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BIBLIOMETRIC ANALYSIS ON THE ORCHESTRATION OF DYNAMIC CAPABILITIES

ANÁLISE BIBLIOMÉTRICA SOBRE ORQUESTRAÇÃO DE CAPACIDADES DINÂMICAS

ANÁLISIS BIBLIOMÉTRICO SOBRE LA ORQUESTACIÓN DE CAPACIDADES DINÁMICAS

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Abstract

Purpose: The overall purpose of this article is to provide an overview of studies related to the orchestration of dynamic capabilities. The specific goal is to identify the main paths for a future research agenda.

Methodology: A bibliometric study and content analysis on Dynamic Capability Orchestration, using software MaxQda, Bibliometrix, and VosViewer. The collected data resulted in a final sample of 54 articles, published from 2003 to 2021.

Results: The results identified four clusters that unfold into 15 research lines. The clusters are: (i) Studies on Business Ecosystems; (ii) Dynamic Capabilities and their Orchestration via Micro-foundations; (iii) Internationalization; and (iv) Technology and Digitalization.

Conclusions: The analysis of the four clusters and the deepening of research paths showed a relationship between clusters, conceptual elements, and orchestration of capabilities, which are presented as a Dynamic Capability Orchestration Model, with an emphasis on the fields of strategy and innovation.

Contributions: The contributions to the studies of dynamic capability orchestration regard the presentation of research clusters that cover the field of study and show routes for future research. These clusters are linked to Business Ecosystems, Orchestration via Micro-foundations, Internationalization, and Technology and Digitalization. Within these groups, there are research flows that articulate referential concepts for creating research lines and new scientific propositions and hypotheses.

Keywords: Orchestration of dynamic capabilities. Dynamic capabilities. Asset orchestration. Systematic review.

Resumo

Objetivo: O objetivo geral deste trabalho é apresentar um panorama de pesquisas relacionadas à orquestração de capacidades dinâmicas. Já o objetivo específico é identificar os principais caminhos para a realização de uma agenda para pesquisas futuras.

Metodologia: Estudo bibliométrico e análise de conteúdo sobre o tema Orquestração de Capacidades Dinâmicas com a utilização dos softwares: MaxQda, Bibliometrix e VosViewer. Os dados coletados representam uma amostra final de 54 artigos no período de 2003 e 2021.

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Resultados: Os resultados identificaram quatro clusters que se desdobram em 15 fluxos de pesquisa. Os clusters de pesquisa identificados são: (i) Estudos sobre Ecossistemas de Negócios, (ii) Capacidades Dinâmicas e sua Orquestração Via Microfundamentos; (iii) Internacionalização; e (iv) Tecnologia e Digitalização.
Conclusões: A análise dos clusters e aprofundamento nos caminhos de pesquisa, mostrou que existe uma relação entre os clusters, elementos conceituais e orquestração de capacidades que são apresentados em formato de um Modelo de Orquestração de Capacidades Dinâmicas estressado no campo da estratégia e inovação.
Contribuições: Para os estudos de orquestração de capacidades dinâmicas, reside na apresentação de clusters de pesquisa que distribuem o campo de estudo e apresentam caminhos para pesquisas futuras. Estes clusters estão ligados a Ecossistemas de Negócios, Orquestração via Microfundamentos, Internacionalização e Tecnologia e Digitalização. Dentro destes clusters encontram-se fluxos de pesquisas que articulam conceitos referenciais para a criação de linhas de pesquisa e novas proposições e hipóteses científicas.

Palavras-chave: Orquestração de capacidades dinâmicas. Capacidades dinâmicas. Orquestração de ativos. Revisão sistemática.

Resumen
Objetivo: El presente trabajo tiene como propósito presentar una visión general de la literatura relacionada con la orquestación de capacidades dinámicas por intermedio de la identificación de los principales caminos evidenciados por la clusterización y los elementos conceptuales para la realización de una agenda para futuras investigaciones.
Metodología: Estudio bibliométrico y análisis de contenido sobre la orquestación temática de capacidades dinámicas con el uso de software: MaxQda, Bibliometrix y VosViewer. Como resultado se representa una muestra final de 54 artículos en el periodo 2003 y 2021.
Originalidad: Este estudio se basa en la comprensión de las diferentes formas de utilizar los microfundamentos a partir de la orquestación de capacidades dinámicas para los campos de la estrategia y la innovación.
Resultados: Se identificaron cuatro clusters como categorías de investigación, que se despliegan en 15 subcategorías. Así, son esos los flujos de investigación para proponer una agenda futura: (i) estudios sobre ecosistemas empresariales, (ii) capacidades dinámicas y su orquestación por microfundamentos; iii) internacionalización; y iv) tecnología y digitalización.
Conclusiones: El análisis de clusters y profundización en las rutas de investigación mostró que existe una relación entre la clusterización, elementos conceptuales y orquestación de capacidades que resultó en un modelo de orquestación de capacidades dinámicas para el campo de la estrategia y la innovación.
Contribuciones: El progreso se revela a través de grupos de investigación que distribuyen el campo de estudio en la presentación de nuevos caminos y preguntas para futuras líneas de investigación más allá del modelo teórico para los ecosistemas empresariales.

Palabras clave: Orquestación. Capacidades dinámicas. Orquestación de recursos. Orquestación de capacidades dinámicas. Análisis bibliométrica.

1 Introduction

The study on Orchestration is part of the seminal research field of Dynamic Capabilities (Teece, Pisano & Shuen, 1997; Helfat & Peteraf, 2015), described as an organization's ability to seek, integrate, build, and reconfigure internal and external competencies, in order to deal with dynamic environments, in constant and quick transformation (Shuen, Feiler & Teece, 2014). From this definition, dynamic capabilities gave rise to several studies that address their

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impacts on innovation, the types of capacities, their applications, consequences, and managerial processes (Teece *et al.*, 1997; Agarwal & Selen, 2013; Helfat & Peteraf, 2015).

Among such studies, the research field on Orchestration of Dynamic Capabilities emerged, as the simultaneous search for exploiting and seizing opportunities requires agility and change of organizational processes (O'Reilly III & Tushman, 2011; Yoshikawa *et al.*, 2020). It comprises the search, configuration, and change of groups of tangible and intangible assets, routines, and competencies to generate competitive advantage and increase organizational performance (Helfat & Peteraf, 2015). The orchestration process refers to the management of companies' capabilities via micro-foundations, to generate new capabilities and organizational agility within business ecosystems (Shuen *et al.*, 2014).

The literature on Dynamic Capability Orchestration covers studies on business ecosystems that investigate the relationship between different ecosystems and capacity building (Pitelis & Teece, 2018; Linde *et al.*, 2021). Micro-foundations have a key role in the strategic articulation for leveraging entrepreneurial resources and generating innovations, through new capabilities that enable reconfiguring business models of different types of firms (Sirmon & Hitt, 2009; Helfat & Peteraf, 2015; Brink, 2019).

Orchestration of Dynamic Capabilities also covers internationalization studies that address process internalization and capacity reconfiguration as catalysts for entrepreneurship and innovation (Shuen *et al.*, 2014; Tasheva & Nielsen, 2020), in addition to exploring the dynamics of knowledge management in the matrix structures of meta-multinational firms (Lesserd, Teece & Leih, 2016). In the field of Information Technology and Digitalization, reconfiguring resources for building and adopting new technologies to improve firm performance is also addressed under the theoretical lens of Capacity Orchestration (Helfat & Raubitschek, 2018; Lee & Kim, 2021).

The academic production shows a large increase in the number of articles involving orchestration of dynamic capabilities, in parallel with the growth of this research topic (Hayter & Cahoy, 2018). Thus, the need to organize future research trends by aligning research agendas and suggestions for seminal papers becomes relevant. Based on this context, we defined the research question: "*What is the current overview of research on orchestration of dynamic capabilities?*", which led us to the general objective of the article - to survey the studies related to this topic, through a bibliometric study and content analysis. The specific objective was to identify the main paths for building an agenda for future research.

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The research gap that the paper aimed to fill regards understanding the different ways of using the foundations of dynamic capability orchestration for studies on strategy and innovation (Helfat & Peteraf, 2015; Helfat & Raubitscheck, 2018; Linde *et al.*, 2021). The field is maturing and has grown continuously over the past five years (Pitelis & Teece, 2018; Hayter & Cahoy, 2018; Rui & Bruyaka, 2021), requiring organization and systematization, so that researchers can explore new forms, under new theoretical lenses and methodological approaches (Tasheva & Nielsen, 2020).

The scientific contribution of this paper to the studies on orchestration of dynamic capabilities lies in presenting clusters that cover the field of study and show routes for future research. These clusters are linked to Business Ecosystems, Orchestration via micro-foundations, Internationalization, and Technology and Digitalization. Within each cluster there are research flows that articulate referential concepts for the creation of research lines and new scientific propositions and hypotheses. Furthermore, we contribute to expand the literature on the topic, by synthesizing and explaining the concept, and showing the difference between Orchestration of Dynamic Capabilities and Asset Orchestration.

2.Theoretical background

2.1 Orchestration of dynamic capabilities

Orchestration of Dynamic Capabilities is the configuration, modification, and integration of groups of tangible and intangible assets, routines, and competencies, to generate competitive advantages aligned with organizations' goals (Helfat & Peteraf, 2015). Especially in continuously changing environments, coordination and reconfiguration of strategies and business models are essential for the effectiveness of innovation management and for increasing organizational performance. Orchestration takes place through the management of companies' capabilities via micro-foundations, for generating new capabilities and organizational agility within business ecosystems (Shuen *et al.*, 2014).

2.1.1 Orchestration of assets x orchestration of dynamic capabilities

Regardless of the industry, companies seek to develop maturity in processes and improve the perception of strategic advantages. This is initially established through past experiences and anticipatory behavior, which can be perceived and articulated to capture, generate, and develop sustainable value for the organization (Pitelis & Teece, 2018). The

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impulse caused by innovation and rapid change creates needs for companies to orchestrate their resources, in order to achieve better outputs. Prior to the theory that addressed the term 'orchestration', Pitelis (2007) already mentioned the development resulting from past experiences that turned into proactive actions.

Studies on orchestration are recent in the literature. Teece (2007, 2014) pioneered this field by developing the topic, and fostered the interest of other researchers, like Helfat & Peteraf (2015), who addressed competitive advantages, and Shuen *et al.* (2014), who explored firm performance. The concept of orchestration is described by the ability to combine technology and resources to develop new products and processes, locally and globally, and is critical for creating strategic business competitiveness, especially in the digital age (Lessard *et al.*, 2016). Additionally, proper asset orchestration leverages strategic and competitive positioning, and is considered effective only by promoting value creation (Lessard *et al.*, 2016; Teece, Peteraf & Leih, 2016).

Since orchestration is similar to the behavior of a conductor in a leading position for achieving congruence (Nadler & Tushman, 1980), he/she is responsible for orchestrating the resources and assets that are core elements for creating new organizational processes and routines (Teece, 2007). According to Helfat *et al.* (2007), asset orchestration is the selection, configuration, change, and creation of tangible and intangible assets. It seeks the enhancement and adaptation of assets through innovation and organizational learning, and by acquiring resources (Helfat & Peteraf, 2015).

On the other hand, the orchestration theory, observed through the lens of dynamic capabilities, helps understanding several phenomena, including technology-based companies. However, the literature still does not show a consensus on the theory of dynamic capability orchestration. Pitelis and Teece (2018) present the concepts of asset orchestration, but these are insufficient to encompass all the nuances of the orchestration theory, as it is broader and includes dynamic capabilities and entrepreneurs' cognitive competencies. The relevance of these competencies in the orchestration theory was shown by Sirmon and Hitt (2009) and Helfat and Peteraf (2015); however, none of these authors explained the construct "orchestration of dynamic capabilities" and its contribution to asset orchestration.

Next, we present a potential definition for orchestration of dynamic capabilities, based on the systematic reading of articles related to orchestration. Therefore, we understand that orchestration of dynamic capabilities involves the creation and co-creation of the decision-making context. Thus, it improves the selection, configuration, transformation, and

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development of capabilities and competencies, within their context, resulting in the generation and co-generation of markets and business ecosystems.

2.2 Micro-foundations in the orchestration process

Micro-foundations are based on managers/entrepreneurs' abilities to constantly orchestrate (identify, coordinate, and reconfigure) the opportunities that emerge from new technologies, consumer needs, market niches, and competitors (Helfat & Peteraf, 2015). Among the micro-foundations are decision makers' managerial and cognitive dynamic capacities, whose efficiency is especially necessary to achieve greater organizational agility (Lessard *et al.*, 2016). Through these capacities it is possible to be agile when managing problems generated by the centralization-decentralization polarization in business ecosystems, which leads to ambidexterity (O'Reilly III & Tushman, 2011; Shuen *et al.*, 2014).

According to O'Reilly III and Tushman (2011), organizational ambidexterity orchestrated via micro-foundations comprises a broad set of routines that include decentralization, differentiation, and integration, beyond the capacity of top managers to orchestrate the simultaneous balance between asset exploration and exploitation (Priyono, Idris, & Abdul Halim Lim, 2020). However, there are also other prominent fields in the universe of dynamic capability orchestration, such as Business Model Configuration (Pitelis & Teece, 2018; Symeonidou & Nicolau, 2018), Digital Ecosystems (Zhou *et al.*, 2017; Helfat & Raubitschek, 2018), Knowledge Management (Rastogi, 2003; Symeonidou & Nicolau, 2018), and Innovation Capacity (Agarwal & Selen, 2013; Rui & Bruyaka, 2021), among others.

3 Methodology

3.1 Bibliometrics and content analysis

We conducted a bibliometric study and content analysis on the topic of Dynamic Capability Orchestration. The former is a conglomeration of statistical methods that enables investigating and organizing scientific publications on a given topic (Pritchard, 1969). It can be defined by three structures: concept mapping, presentation of theory relevance, and exploitation of existing methodologies in the literature (Thanuskodi, 2010). Knowledge is organized from scientific research, and contributes for identifying gaps that may foster new studies (Aria & Cuccurullo, 2017), while content analysis examines texts in qualitative studies (Bardin, 2016).

To carry out the research, we used three software - MaxQda, Bibliometrix, and VosViewer. MaxQda helped identify the categories of the four clusters, in the content analysis

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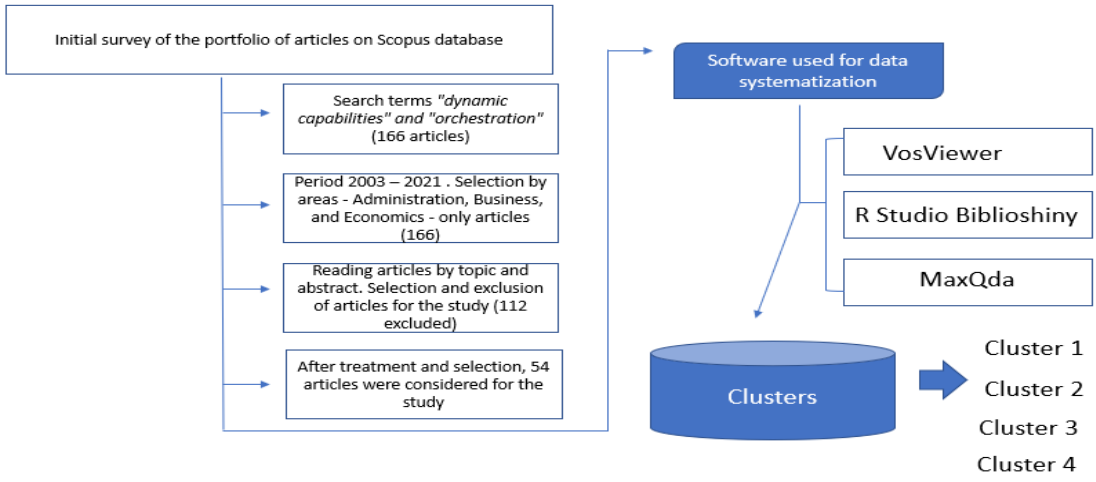
for reviewing and separating the texts. The Bibliometrix R Package software enabled the quantitative programming language to analyze and describe published studies. We chose the 2.0 version of R Studio Cloud, including the Biblioshiny extension, which allows treating data collected at the Scopus database in csv format, showing them in graphs and tables that helped the analysis of the considerable number of surveyed articles (Aria & Cuccurullo, 2017). And the VosViewer 1.6.16. software analyzed the bibliometric networks of the specific fields of study. Its use assisted in conducting graphical analyses, such as publications per year, network of authors per citation, most evident research areas, keyword networks, and cooperation networks, including authors, journals, and countries.

3.2 Data collection and extraction

Data collection had four steps. The first comprised extracting data from the Scopus database, using the terms "dynamic capabilities" and "orchestration," through which we identified 196 articles published between 2003 and 2021. Then we applied filters, selecting the areas of Administration, Business, and Economics. This database has a huge number of articles, and is one of the most relevant in quotations of peer-reviewed articles (Aria & Cuccurullo, 2017). Figure 1 shows the stages of selection and systematization of the articles for the literature review.

Figure 1

Process of collecting and systematizing data



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The second step was to export the database to Microsoft Excel. We separated studies of greater relevance to meet the research objective, by topic, and read the articles' abstracts, which resulted in the exclusion of 30 papers, whose themes were not relevant for the study objective. The exclusion criteria considered themes related to "Information Technology", "Telephone Services", "Cloud Services", "Data Integration", and related topics, which were part of the Information Systems area and did not approach the theoretical lens of Dynamic Capability Orchestration.

With a final sample of 54 articles, the third stage addressed content analysis, using the MaxQda software, which enabled reading with criteria for tabulation in Microsoft Excel, emphasizing the most quoted articles for the content analysis (Bardin, 2016). In the fourth stage, in order to compose the results of the base systematization, we used the software Bibliometrix, in the Biblioshiny extension, and the VosViewer. To present an overview of the studies, we did the following analyses: statistical data and information, bibliographic coupling, historiographical citation analysis, thematic map, and research clusters.

4 Bibliometric analysis

Bibliometric study is a method that uses quantitative and statistical data analysis to identify topics of relevance in the literature (Knopf, 2006). The increase in publications makes bibliometric studies relevant for showing highlights that enable analyses such as main journals, authors who carried out certain studies, number of publications per year and country, and, finally, presenting frameworks for future research (Thanuskodi, 2010). The set of publications is the starting point for a bibliometric study, and can be established by organizing the surveyed data, contributing to generate knowledge on the research topic (Knopf, 2006).

4.1 Data and statistical information

From the collected data, we reached a final sample of 54 articles. In this set, the papers were written by 160 authors, between 2003 and 2021. The average number of quotes in the articles, since 2003, is 34%, and per year is 5%. There are five articles with a single author, and 49 with several, which shows the relevance of studies with many authors, and less interest in single-author papers. Altogether, there were 270 keywords, which guided the development of this research. We got details on quotes, number of keywords, and single or joint authorship, through the Bibliometrix software. The topic on 'orchestration of dynamic capabilities' is recent in the literature. In 2007, Pitelis (2007) published the first paper, and as of 2019 researchers

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showed greater interest in the subjects that contain terms like *managerial capacity*, *innovation*, *performance*, and *technology*.

4.2 Articles, journals, and authors who address the topic

We ranked the ten journals with the highest relevance of citations in studies on orchestration of dynamic capabilities. Such relevance is attested to by the metric called H index, estimated by the ratio between the number of quotations that the articles published in that journal received, during a certain period, and the number of journals in which they were quoted. Thus, Table 1 shows the H index of each journal. The bibliometric analysis established by the Biblioshiny software highlights three journals that reached 1,169 quotes, representing 66% of the total number of articles analyzed in the database.

Table 1

Ranking of the 10 most productive and influential journals

Ranking	Journal	Articles	H index	Quotes
1	Strategic Management Journal	2	286	781
2	California Management Review	1	129	271
3	Research Policy	1	238	117
4	Journal of Operations Management	1	191	93
5	Journal of Intellectual Capital	1	89	69
6	Journal of Strategic Information Systems	1	88	51
7	Energy Strategy Reviews	1	33	41
8	Strategic Organization	2	57	34
9	Academy of Management Journal	1	318	33
10	Global Strategy Journal	1	24	30

Source: Prepared by the author

There were two articles published in journal 1 - Strategic Management Journal. The first addresses managerial Cognitive Capabilities and the micro-foundations of dynamic capabilities, by Helfat and Peteraf (2015), and is the most quoted article in the base. The second analyzes managerial dynamic capabilities and the effects on firm performance (Sirmon & Hitt, 2009). Journal 2, California Management Review, features a study on organizational ambidexterity and how managers explore and exploit it (O'Reilly III & Tushman, 2011). Journal

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3, Research Policy, presents a study addressing dynamic and integrative capabilities to profit from innovation, in digital platform-based ecosystems (Helfat & Raubitschek, 2018).

Table 2 shows the 10 most relevant articles and authors in studies on Dynamic Capability Orchestration. Their respective impacts are measured in terms of total quotes, which point to Helfat and Peteraf (2015) as the most influential, with almost twice as many quotes as the second author duo, O'Reilly III and Tushman (2011). The majority of the most influential articles address managerial capabilities and innovation.

Table 2

Ranking of relevant authors

Ranking	Authors	Title	Quotes
1	Helfat & Peteraf (2015)	Managerial cognitive capabilities and the micro-foundations of dynamic capabilities.	504
2	O'Reilly III & Tushman (2011)	Organizational ambidexterity in action: How managers explore and exploit.	268
3	Sirmon & Hitt (2009)	Contingencies within dynamic managerial capabilities: Interdependent effects of resource investment and deployment on firm performance.	257
4	Helfat & Raubitschek (2018)	Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems.	111
5	Koufteros, Verghese, & Lucianetti (2014)	The effect of performance measurement systems on firm performance: A cross-sectional and a longitudinal study.	93
6	Rastogi (2003)	The nature and role of IC: Rethinking the process of value creation and sustained enterprise growth.	68
7	Queiroz *et al.* (2018)	The role of IT application orchestration capability in improving agility and performance.	48
8	Shuen, Feiler, & Teece (2014)	Dynamic capabilities in the upstream oil and gas sector: Managing next generation competition.	41
9	Giudici, Reinmoeller, & Ravasi (2018)	Open-system orchestration as a relational source of sensing capabilities: Evidence from a venture association.	30
10	Lessard, Teece, & Leih (2016)	The Dynamic Capabilities of Meta-Multinationals.	30

Source: Prepared by the author.

4.3 Bibliographic coupling

The co-citation cluster analysis stems from articles of impact in the scientific community, and provides a microscopic view of association networks. Nodes represent the authors, and networks symbolize the citations between the authors with higher visibility, represented by several co-citation networks (Grácio, 2016). Co-citation Analysis, on the other hand, measures the relationship between two or more articles, based on the number of

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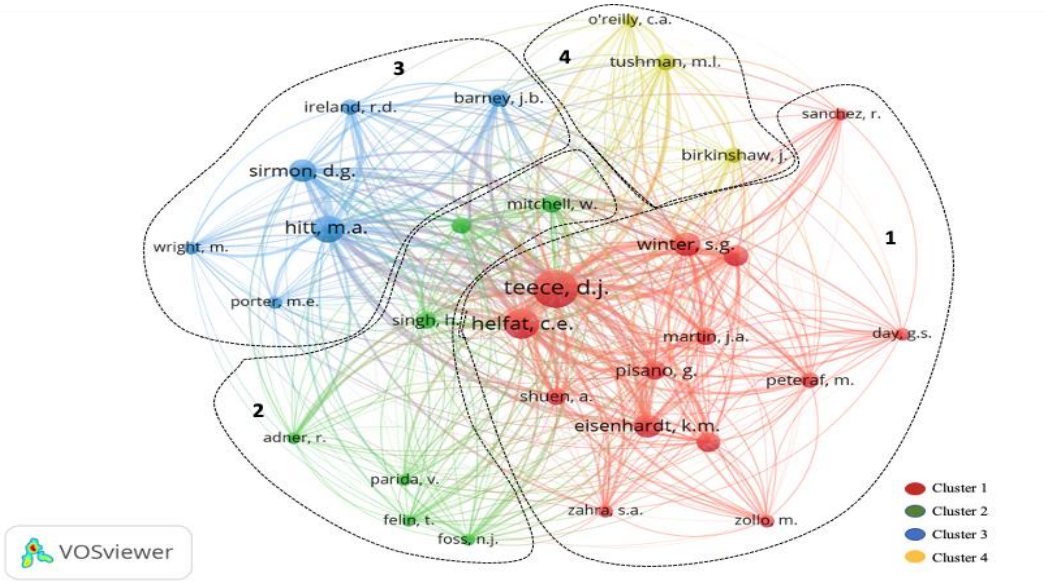
publications in which they are quoted. We designed four clusters; in Cluster 1, Teece (1997) is the most relevant in citations, because he created the fundamentals of dynamic capabilities. Cluster 2 includes authors with recent citations. Cluster 3, although distant from Cluster 1, shows its relevance by the size of the connections. Cluster 4 is located between clusters 1 and 3, and has a lower frequency of co-citations, compared to the others, which we can check by the size of the nodes.

Figure 2

Author co-quotes on Dynamic Capability Orchestration



Source: Prepared by the author.

4.4 Keyword analysis

Since keywords indicate an article's most relevant terms, regarding the research topics and fields, we carried out a keyword co-occurrence analysis, to understand the thematic structure of the field (Knopf, 2006; Thanuskodi, 2010). By analyzing the authors' keywords present in the 54 articles, through the VOSviewer software, and filtering terms specific to the articles' object of study, we developed a keyword network (Fig. 3), where the proximity and the gradient that connect the keywords show the frequency of their coexistence, while the size of the node represents the frequency of the term's occurrence.

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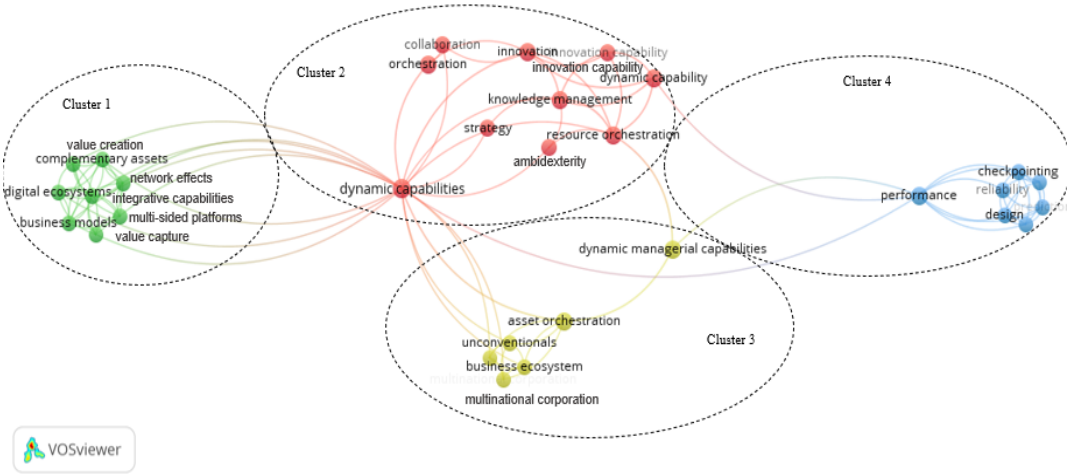
Figure 3

Co-occurrence of authors' keywords



Source: Prepared by the author.

The network suggests four clusters. The number of keywords in the clusters is distributed rather equally, with a certain uniformity of the topics. Cluster 1 covers terms related to business models, value creation and capture, and digital ecosystems; Cluster 2 presents terms related to orchestration, knowledge management, and dynamic and innovation capabilities. In Cluster 3 there are terms referring to managerial capabilities, asset orchestration, and multinational corporations; finally, in Cluster 4, the terms refer to technology and digitalization.

4.5 Analysis of historiographic quotes

The historiographic analysis allows a chronological view of the relevant quotations in face of the bibliographic data. The results presented in Figure 4, with authors and years, show in 2009 the initial development of studies that address orchestration. From the historiographical citations, we can notice the research development. The red colors, analyzed as warm, concentrate the largest cluster of citations between authors who develop the same research interest. Mazumder and Garg (2021) conducted studies quoting Zhou *et al.* (2017), who addressed topics on resource regrouping and organizing.

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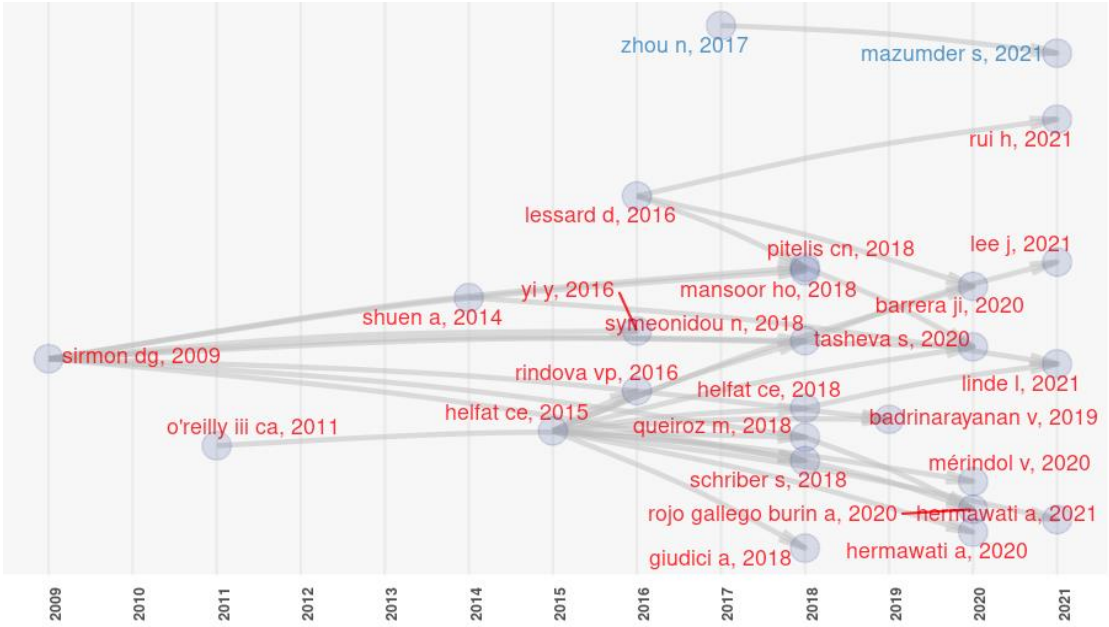
Figure 4

Analysis of Historiographic Quotes



Source: Prepared by the author.

4.6 Thematic map

To show the internal (seen in density) and external (seen in centrality) strengths of authors' keyword associations, we drew a two-dimensional thematic map (Figure 5). We observe in it that the keywords present in the type A quadrant, whose internal and external associations are high, represent dominant topics in the literature. In our study, these are the topics related to performance and asset orchestration. Their relevance is linked to the purpose of dynamic capability orchestration.

On the other hand, quadrant D, whose internal and external associations are weaker, does not show any research topic, indicating greater cohesion and connection between the study approaches that cover the orchestration of dynamic capabilities. In quadrant C, internal associations are significant, but external are weaker, and the only topic in this cluster is firm performance. We observe that this research flow is isolated from other topics in the field, and may be more connected to other lines of research.

In quadrant B, where internal associations are weaker and external are high, we found the highest concentration of keywords, with emphasis on the topics of orchestration, resource orchestration, and dynamic capabilities. This configuration suggests that there is greater coherence in the study fields, although the correlations between the topics are weaker.

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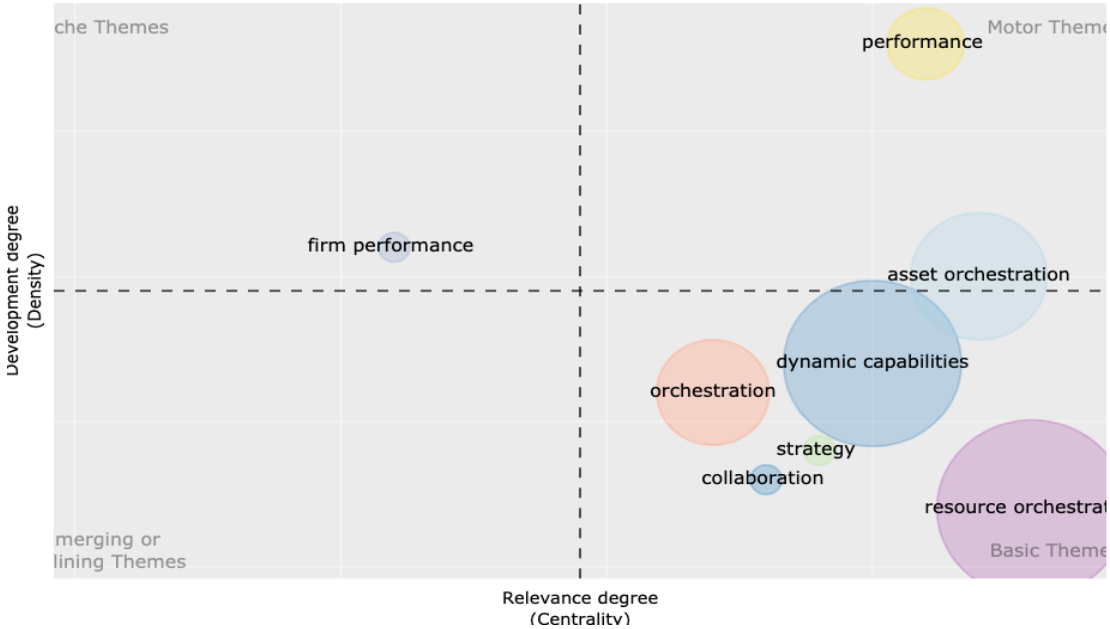
Figure 5

Thematic map of Dynamic Capability Orchestration



Source: Prepared by the author.

5 Content analysis

We applied content analysis (Bardin, 2016) for examining the articles. By reading them, we selected excerpts, separated them into categories, and organized on a table. We used MaxQda software to ensure a better criterion for the articles' content analysis, and to enable our joint work. We identified four research categories that, from the perspective of this bibliometric analysis, we considered as *Research Clusters*. They are: (1) *Studies on Business Ecosystems; (2) Dynamic Capabilities and their Orchestration via Micro-Foundations; (3) Internationalization; and (4) Technology and Digitalization.*

In addition to the *Research Clusters*, Content Analysis showed subcategories with relevant incidence, which we named Research Flows. These are topics that appear within the context of each of the Research Clusters, and were divided in order to contribute with the process of systematization of the study field.

Figure 6 shows the Research Clusters and flows, extracted from the Content Analysis of the articles collected in the database. The dotted squares represent each of the Research Clusters identified, as well as their context. The arrows indicate the research paths pointed out by different researchers within each cluster, leading to the Research flows addressed.

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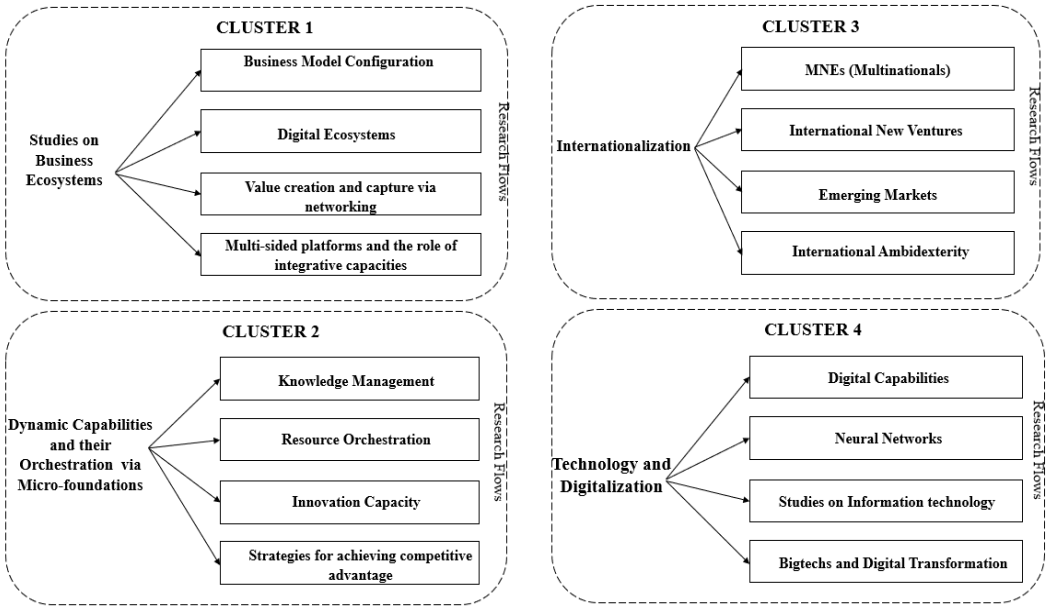
Figure 6

Research clusters and flows



Source: Prepared by the author.

5.1 Research categories surveyed: Research clusters and their research flows

We identified the research categories by crossing the data extracted from reading the articles and analyzing data from software VosViewer and MaxQda. This process took place by following the assumptions mentioned by LeCompte (2000): (i) data organization; (ii) search of repeated research items; (iii) creation of sets of items (categories and subcategories); (iv) creation of analysis patterns; and (v) creation of structures and visual models for understanding categories and subcategories, using software support. From this analysis, four research categories - Research Clusters -, and 15 subcategories - Research Flows - emerged (Figure 6).

5.1.1. Cluster 1: Studies on business ecosystems

Cluster 1 represents the category Business Ecosystem Studies. The topic Business Ecosystem was highly repeated, motivated by studies that aim to understand how innovation takes place through the process of orchestration in different ecosystems. Among these ecosystems are Entrepreneurial Ecosystem (Symeonidou & Nicolau, 2018; Linde *et al.*, 2021), Digital Ecosystem (Helfat & Raubitschek, 2018), Innovation Ecosystem (Agarwal & Selen, 2013), and Industrial Ecosystem (Shuen *et al.*, 2014). Within the Ecosystem context, this cluster covered the following Research Flows (subcategories): Business Model Configuration, Digital

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Ecosystems, Value Creation and Capture via Networking, and Multisided Platforms and the Role of Integrative Capabilities.

Studies of business model configuration seek to understand the creation of new business models from the perspective of dynamic capabilities, considering existing ecosystems and the exchange of information between companies and digital platforms, which allow shaping the strategic positioning of firms, through the creation of new capabilities and resources (Pitelis & Teece, 2018; Symeonidou & Nicolau, 2018). The phenomena of study in this flow include startups, MNEs, and SMEs (Symeonidou & Nicolau, 2018). Business models are the central axis for achieving competitive advantage through dynamic capabilities that can be adapted, according to market challenges.

The flow of Digital Ecosystems unfolds the digital transformation phenomenon that appears as a driving factor for companies' adjustment to new platforms, in a technological context (Zhou *et al.*, 2017; Helfat & Raubitschek, 2018; Garbellano & Da Veiga, 2019; Yoshikawa *et al.*, 2020; Mazumder & Garg, 2021). Industry 4.0 and the orchestration of dynamic capabilities in small and medium-sized enterprises in developed countries are determinants for knowledge exchange between the digital ecosystem and the entrepreneurial ecosystem (Garbellano & Da Veiga, 2019). On the other hand, the role of integrative capabilities is necessary for firms to absorb new technologies into their business environment and create value through innovation capabilities, environmental digitalization, and ability to detect market threats (Helfat & Raubitscheck, 2018; Mazumder & Garg, 2021). Information technology (IT), which provides the renewal of firm's resources and organizational agility, is a widely analyzed phenomenon in this path, within the context of developing economies (Ma *et al.*, 2015; Zhou *et al.*, 2017; Queiroz, *et al.*, 2018).

Value creation and capture via networking is a research flow that covers value capture and innovation creation using networking and dynamic capabilities that are orchestrated in different ecosystems (Rui & Bruyaka, 2021). In turn, the flow 'Multisided Platforms and the Role of Integrative Capabilities' considers the role of integrative capacities for adopting platforms that can generate innovation and follow companies' digital transformation, providing them with competitive advantage (Helfat & Raubitscheck, 2018; Hermawati & Gunawan, 2020).

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5.1.2. Cluster 2: Dynamic capabilities and their orchestration via micro-foundations

Cluster 2 represents Dynamic Capabilities and their Orchestration via Micro-Foundations. The cluster emerged from the research flows Knowledge Management (Knowledge-based View), Resource Orchestration, Innovation Capacity, and Strategies for Achieving Competitive Advantage. Cluster 2 comprises studies that follow the micro-foundations (sensing, seizing, and reconfiguring), in order to influence and relate concepts and variables from other theoretical foundations.

Knowledge-based View (KBV) proved to be a latent research subcategory, and addresses issues related to the foundations of Social Capital (SC), Human Capital (HC), and Intellectual Capital (IC), for understanding the orchestration of dynamic capabilities within companies (Rastogi, 2003; Symeonidou & Nicolau, 2018). These studies cover the Entrepreneurial Ecosystem and government relations, especially to check the relationship between SC, HC and IC variables with the micro-foundations of dynamic capabilities.

The Resource Orchestration research flow was a latent subcategory during the analyses. Since the foundations of dynamic capabilities are rooted in the Resource-Based View (RBV), the flow presented a number of studies highlighting the managerial implications of dynamic capabilities for renewing competencies that result in firm performance (Sirmon & Hitt, 2009). Studies on resource orchestration focus on understanding how dynamic capabilities can foster firms' organizational change across different industries and ecosystems (Shuen *et al.*, 2014; Symeonidou & Nicolau, 2018). In this research flow, micro-foundations define resource orchestration and its role for business asset allocation.

The role of innovation as a capacity has also appeared as a research flow and was named as Innovation Capability (Agarwal & Selen, 2013; Helfat, & Raubitschek, 2018; Hermawati & Gunawan, 2020; Rui & Bruyaka, 2021). In most studies on orchestration of dynamic capabilities, innovation capacity is the result of the process and the relationship between the micro-foundations; it has also been identified as an integrative capability for reconfiguring firms' business model.

The research flow Strategies for Achieving Competitive Advantage includes the seminal text by Helfat and Peteraf (2015), showing that the orchestration of dynamic capabilities takes place through the micro-foundations adopted by top managers, which relate to their cognitive capacity for designing new strategies. Still in this flow, ecosystems are present in the studies by Brink (2019) and Linde *et al.* (2021), showing that companies' strategies use micro-foundations for exchanging knowledge with different ecosystems, and formulate paths for the

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creation of competitive advantage. This research flow is highly relevant in emerging markets that establish entrepreneurial and technological ecosystems to help firms improve their capabilities and achieve competitive advantages in the market through cooperation (Ma *et al.*, 2015; Zhou *et al.*, 2017; Queiroz *et al.*, 2018).

5.1.3. Cluster 3: Internationalization

Cluster 3 focuses on the field of International Business. The categorical repetition of this Cluster was smaller than the others, and its Research Flows are linked to Multinationals, International New Ventures, Emerging Markets, and International Ambidexterity (Pitelis & Teece, 2018; Tasheva & Nielsen, 2020; Priyono *et al.*, 2020; Rui & Bruyaka, 2021).

The Multinational Enterprise (MNE) research flow presents studies on process internalization using the orchestration of dynamic capabilities to generate business coopetition and foster entrepreneurship and Open Innovation practices (Shuen *et al.*, 2014; Soebandrija, Aprillia & Ho, 2016; Pitelis & Teece, 2018). Additionally, Lesserd *et al.* (2016) address MNEs from the perspective of Meta-Multinationals, which are firms that orchestrate their assets and dynamic capabilities by concentrating their knowledge in headquarters and orchestrating their resources among the subsidiaries.

International New Ventures are startup companies that internationalize, and were identified as a research flow within the Internationalization Cluster, addressing these firms and their global dynamics by counting on the capabilities and resources they hold, besides highlighting the relationship between Social Capital, Human Capital, and Cognitive Capabilities (Ma *et al.*, 2015; Tasheva & Nielsen, 2020). According to Ma *et al.* (2015), the role of technology and digitalization for International Ventures is investigated in emerging markets due to resource shortage and the need to articulate the micro-foundations for firm internationalization.

Emerging Markets are a trend in future studies on orchestration of dynamic capabilities, and was a subcategory mapped as a research flow (Ma *et al.*, 2015; Zhou *et al.*, 2017; Rui & Bruyaka, 2021). Studies on the Chinese market stood out in the database, through the analysis of cases that relate orchestration of dynamic capabilities to the creation of industry networking for business strategy formulation (Rui & Bruyaka, 2021), use of IT for orchestration of firm processes (Zhou et. al, 2017), and the adoption of new technology platforms for startups (Ma *et al.*, 2015).

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International Ambidexterity is a research flow that deepens *exploitation* and *exploration*, focusing on the organizational agility of small and medium-sized companies that try to enter the global market through innovation (Priyono *et al.*, 2020). Here, the role of executives is crucial for companies that practice international ambidexterity, because it depends on cognitive capabilities that drive technology companies to explore their potentials and reconfigure their businesses to increase organizations' efficiency (O'Reilly III & Tushman, 2011).

5.1.4. Cluster 4: Technology and digitalization

Cluster 4 comprises Technology and Digitalization studies, focusing on research on digital platform ecosystems. This cluster became relevant recently in the business sphere, especially since the year 2019. The network interconnected to technology and digitization studies cover digital capabilities, information technology studies, and digital transformation (Helfat & Raubitschek, 2018; Queiroz *et al.*, 2018).

Studies that include digital capabilities exploit capacity development in the market for value creation, through continuous process reconfiguration (Zhou *et al.*, 2017). Accordingly, Yuan *et al.* (2018) address the increase of digital capacities in educational institutions and present ways to perceive new stages in the creation of new technologies.

Regarding information technology studies, Koufteros, Verghese, and Lucianetti (2014) addressed project monitoring systems using the diagnostics as an attribute for capturing a constructive technological capability. Other studies regard the use of resource reconfiguration in positive technology building for firm performance (Lee & Kim, 2021).

Research that approaches digital transformation shows the application of technology to adapt renewable and non-renewable energy facilities (Shuen *et al.*, 2014; Brink, 2019). Digital transformation has driven companies to create digital platforms for promoting agility, unification, and systematization of processes (Helfat & Raubitschek, 2018; Mazumder & Garg, 2021).

6 Directions for future research

6.1 Research agenda on orchestration of dynamic capabilities

After organizing the research field and systematically reading the articles in the database, the creation of Clusters and Research Flows provided the possibility of suggesting

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future research paths and defining questions that consolidate a Research Agenda, based on the most cited articles. Table 3 presents the 10 most quoted authors, who represent 82% of the database analyzed in the paper, including the main research questions on the phenomenon of Orchestration of Dynamic Capabilities, and suggestions for future research from each of the articles. We also present different types of analysis, methodological approaches, and supporting theories, in order to define paths for the advancement of this field.

Considering the recent increase in studies, the qualitative approach has prevailed and intends to create propositions to advance case studies and generate concepts and constructs that will serve as a basis for subsequent quantitative studies. In this regard, case studies, theoretical essays, and non-systematic literature reviews have led the qualitative research, while in quantitative research the main statistical methods used consist of regression techniques, and focus on Contingency Theory studies and the relationship between different types of Capital - Human, Intellectual and Social. We suggest studies with a mixed approach (Quali-Quanti), in order to test the propositions presented in the essays, reviews, and case studies.

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Table 3

Future research Agenda and Methodological Research Approach

Authors	Type of analysis	Method	Theory	Future research directions: Research Agenda
Helfat & Peteraf (2015)	Qualitative	Documentary Research and Field Observation	- Managerial Cognitive Capacities; - Micro-foundations of Dynamic Capabilities	- How can the cognitive ability of managers and executives foster orchestration in different business ecosystems? - How can cognitive capacities contribute to heterogeneous managerial abilities in different types of firms? - How can the interaction of top management's cognitive capacities affect the team's decision making, especially regarding strategic change?
O'Reilly III & Tushman (2011)	Qualitative	Case Study	- Organizational Ambidexterity;	- How can resources collaborate with the orchestration of dynamic capabilities via Organizational Ambidexterity? - How can Organizational Ambidexterity orchestrate dynamic capabilities between business ecosystems? - What technological cases in organizations enable the orchestration of dynamic capabilities via organizational ambidexterity, for improving performance in digital environments?
Sirmon & Hitt (2009)	Quantitative	Multiple Regression	- Contingency Theory; - Knowledge-based View	- How does resource investment and managers' knowledge enable the orchestration of capabilities? - How can asset orchestration generate new capacities and optimize firm performance? - What are the main variables that influence decision making towards the orchestration of capacities and resources between firms?
Helfat & Raubitschek (2018)	Qualitative	Literature review focused on theory	- Dynamic Capabilities; - Innovation Capacity; - Multisided Platforms in Digital Ecosystems (MSP); - Integrative Capacities	- How Digital Ecosystems are orchestrating their dynamic capabilities? - What is the role of innovation and integration capacities for capability orchestration between Business Ecosystems? - How can orchestration of innovation capabilities increase the ability of companies and managers to use digital platforms and respond to market threats in product creation?
Koufteros *et al.* (2014)	Quantitative	Logit Regression with Factor Analysis and Covariance Matrix	- Resource Orchestration; - Organizational Information Processing Theory	- Which is the role of capacity and resource orchestration in companies' performance? - How can the orchestration of resources and capacities between the different levels of the supply chain affect firm performance?
Rastogi (2003)	Qualitative	Literature review focused on theory	- Knowledge Management; - Intellectual Capital	- What is the role of knowledge management in the orchestration of dynamic capabilities? - How can Intellectual Capital provide dynamic capability orchestration between different ecosystems? - How can capacity orchestration create value by using knowledge management?

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Authors	Type of analysis	Method	Theory	Future research directions: Research Agenda
Queiroz *et al.* (2018)	Quantitative	Survey with Partial Least Square Regression -PLS – Structural Equations	- Dynamic Capabilities - Information Technology Capacity;	- Which capabilities are related to Information Technology Capacity and can stimulate resource orchestration? - How can organizational agility accelerate the orchestration of dynamic capabilities among different digital and technological ecosystems? - What are the necessary capacities for building a portfolio of Information Technology capabilities, and how can this affect firm performance?
Shuen *et al.* (2014)	Qualitative	Documentary Research and Field Observation	- Dynamic Capabilities; - RBV (Resource-based View)	- How can industrial clusters' activities foster the orchestration of dynamic capabilities? - How do infrastructure sectors orchestrate their capacities in order to renew their resources and competencies? -What is the role of different Business Ecosystems in orchestrating dynamic capabilities in high investment companies?
Giudici *et al.* (2018)	Qualitative	Interpretive Approach and triangulation of primary and secondary sources	- Dynamic Capabilities; - Network orchestration	- How can orchestration in open systems assist in conceiving new business models? - - How do firms that invest in searching new opportunities deal with distinct classes of dynamic capabilities?
Lessard *et al.* (2016)	Qualitative	Bibliographic Research	- Dynamic Capabilities; - Multinational Theory – Eclectic Paradigm.	- What is the role of Meta-Multinational companies for Dynamic Capability Orchestration? - How does globalization foster the orchestration of dynamic capabilities for the expansion of different types of firms? - How is the orchestration of assets and dynamic capabilities linked to companies' internationalization process?

Source: Prepared by the author.

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7 Conclusion

The paper's overall goal - to present an overview of research related to orchestration of dynamic capabilities - was fully achieved. The growth of studies on the topic occurred between 2017 and 2021, guided by the deepening of clusters' subjects. In addition, research paths are shown in Table 3, based on the analyses with the software and systematic readings, from which we extracted suggestions for future research and limitations of the main articles analyzed, thus meeting our paper's specific objective.

During the analysis, we presented the methods and theories used, simultaneously with thematic analyses of keywords and research groupings that bring scientific contributions. We intend to help researchers in their areas and flows that are currently being explored, with the potential for growth in the coming years. This academic contribution frames the field of Dynamic Capability Orchestration from the perspective of different phenomena and theoretical lenses, showing the advances that can contribute to the flow of studies, growth of the topic, and scientific gaps that researchers can address in the future.

The analysis of the clusters and their unfolding into research paths showed that there is a relationship between clusters, conceptual elements, and capability orchestration. Figure 7 suggests a model that consolidates, in practice, how the foundations of Dynamic Capability Orchestration have been addressed over time, in the field of strategy and innovation studies. The model is based on the bibliometric analyses carried out in this paper. The assets, resources, and capabilities of different business ecosystems are articulated by the micro-foundations, for renewing competencies and new capabilities within other ecosystems. Additionally, we inserted into the model factors like Internationalization and Digitalization to investigate the different contexts and relationship between the ecosystems.

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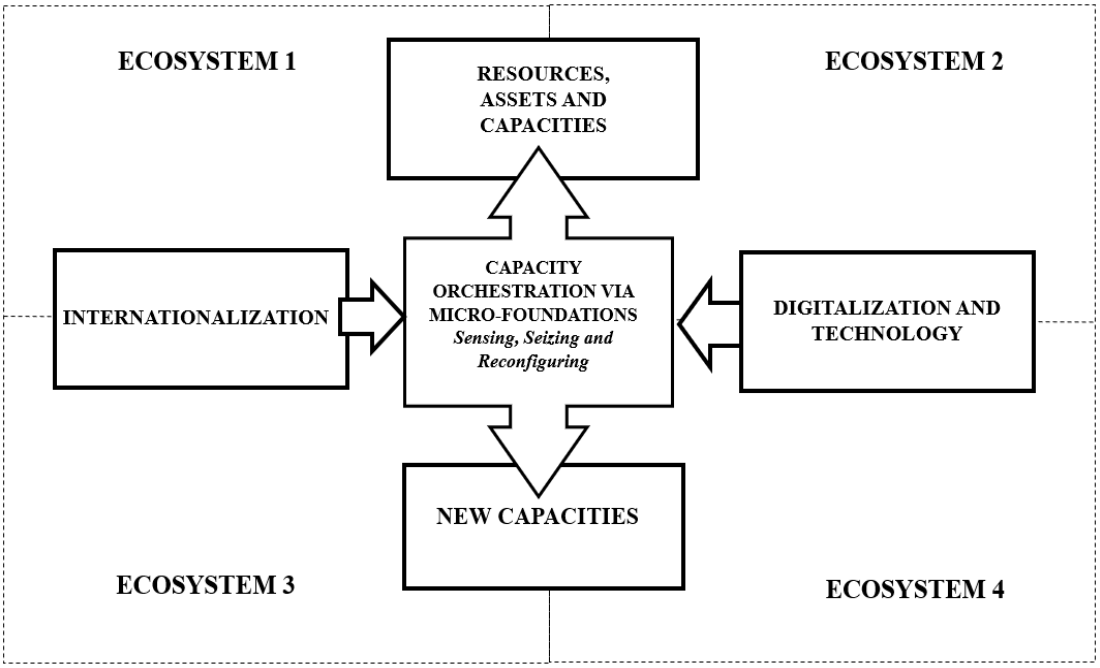
Figure 7

Dynamic Capability Orchestration Model in the field of Strategy and Innovation



Source: Prepared by the author

We suggest that scientists address the research questions presented in Table 3, creating hypotheses and propositions that include the Research Clusters, to bring new contributions to the presented research flows and to the seminal articles examined in this paper. The limitation lies in the bibliometric method; due to its nature, it restricts the critical sense of articulation of the selected papers. To overcome this problem, we suggest carrying out meta-analyses and Systematic Literature Reviews, using the bibliometric technique together with a critical deepening of the articles found in databases. Future studies should explore the model suggested in this paper (Figure 7), by including new elements and identifying new theories and perspectives to advance the studies on Orchestration of Dynamic Capabilities in a multidisciplinary way.

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Authors' contributions

Contribution	Noronha, M.E.S.	Ferraro, D.M. J.	Silva, R. de S. V.
Contextualization	X	X	X
Methodology	----	X	X
Software	----	----	X
Validation	X	X	X
Formal analysis	X	X	----
Investigation	X	X	----
Resources	X	X	X
Data curation	X	X	X
Original	X	X	X
Revision and editing	X	X	----
Viewing	X	X	X
Supervision	X	X	X
Project management	X	-----	----
Obtaining funding	----	----	----

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