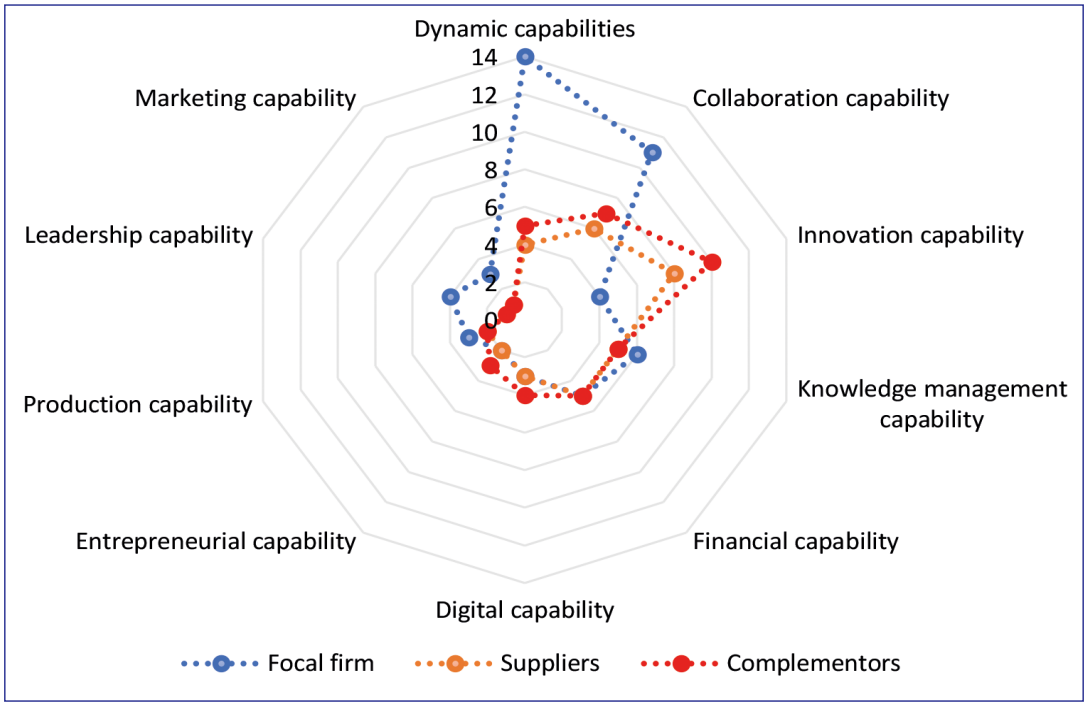
Leadership capability can be defined as the ability to consistently anticipate radical changes occurring in the industry, revising the nature of competition, and making necessary transformations (Abdelgawad et al., 2013). This capability enables the transformation of the institutional context and ecosystems around the objectives of the leading firm. When a firm aims to establish itself as a leader within an ecosystem, it needs to gain legitimacy through relationships and value distribution among other actors since the very concept of an ecosystem is based on interdependence between organisms (Moore, 1993). Developed ecosystems tend to have at least one leading company, which becomes a source of inspiration for other actors involved (Velt et al., 2018).

Market capabilities assist companies in providing personalized and enriched experiences to customers, enabling value capture (Kopalle, Kumar, & Subramaniam, 2020). They can be defined as the organization's ability to create ways of delivering value to customers (Nambisan et al., 2019). These capabilities are related to a company's market orientation, enabling the launch of new products and services focused on customer needs (Öberg & Alexander, 2019). They are also associated with the sales efforts of focal firms and can be leveraged through cooperation with complementors within ecosystems (Hannah & Eisenhardt, 2018).

Mapping the capabilities for different actors in the ecosystem

The literature review allowed us to identify that certain capabilities are often directed towards specific types of actors in the business ecosystem (Adner & Kapoor, 2010). Figure 4 presents a radar chart, where it is possible to observe which types of capabilities and actors are more associated.

Figure 4
Capabilities for ecosystem



Caption: The numbers refer to the total number of articles in the systematic review of literature (RSL) that mention each capability.

Source: Elaborated by the authors.

Focal firms

The majority of studies analyze the capabilities within focal firms. Among these, dynamic capabilities (15.7%) are prominently present, enabling leading firms to create and capture value within their ecosystem (Helfat & Raubitschek, 2018). Their crucial role in enabling startups to develop and become leaders in their ecosystem was also highlighted.

Among the operational capabilities in focal firms, the following were most frequently mentioned: collaboration capabilities, organizational capabilities, leadership capabilities, production capabilities, and marketing capabilities.

The most frequently cited among these capabilities was the collaboration capability (12.4%). In ecosystems, relationships and partnerships are often orchestrated by focal firms, but the collaborative capacity is also crucial for fostering entrepreneurship and startups' development (Ratten, 2017).

A presence of organizational capabilities (6.7%) is justified by its importance in the sustainable growth of individual companies and business ecosystems, stimulating adaptation and operational activities of firms (Pankov, Velamuri, & Schneckenberg, 2019).

The frequency of production capabilities (3.4%) can be explained by the fact that focal firms usually develop these capabilities by bringing knowledge from other countries, while startups and SMEs are more dependent on the cultural skills of their leaders (Rong et al., 2018).

The prominence of leadership capability in focal firms (4.5%) occurs because they have a dominant role in the development of ecosystems (Teece, 2017).

Marketing capabilities, although predominantly associated with focal firms, were the least cited in relation to ecosystems, despite being one of the most common in the capabilities literature (Danneels, 2016).

Complementors and suppliers

In the case of complementers, the capacities of innovation, digital, and entrepreneurship stand out. The capacity for innovation is more prevalent among complementers (21.3%) and suppliers (19.5%). Focal firms can stimulate these two capacities through training programs for suppliers and complementers, and by providing means to involve external actors in their innovation process (Schwartz & Bar-El, 2015). Strengthening SMEs, startups, and entrepreneurs acting as complementers within an ecosystem is essential for the development of the capacity for innovation (Aramo-Immonen, Leppäniemi, Soini, & Joel-Edgar, 2017).

In the literature, digital capabilities are more frequent among complementers (4.5%). These capabilities have the potential to enhance their innovative performance and that of the ecosystem, as they play a fundamental role in innovation (Kahle et al., 2020).

Furthermore, the frequency of entrepreneurial capabilities is also observed among complementers (3.4%), as they represent startups and innovative companies that offer support to the focal firm (Helfat & Raubitschek, 2018).

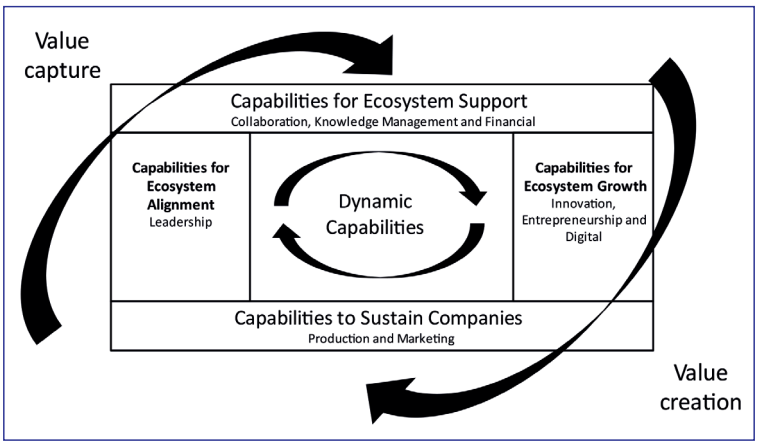
In a balanced manner, both among focal firms and among complementers and suppliers, the capacities of knowledge management and financial capabilities stand out. The capacity for knowledge management is a pillar of competitive advantage for focal firms and also for complementers and suppliers. Financial capabilities are essential for their individual development and for the ecosystem as a whole, and can be a constraint to their evolution if not sufficiently developed (Scheidgen, 2020).

DISCUSSION

The literature highlights that focal firms possess dynamic capabilities, which are responsible for reconfiguring the operational capabilities within the ecosystem (Teece, 2017). However, these capabilities are unequally distributed, as they are concentrated in focal firms. Nevertheless, for a business ecosystem to thrive, it is not sufficient for only one type of actor to possess dynamic and operational capabilities. On the contrary, managing the capabilities within the ecosystem requires a coordinated distribution of capabilities among different actors. In this case, the literature, in isolation, does not fully explain the management of capabilities in the ecosystem.

The identification and mapping undertaken in this article allows us to present an initial structuring of the capability management in the ecosystem. Figure 5 illustrates our framework, where dynamic capability is presented as the central link and driver of the set of capabilities to sustain firms and the ecosystem, as well as to align and foster the ecosystem's growth.

Figure 5
Ecosystem capabilities management framework



Source: Elaborated by the authors.

Capabilities for ecosystem alignment

The set of capabilities required for ecosystem alignment encompasses leadership and organizational capabilities. It is crucial to emphasize that alignment is central, as the ecosystem, as a structure, demands aligned interdependence among actors for value creation and capture (Adner, 2017). The leadership capability of the focal firm provides strategic purpose by giving meaning (Felin & Zenger, 2016) to the interdependent actions of ecosystem actors in value capture and creation. On one hand, the leadership capability of suppliers and complementors ensures anticipation of radical market changes. On the other hand, the organizational capability of firms is necessary for adjusting the company's structure, processes, rules, and systems to the required changes. This demands not only the focal firm but also suppliers and complementors to possess this developed capability to absorb changes more effectively and quickly. We understand that the set of capabilities for alignment impacts not only value creation but, above all, value capture in the ecosystem.

These results highlight the importance of leadership and organizational capabilities in value creation and capture within the ecosystem. Future studies could delve deeper into these topics, exploring how these capabilities can be developed and enhanced by different ecosystem actors. Additionally, the implications of these capabilities on innovation and competitiveness could be investigated to understand how the interdependent alignment of ecosystem actors can generate competitive advantages for the involved firms. The relationship between these capabilities and ecosystem performance could also be explored. Another important aspect to explore would be the role of different governance forms in promoting alignment and the development of these capabilities.

Capabilities for ecosystem sustainability

The set of capabilities for ecosystem sustainability encompasses collaboration, knowledge management, and financial capabilities. We believe that these three capabilities should be distributed among focal firms, complementors, and suppliers to ensure the sustainable interdependence of ecosystem actors (Adner & Kapoor, 2010). The focal firm needs to develop collaboration capability to lead, coordinate, and control the interdependent relationships within the ecosystem. Complementors and suppliers rely on collaboration capability for their insertion and maintenance in the ecosystem (Ratten, 2017). Since the knowledge generated within the ecosystem is dispersed, stemming from interdependent firm relationships, knowledge management capability is essential for all actors. It is crucial that knowledge generated in these relationships is not lost and can be leveraged in future interactions between the same actors. In particular, regarding knowledge transfer within the ecosystem, the focal firm tends to focus its capabilities on absorbing knowledge, while complementors and suppliers focus on disseminating knowledge. Finally, none of the actors can do without financial capability for capital mobilization and investment. In this case, the focal firm tends to be prominent in this capability, both for its maintenance and for identifying and creating opportunities for other ecosystem actors. The capabilities for ecosystem sustainability also contribute more strongly to capturing the value created within the ecosystem.

Based on this set of capabilities, future research could delve into how these capabilities can be developed and enhanced by different ecosystem actors. A possible research line would be to investigate how companies can build and manage a collaborative environment conducive to knowledge sharing and creation within the ecosystem, aiming to improve their knowledge management capability. Additionally, the implications of mobilizing financial resources for ecosystem sustainability could be investigated, seeking to understand how companies can manage and share financial resources more efficiently and equitably within the ecosystem. Another relevant issue would be to evaluate the impact of different governance forms in promoting ecosystem sustainability, considering that governance practices can significantly influence the dynamics of interaction among ecosystem actors. The relationship between these capabilities and ecosystem performance and their implications for competition between ecosystems could also be explored.

Capabilities for ecosystem growth

The set of capabilities for ecosystem growth includes innovation, entrepreneurship, and digital capabilities.

Innovation and entrepreneurship capabilities are more explored within the complementors' realm, which represents entrepreneurs and startups. Their innovation potential, however, depends not only on the focal firm, usually the leader in technology and knowledge within the ecosystem (Aramo-Immonen et al., 2017), but also on suppliers, who either direct ecosystem innovation or need to absorb innovation demands.

Digital capability is strongly associated with innovation and entrepreneurship (Farago, Denkewski, Lourenço, & Fernandes, 2019), but demands a constant learning strategy from all actors to co-develop and apply new digital technologies using ecosystem resources and capabilities. In our view, this set of capabilities plays a more prominent role in value creation within the ecosystem.

The capabilities for ecosystem growth offer various possibilities for future research. One of them would be conducting empirical studies that delve into how these capabilities are developed, managed, and utilized by different actors within the ecosystem. For instance, one can investigate how focal firms develop their innovation capabilities and share that knowledge with other actors in the ecosystem, or even how focal firms can enhance the entrepreneurial capabilities of complementors within their ecosystem. It would also be interesting to explore how the different identified capabilities interact with each other to create value in the ecosystem. For example, how innovation capabilities can be leveraged by digital capabilities or how leadership capabilities can influence collaboration capabilities. Another area of research could be to investigate how different ecosystems may require different sets of capabilities for their development and sustainability. For instance, platform companies may require a different set of capabilities compared to more traditional firm ecosystems. It would also be relevant to investigate how various contextual factors, such as the size of the ecosystem, the diversity of actors, and the complexity of interdependencies, may affect the development and utilization of the different capabilities identified in this study.

Capabilities for sustaining firms in the ecosystem

The set of capabilities for sustaining firms in the ecosystem, comprised of production and/or operational capabilities and marketing capabilities, was the least addressed, especially in terms of the marketing aspect. In our view, this lack of interest is plausible, as these capabilities are already discussed in the literature. However, they cannot be neglected by any of the actors, as the central characteristics of ecosystems include both competition and collaboration among companies. This means that companies need their marketing and production and/or operational capabilities to maintain their competitiveness in the market and enhance the ecosystem's competitiveness through collaboration with other actors. Thus, as the literature on strategy and innovation already points out, these capabilities are of great importance for value creation in the ecosystem.

Future research related to sustaining capabilities could delve deeper into how these capabilities are developed and utilized by different actors within the ecosystem, particularly by focal firms. Additionally, investigating how companies collectively improve these capabilities within the ecosystem by sharing knowledge and resources could be explored. Another interesting research area would be to investigate how marketing and production and/or operational capabilities can be leveraged within the ecosystem. For example, it can be expected that a focal firm with well-developed marketing capabilities would benefit all actors participating in its ecosystem, so that just by being part of it, actors would advantage from each other's capabilities.

Dynamic capabilities for ecosystem transformation

In our framework, dynamic capabilities play a central role, constituting the driving force for ecosystem competitiveness. They are of great relevance to focal firms, complementors, and suppliers, as dynamic capabilities reconfigure operational capabilities, enabling the ecosystem to evolve in its life cycle and competitiveness (Teece, 2017). We believe that the combination of dynamic capabilities of each actor forms a higher-order capability with the potential to improve the aggregate performance of the different interdependent actors in the ecosystem (Helfat & Raubitschek, 2018). From our perspective, the study of these dynamic capabilities represents the most promising field for the evolution of the current theoretical approach of the capability-based view.

In terms of future research, it is essential to deepen the study of dynamic capabilities, their development, and utilization by different actors within the ecosystem. One could investigate how focal firms develop their dynamic capabilities and how these capabilities reconfigure the capabilities of other ecosystem actors. Additionally, exploring how complementors can leverage the dynamic capabilities of focal firms would be beneficial. Equally important would be empirical research on how the dimensions of sensing, seizing, and transforming, as proposed by Teece (2007), manifest and contribute not only to individual firms but also to the focal value proposition of the ecosystem.

CONCLUSION

In this article, we identified and mapped the capabilities for ecosystem management, namely: dynamic capabilities, collaboration capability, innovation capability, knowledge management capability, financial capabilities, organizational capabilities, digital capabilities, entrepreneurial capabilities, production capability, leadership capability, and marketing capabilities. Based on these capabilities, we presented a framework for ecosystem capability management to demonstrate the differentiated yet aggregated dispersion for competition through ecosystems. Through these contributions, this article addressed the research question and the overall objective. The results led us to present the capabilities for alignment, sustainability, and growth of an ecosystem. The alignment capabilities involve leadership and organizational capabilities, ensuring interdependent alignment of actors in value creation and capture. The sustainability capabilities of the ecosystem involve collaboration, knowledge management, and financial capabilities, ensuring sustainable interdependence among ecosystem actors. The growth capabilities involve innovation, entrepreneurial, and digital capabilities, creating value in the ecosystem. The capabilities for the sustainability of companies within the ecosystem are the production and/or operational and marketing capabilities, crucial for maintaining and increasing companies' competitiveness within the ecosystem. Lastly, the dynamic capabilities play a central role in our framework, as they enable the transformation of all other capabilities.

Among the main limitations of this study, the first one is the selection of only two databases. While this choice is justified by considering two of the primary available databases, it may have potentially overlooked relevant works that could have been useful for this study. Additionally, as an initial study, our focus was on identifying and mapping the capabilities for ecosystem management. To accomplish this research, we decided not to delve into the dimensions, definitions, and specific details of each individual capability. We recognize that each mapped capability and its relationship with the ecosystem is complex and requires further specific studies in the future.

As suggestions for future research, we recommend empirical studies that can further expand the understanding of the development and management of the ecosystem capabilities identified and mapped in this study, as we offered a generic focus, and each capability could be explored in specific works. Future research could also explore the life cycle of the ecosystem and the capabilities that are relevant at each stage since our research did not address the different stages of ecosystem development, which could be empirically examined. Furthermore, investigations on the factors affecting the development of the capabilities identified in this article would be relevant. For example, what factors influence the capacity for collaboration in different ecosystem contexts? How can financial capabilities be developed in emerging companies in innovation ecosystems? This investigation could inform policies and strategies for capacity development in different contexts. Evaluating the impact of these identified and mapped capabilities on ecosystem performance would be another aspect to be investigated in future research. For instance, how do innovation capabilities affect ecosystem competitiveness? How do financial capabilities impact the survival of companies in the ecosystem? In which actors of the ecosystem does the presence of a specific capability improve ecosystem performance? Such evaluations could help understand how capabilities affect the ecosystem's dynamics and provide useful information for decision-making. The framework presented in this article can be empirically applied in different contexts, including different sectors, countries, and regions. This would allow for a broader comparison of the capabilities required for effective ecosystem management and help identify differences and similarities between different contexts.

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REFERENCES

Abdelgawad, S. G., Zahra, S. A., Svejenova, S., & Sapienza, H. J. (2013). Strategic leadership and entrepreneurial capability for game change. *Journal of Leadership & Organizational Studies*, *20*(4), 394-407. Retrieved from https://doi.org/10.1177/1548051813475484

Adner, R. (2006, April). Match your innovation strategy to your innovation ecosystem. *Harvard business review*, *84*(4), 98. Retrieved from https://hbr.org/2006/04/match-your-innovation-strategy-to-your-innovation-ecosystem

Adner, R. (2017). Ecosystem as structure: an actionable construct for strategy. *Journal of Management*, *43*(1), 39-58. Retrieved from https://doi.org/10.1177/0149206316678451

Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, *31*(3), 306-333. Retrieved from https://doi.org/10.1002/smj.821

Aramo-Immonen, H., Leppäniemi, J., Soini, J., & Joel-Edgar, S. (2017). Mediator's role in an innovation ecosystem. *International Journal of Business and Systems Research*, *11*(3), 229-242. Retrieved from https://doi.org/10.1504/IJBSR.2017.085467

Basole, R. C., & Park, H. (2018). Interfirm collaboration and firm value in software ecosystems: Evidence from cloud computing. *IEEE Transactions on Engineering Management*, *66*(3), 368-380. Retrieved from https://doi.org/10.1109/TEM.2018.2855401

Danneels, E. (2016). Survey measures of first- and second-order competences. *Strategic Management Journal*, *37*(10), 2174-2188. Retrieved from https://doi.org/10.1002/smj.2428

Farago, F. E., & Borini, F. M. (2021, September). Capabilities for Strategic Management of Business Ecosystems. In *Proceedings of 1º International Conference on Business, Management & Social Sciences*, Islamabad, Pakistan.

Farago, F. E., Borini, F. M., & Gomes, L. A. D. V. (2020). Gestão de ecossistemas de negócios: uma visão baseada em capacidades. In *Anais do 44º Encontro da ANPAD*, Rio de Janeiro, RJ.

Farago, F. E., Denkewski, W., Lourenço, M. L., & Fernandes, J. M. F. (2019). Dynamic capabilities, new business creation and the entrepreneur: an analysis about the La La Land film. *International Journal of entrepreneurship*, *23*(1), 1-14. Retrieved from https://www.abacademies.org/articles/Dynamic-Capabilities,-New-Business-Creation-and-the-Entrepreneur-An-Analysis-about-the-La-La-Land-Film-23-1.pdf

Felin, T., & Zenger, T. R. (2016). Strategy, Problems, and a Theory for the Firm. *Organization Science*, *27*(1), 222-231. Retrieved from https://doi.org/10.1287/orsc.2015.1022

Gomes, L. A. V., Chaparro, X. A. F., Facin, A. F. F., & Borini, F. M. (2021, October). Ecosystem management: past achievements and future promises. *Technological Forecasting and Social Change*, *171*, 120950. Retrieved from https://doi.org/10.1016/j.techfore.2021.120950

Gomes, L. A. V., Facin, A. L. F., Salerno, M. S., & Ikenami, R. K. (2018, November). Unpacking the innovation ecosystem construct: evolution, gaps and trends. *Technological Forecasting and Social Change*, *136*, 30-48. Retrieved from https://doi.org/10.1016/j.techfore.2016.11.009

Hannah, D. P., & Eisenhardt, K. M. (2018). How firms navigate cooperation and competition in nascent ecosystems. *Strategic Management Journal*, *39*(12), 3163-3192. Retrieved from https://doi.org/10.1002/smj.2750

Hannibal, M. (2020, December). The influence of additive manufacturing on early internationalization: considerations into potential avenues of IE research. *Journal of International Entrepreneurship*, *18*(4), 473-491. Retrieved from https://doi.org/10.1007/s10843-019-00267-y

Helfat, C. E., & Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Research Policy*, *47*(8), 1391-1399. Retrieved from https://doi.org/10.1016/j.respol.2018.01.019

Hong, J. F., & Snell, R. S. (2013). Developing new capabilities across a supplier network through boundary crossing: a case study of a China-based MNC subsidiary and its local suppliers. *Organization Studies*, *34*(3), 377-406. Retrieved from https://doi.org/10.1177/0170840612467154

Hou, H., & Shi, Y. (2020, February). Ecosystem-as-structure and ecosystem-as-coevolution: a constructive examination. *Technovation*, *100*, 102193. Retrieved from https://doi.org/10.1016/j.technovation.2020.102193

Kahle, J. H., Marcon, É., Ghezzi, A., & Frank, A. G. (2020, July). Smart Products value creation in SMEs innovation ecosystems. *Technological Forecasting and Social Change*, *156*, 120024. Retrieved from https://doi.org/10.1016/j.techfore.2020.120024

Kay, N. M., Leih, S., & Teece, D. J. (2018). The role of emergence in dynamic capabilities: a restatement of the framework and some possibilities for future research. *Industrial and Corporate Change*, *27*(4), 623-638. Retrieved from https://doi.org/10.1093/icc/dty015

Kolagar, M., Parida, V., & Sjödin, D. (2022). Ecosystem transformation for digital servitization: A systematic review, integrative framework, and future research agenda. *Journal of Business Research*, *146*, 176-200. Retrieved from https://doi.org/10.1016/j.jbusres.2022.03.067

Kopalle, P. K., Kumar, V., & Subramaniam, M. (2020). How legacy firms can embrace the digital ecosystem via digital customer orientation. *Journal of the Academy of Marketing Science*, *48*(1), 114-131. Retrieved from https://doi.org/10.1007/s11747-019-00694-2

Krippendorff, K. (2018). *Content analysis: an introduction to its methodology*. Thousand Oaks, CA: Sage Publications.

Lorenzen, M. (2019). How early entrants impact cluster emergence: MNEs vs. local firms in the Bangalore digital creative industries. *Management and Organization Review*, *15*(3), 495-531. Retrieved from https://doi.org/10.1017/mor.2018.53

Matias, G. P., Silva, G. R. R., & Farago, F. E. (2020). Precarization of work and migration: a review of the international literature. *Internext*, *15*(1), 19-36. Retrieved from https://doi.org/10.18568/internext.v15i1.527

Matias, G. P., & Farago, F. E. (2021). Responsabilidade social corporativa e desempenho financeiro: uma revisão sistemática da literatura internacional. *Future Studies Research Journal: Trends and*

Strategies, *13*(1), 112-128. Retrieved from https://doi.org/10.24023/FutureJournal/2175-5825/2021.v13i1.359

Moore, J. F. (1993). Predators and prey: a new ecology of competition. *Harvard Business Review*, *71*(3), 75-86. Retrieved from https://hbr.org/1993/05/predators-and-prey-a-new-ecology-of-competition

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital Innovation Management: reinventing innovation management research in a digital world. *Mis Quarterly*, *41*(1), 223-238. Retrieved from https://doi.org/10.25300/MISQ/2017/41:1.03

Nambisan, S., Zahra, S. A., & Luo, Y. (2019). Global platforms and ecosystems: Implications for international business theories. *Journal of International Business Studies*, *50*(9), 1464-1486. Retrieved from https://doi.org/10.1057/s41267-019-00262-4

Öberg, C., & Alexander, A. T. (2019). The openness of open innovation in ecosystems–integrating innovation and management literature on knowledge linkages. *Journal of Innovation & Knowledge*, *4*(4), 211-218. Retrieved from https://doi.org/10.1016/j.jik.2017.10.005

Pankov, S., Velamuri, V. K., & Schneckenberg, D. (2019, February). Towards sustainable entrepreneurial ecosystems: examining the effect of contextual factors on sustainable entrepreneurial activities in the sharing economy. *Small Business Economics*, *56*(3), 1-23. Retrieved from https://doi.org/10.1007/s11187-019-00255-5

Parente, R., Melo, M., Andrews, D., Kumaraswamy, A., & Vasconcelos, F. (2020). Public sector organizations and agricultural catch-up dilemma in emerging markets: The orchestrating role of Embrapa in Brazil. *Journal of International Business Studies*, *52*, 646-670. Retrieved from https://doi.org/10.1057/s41267-020-00325-x

Penrose, E. (1959). *The theory of the growth of the firm*. Oxford, UK: Oxford University Press.

Pitelis, C. N., & Teece, D. J. (2018). The new MNE: 'Orchestration'theory as envelope of 'Internalisation' theory. *Management International Review*, *58*(4), 523-539. Retrieved from https://doi.org/10.1007/s11575-018-0346-2

Ratten, V. (2017). Entrepreneurial universities: the role of communities, people and places. *Journal of Enterprising Communities: People and Places in the Global Economy*, *11*(3), 310-315. Retrieved from https://doi.org/10.1108/JEC-03-2017-0021

Rong, K., Lin, Y., Li, B., Burström, T., Butel, L., & Yu, J. (2018). Business ecosystem research agenda: More dynamic, more embedded, and more internationalized. *Asian Business & Management*, *17*, 167-182. Retrieved from https://doi.org/10.1057/s41291-018-0038-6

Rong, K., Patton, D., & Chen, W. (2018). Business models dynamics and business ecosystems in the emerging 3D printing industry. *Technological Forecasting and Social Change*, *134*, 234-245. Retrieved from https://doi.org/10.1016/j.techfore.2018.06.015

Roundy, P. T., & Fayard, D. (2019). Dynamic capabilities and entrepreneurial ecosystems: the micro-foundations of regional entrepreneurship. *The Journal of Entrepreneurship*, *28*(1), 94-120. Retrieved from https://doi.org/10.1177/0971355718810296

Sant'Ana, T. D., Bermejo, P. H. S., Moreira, M. F., & Souza, W. V. B. (2020). The structure of an innovation ecosystem: foundations for future research. *Management Decision*, *58*(12), 2725-2742. Retrieved from https://doi.org/10.1108/MD-03-2019-0383

Scheidgen, K. (2020). Degrees of integration: how a fragmented entrepreneurial ecosystem promotes different types of entrepreneurs. *Entrepreneurship & Regional Development*, *33*(1-2), 54-79. Retrieved from https://doi.org/10.1080/08985626.2020.1734263

Schiuma, G., & Carlucci, D. (2018, September). Managing strategic partnerships with universities in innovation ecosystems: a research agenda. *Journal of Open Innovation: Technology, Market, and Complexity*, *4*(3), 25. Retrieved from https://doi.org/10.3390/joitmc4030025

Schoemaker, P. J., Heaton, S., & Teece, D. (2018). Innovation, dynamic capabilities, and leadership. *California Management Review*, *61*(1), 15-42. Retrieved from https://doi.org/10.1177/0008125618790246

Schwartz, D., & Bar-El, R. (2015). The role of a local industry association as a catalyst for building an innovation ecosystem: an experiment in the State of Ceara in Brazil. *Innovation*, *17*(3), 383-399. Retrieved from https://doi.org/10.1080/14479338.2015.1075855

Serva, M. (2017). Epistemologia da administração no Brasil: o estado da arte. *Cadernos EBAPE.BR*, *15*(4), 741-750. Retrieved from https://doi.org/10.1590/1679-395173209

Shang, T., Chang, F., & Shi, Y. (2012). Deciphering business ecosystem capabilities of the emerging electric vehicle industry. In *IEEE International Conference on Industrial Engineering and Engineering Management*, Hong Kong, China. Retrieved from https://doi.org/10.1109/IEEM.2012.6837817

Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019, November). Organizing for digital servitization: a service ecosystem perspective. *Journal of Business Research*, *104*, 450-460. Retrieved from https://doi.org/10.1016/j.jbusres.2019.02.012

Song, H., Chen, S., & Ganguly, A. (2020). Innovative ecosystem in enhancing hi-tech SME financing: mediating role of two types of innovation capabilities. *International Journal of Innovation Management*, *24*(2), 2050017. Retrieved from https://doi.org/10.1142/S1363919620500176

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350. Retrieved from https://doi.org/10.1002/smj.640

Teece, D. J. (2017). *Entrepreneurship, Innovation, and Platforms* (Advances in Strategic Management, Vol. 37, pp. 211-225). Bingley, UK: Emerald Publishing Limited.

Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*(1), 40-49. Retrieved from https://doi.org/10.1016/j.lrp.2017.06.007

Teece, D. J. (2020). Hand in Glove: Open Innovation and the Dynamic Capabilities Framework. *Strategic Management Review*, *1*(2), 233-253. Retrieved from http://dx.doi.org/10.1561/111.00000010

Teece, D. J., & Leih, S. (2016). Uncertainty, innovation, and dynamic capabilities: an Introduction. *California Management Review*, *58*(4), 5-12. Retrieved from https://doi.org/10.1525/cmr.2016.58.4.5

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, *18*(7), 509-533. Retrieved from https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Velt, H., Torkkeli, L., & Saarenketo, S. (2018). The entrepreneurial ecosystem and born globals: the Estonian context. *Journal of Enterprising*

Communities: People and Places in the Global Economy, *12*(2), 117-138. Retrieved from https://doi.org/10.1108/JEC-08-2017-0056

Winter, S. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, *24*(10), 991-995. Retrieved from https://doi.org/10.1002/smj.318

Wulf, A., & Butel, L. (2016). Knowledge sharing and innovative corporate strategies in collaborative relationships: the potential of open strategy in business ecosystems. In S. Liu, B. Delibašić, & Oderanti, F. (Eds.), *Decision Support Systems VI - Addressing Sustainability and Societal Challenges* (Lecture Notes in Business Information Processing, Vol. 250, pp. 165-181). Cham, UK: Springer.

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Fabio Emanuel Farago: Conceptualization (Equal); Data curation (Lead); Formal Analysis (Equal); Investigation (Lead); Methodology (Lead); Writing- original draft (Equal); Writing- review & editing (Equal).

Felipe Mendes Borini: Conceptualization (Equal); Supervision (Lead); Validation (Lead); Writing- original draft (Equal); Writing- review & editing (Equal).

Leonardo Augusto Vasconcelos Gomes: Conceptualization (Equal); Funding acquisition (Lead); Project administration (Lead); Supervision (Supporting); Validation (Supporting).