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## Article

# A bibliometric analysis of a four-construct framework : innovation management, competitive advantage, agility and organizational performance

Management dynamics in the knowledge economy

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National University of Political Studies and Public Administration, Bucharest

*Reference:* Jerdea, Loredana (2023). A bibliometric analysis of a four-construct framework : innovation management, competitive advantage, agility and organizational performance. In: Management dynamics in the knowledge economy 11 (3), S. 306 - 323.  
<https://www.managementdynamics.ro/index.php/journal/article/download/519/479/2477>.  
doi:10.2478/mdke-2023-0019.

This Version is available at:  
<http://hdl.handle.net/11159/631082>

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# A Bibliometric Analysis of a Four-Construct Framework: Innovation Management, Competitive Advantage, Agility and Organizational Performance

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Received: March 7, 2023  
Revised: March 12, 2023  
Accepted: May 1, 2023  
Published: September 24, 2023

**Abstract:** In a globalized economy, innovation is a priority of ensuring the competitive advantage and organizational performance of agile companies, competitiveness being the core of the development in any economic activity. Consequently, the purpose of this research is to provide an overview regarding the connections between four main constructs, respectively innovation management, competitive advantage, agility and organizational performance, through performing a bibliometric analysis by using the VOSviewer visualization tool. The information has been selected from the Web of Science Core Collection database (WoS) during February 2023. This preliminary study aims to grant relevance to the potential research areas prone to be exploited when discussing the matter of innovation management in relation to organizational performance, competitive advantage achievement and agility. The main premise is that every company has its particularities and acts accordingly to stay competitive through innovating its business model and through an articulate innovation management, also encompassing agility, with a view to reach organizational performance and strong competitive advantage. In terms of findings, the bibliometric analysis conducted confirms the existence of compelling relationships between constructs, thus supporting further scrutiny in this direction.

**Keywords:** innovation; innovation management; competitive advantage; agility; organizational performance; small and medium-sized enterprises (SMEs).

## Introduction

In the context of the knowledge economy, as the global business environment becomes more competitive, innovation becomes critical, with a dominant role in the market (Ratten et al., 2017). "Innovation is the core of development and productivity in any economic activity" (Kogabayev & Maziliauskas, 2017, p. 59). Drucker (2015) outlines seven sources of innovation opportunities: four internal (unpredictability, inconsistency between current and desired reality, innovation based on the need for a process, changes in industry or market) and three external (demography, changing perceptions and scientific and non-scientific new knowledge).

Definitions of the innovation concept vary to a large extent. Schumpeter defined innovation as the economic impact of technological change; Twiss - as the process that combines science, technology, economics and management to create novelty and expand it from idea to commercialization; Afuah - as new knowledge embedded in products, processes and services (as cited in Kogabayev & Maziliauskas, 2017). Their common element is the process by which a good initiative is transformed from an idea into practical use, with the help of the full development and exploitation of new knowledge (Tidd &

## How to cite

Jerdea, L. (2023). A Bibliometric Analysis of a Four-Construct Framework: Innovation Management, Competitive Advantage, Agility and Organizational Performance. *Management Dynamics in the Knowledge Economy*, 11(3), 306-323. DOI 10.2478/mdke-2023-0019

ISSN: 2392-8042 (online)

Journal Abbreviation: *Manag. Dyn. Knowl. Econ.*

www.managementdynamics.ro

<https://content.sciendo.com/view/journals/mdke/mdke-overview.xml>

Bessant, 2013). Thus, innovation can be treated as a tool used by entrepreneurs to turn change into opportunities and these into new ideas to translate them into widespread practice (Tidd & Bessant, 2013). It is emphasized, however, the need for the innovation process to be sustainable and responsible, in order to take into account the consequences of innovation decisions and to anticipate the possible negative impact (Bessant & Tidd, 2015).

The innovation process is a complex one, which involves efficient management of several different activities; it is, therefore, a management process, the approach of which is decisive for the results obtained (Trott, 2017). Although the process seems random and uncertain, models can be found that tip the chances of innovation to success: not by developing and implementing a predictable mechanism, but by creating conditions within the organization that increase the likelihood of success of a resolution of several challenges with a high level of uncertainty (Tidd & Bessant, 2013).

There are several ways in which organizations can approach the innovation process, the main ones being: the champion of innovation (a single person in charge of this aspect, who enjoys a lot of freedom, but generally little authority), the team dedicated to innovation (which tends to be more radical than incremental and more skeptical), the central innovation department working with innovation ambassadors (the department denotes youth, novelty, out-of-the-box vision and ambassadors company experience, expertise and in-depth knowledge) (von Stamm, 2003).

Considering the globalization process, the companies must prove competitiveness, being in a competition not only with the conational entities, but with all the companies from the respective field, regardless the origin country. We discuss, therefore, about a tight competitiveness at a global level, within which are successful only the ones that manage to keep the track with the technological evolutions and not only (Vătămănescu et al., 2016a, 2017). This aspect is even more actual at regional level, within the European Union, where the companies have free access in all the state members and the companies from the countries with less developed economies are competing directly with the ones from the more developed countries. Moreover, we do not discuss only about a competition within the European Union, but also about an economic competition between the European Union as a whole and the other developed economies around the globe. Therefore, we can ask ourselves how a European software company can compete with American or Asian well-known brands or how can an East-European start-up level and compete against a developed West-European company, keeping in mind that they have access on the same markets. We can also ask additional valid questions, whether or not these inequalities can be balanced and how the market players stay relevant, keep the competitiveness or become competitive and manage to develop despite of all viable options existing on the market, some of them being already developed and already international. An answer would be through continuous innovation, in order to manage to offer to the consumers experiences that are not offered by others yet or cannot be offered due to a certain cause, together with a relevant marketing campaign (Dinu et al., 2023; Vătămănescu et al., 2022a, 2022b, 2022c).

However, precisely because of the multitude of options existing on the market, thereof the vast majority confront the same question, innovation can be considered a competition itself. Anybody can have innovative ideas as this resource is unlimited. Therefore, it becomes important how the respective ideas are implemented: as fast as possible, as efficient as possible, with as few resources as possible, with as few costs as possible, with a better and more successful perspective before the consumers. This way, it becomes important the management of innovation (Dinu et al., 2023; Vătămănescu & Alexandru, 2018). Innovation management allows organizations to focus on competitiveness and

performance and, nationally and internationally. Hereby it is acknowledged the importance pursuing systemic innovation and to increase competitiveness and value creation (Caetano, 2017; Vătămănescu et al., 2015, 2016b, 2016c).

The majority of the theoretical resources are focused on the theorization of the innovation management as a field, insisting on its multidisciplinary character and on the multiple definitions. There are studies related to the applicability of the innovation management in certain fields or for particular types of companies, in general, there are studies related to the applicability of the innovation management within particular economy types (as emergent economies), or studies that analyze the influence of particular factors over the efficiency of the innovation management (such as leadership, the team's creativity, the team's diversity and so on), or studies focused on the general complementarity of the agile and innovation management in the quest for organizational performance and competitive advantage achievement.

Given these arguments, the subject matter is relevant and topical, because it covers the theoretical grounds and the methods according to which companies, especially the European small and medium-sized enterprises (SMEs), can tackle innovation management in order to be more competitive both at the European Union level and globally. Also, at national level, the subject is relevant and up to date, considering that many Romanian companies, especially the smallest ones, show a great interest in agile methodologies. It is mandatory that the limited resources are used in the best manner and the companies are flexible in order to meet their innovation objectives as soon as possible. In this front, investigating the business models used in order to drive competitive advantage and organizational performance by employing innovation and agility management in European SMEs comes forward as a major prerequisite for further developments (Mitan & Vătămănescu et al., 2019; Vătămănescu et al., 2015, 2018).

Therefore, the purpose of this research is to provide an overview regarding the connections between four main constructs, respectively innovation management, competitive advantage, agility and organizational performance, through performing a bibliometric analysis by using the VOSviewer visualization tool. The examination offers hence a preliminary outlook of the relationships among the concepts without delving into the intricate theoretical links which would be the subject of the second research report.

## **Contextual and conceptual framework**

### ***From innovation towards innovation management***

This preliminary framework will cover the importance of innovation and innovation management for companies, the various definitions and classifications of innovation and innovation management, theoretical models of innovation and innovation management, the applicability of innovation management in different fields and in companies, the features of innovation management in companies, the relationships between business models and innovation management, agility and organizational performance.

To start with, innovation is responsible for creating and maintaining the competitive advantage of companies and ensures their sustainability and continuity (Santos et al., 2019; Vătămănescu et al., 2019, 2020a, 2020b; 2022a). The success of a business is related to the process of innovation management, as it allows the creation of value for stakeholders by implementing a new product or process or a significantly improved version, a new marketing method, a new organizational approach aimed for business practices (Santos et al., 2019; Vătămănescu et al., 2022a).

In the case of innovation, there is no single formula or model that is applicable to all companies, as a consequence of the multitude of its definitions and classifications, due to its multidisciplinary origin, with significant influences from product management, project management, procurement management, knowledge management, technology management, strategic management and others (Viveiros Lopes et al., 2016). From the purpose point of view, innovation can be classified into four types, according to the OECD: product innovation (to introduce a new product or significantly improve an existing one), process innovation (a new method or the improvement of an existing method), organizational innovation (organizational methods as a result of strategic decisions) and marketing innovation (introduction of a new marketing method) (Viveiros Lopes et al., 2016).

In terms of the extent of implementation, innovation can be classified into four types: incremental innovation (improvements using existing technologies), modular innovation (similar to radical innovation in terms of necessary concepts), architectural innovation (similar to incremental innovation in terms of necessary concepts) and radical innovation (introduction of a new technology) (Viveiros Lopes et al., 2016). Incremental strategy starts from the philosophy of a limited ability to understand the present and predict the future and requires the company's ability to adapt its strategy at any time, based on new information and understanding, which it is constantly looking for (Tidd & Bessant, 2013). In contrast, the rationalist strategy is based on military experience, where the strategy consists, in principle, in a linear model: it evaluates, determines and acts (Tidd & Bessant, 2013).

In terms of technological uncertainty, innovation can be classified into four types: small innovation, medium innovation, large innovation and very large innovation (Viveiros Lopes et al., 2016). From the point of view of where the innovation takes place, it can be open (it also involves the external environment, such as customers, suppliers, competitors, universities, etc.) or closed (it happens entirely and exclusively within the organization) (Viveiros Lopes et al., 2016).

From the point of view of the source of innovation, it can be recombinant or obtained by design (Tidd & Bessant, 2013). Recombinant innovation involves the transposition of an old idea, already used in a completely new context, where it has the potential to bring an element of novelty (Bessant & Tidd, 2015; Tidd & Bessant, 2013). Design innovation involves changing the meaning of a product or service in the mind of the consumer, with a new purpose; this can range from incremental innovation to radical innovation (Bessant & Tidd, 2015; Tidd & Bessant, 2013).

Afuah (2003) outlines the following theoretical models of innovation: the Abernathy-Clark model (which explains why established entities may perform better than new entities in terms of radical innovations), the Henderson Clark model (which explains why established entities seem to have significant difficulties in tackling incremental innovations), the disruptive technological change model (which explains why established entities fail to exploit disruptive technologies), the value-added innovation chain model (which explains why established entities can perform better than the new ones in terms of radical innovations, as well as why they fail to approach incremental innovations) and the Teece model (which explains why established entities can still take advantage of radical technological innovations).

Shifting towards innovation management, various authors point out differences between the concepts of "innovation management" and "management of innovation": the first is associated with changes in the activity of managers that create long-term benefits, rather

than referring to an innovative nature of management in general, without necessarily emphasizing the outcome of innovation, and the latter has four cores: new ideas, people, transactions and the institutional context, taking into account the results of innovation as well (Albors-Garrigos et al., 2018). It can be concluded that innovation management requires an extensive holistic approach, including both technology management techniques and innovative management techniques in order to increase the efficiency of the innovation process in a company (Albors-Garrigos et al., 2018).

In terms of the implementation of innovation management, Trott (2017) mentions almost 50 tools that can be used, tools that can be grouped in the following types of management: knowledge and technology management, market research, cooperation and networking, human resources management, interface management, creativity development, process improvement, project management, product development and design, business creation.

### ***Applicability of innovation management***

In the service industry, production and delivery occur simultaneously and the implementation of new ideas is more difficult than the process of creating those ideas (von Stamm, 2003). In service industry innovation management, five angles have been proposed that can be addressed: positioning innovation (developing a unique proposal that differentiates the product or company from existing market offerings), process innovation (improving the consumer experience by adding or removing a step in the process), innovation in service delivery (reorganization of existing bundled services, improvement of an existing service, creation of a whole new service), innovation of people (increase or decrease of individual discretion to improve the consumer experience through individualized services), innovation of communication (use of branding for differentiation of a service) (von Stamm, 2003).

In family business, although the budget available for research and development is low, the results of innovation management are often better (Frank et al., 2019). Compared to other companies, family businesses rarely invest in innovation, but they prove a high disposition to engage in innovative activities, especially when there are conditions that press them in this regard, such as the threat of profits (Frank et al., 2019). They tend to prefer incremental innovations (Frank et al., 2019). In general, small and medium-sized enterprises have a reputation for high innovation potential and innovation management is accelerated by the fact that management and ownership are often identical, by direct contact with consumers, by production flexibility and flexible organizational structures. The weaknesses of SME innovation management are the lack of a structured innovation process, underdeveloped planning systems and the lack of inter-departmental staff involvement (Gaubinger et al., 2015).

Within companies, there are several elements that are important for the smooth running of the innovation management: leadership (different stages and types of innovation have different leadership needs and each leadership style has its own particularities and its own methods of contributing to different types and stages of innovation) (Łukowski, 2017), team diversity (which can, on one hand, increase creativity and innovation, and on the other hand create barriers to collaboration) (Weiss et al., 2018), team creativity (which can have both positive and negative results) (Brem et al., 2016) and team preparation (knowledge management: generating new knowledge, identifying, storing, distribution and exploitation of existing knowledge) (Bessant & Tidd, 2015).

An essential contribution to innovation management comes from operational management, which has proposed a set of best practices that together are called "Lean management" and combines process management with attention to people, culture and

leadership to ensure that resources are used efficiently (Goller & Bessant, 2017; Solaimani et al., 2019). The culture of learning within companies increases the capacity for innovation, employees are encouraged to develop proactive attitudes towards continuous development and positively affects the company's innovation (Solaimani et al., 2019). Lean innovation management is a socio-technical system that aims to promote an analytical mindset to stimulate continuous development, problem-solving approaches and process efficiency (Solaimani et al., 2019).

In small and medium-sized enterprises, innovation management can be influenced by digitalization and agility (Niewohner et al., 2019). Agility refers to the ability of the team to react quickly and be flexible to unexpected changes, and various studies confirm a positive correlation between agile methods and the innovative ability of companies or the probability of success of innovations (Niewohner et al., 2019; Pinzaru et al., 2016). Thus, developing a detailed plan for each task will increase the innovative efficiency of SMEs (Niewohner et al., 2019; Vătămănescu & Alexandru, 2014, 2018).

Innovation management can also have a regional component, taking into account the particularities and opportunities of each region: for example, in the European Union, there are public policies to support SMEs in developing a business-friendly environment, to support their internationalization and to support them for innovation (Todeva & Ketikidis, 2017).

#### ***Innovation management, agility and organizational performance within the aegis of business models***

Nowadays, in order to overcome the market competition, it becomes extremely important for a player to gain, develop or expand its agility capability and translate it through future innovation, given the dynamics of the market and the accelerated rhythm that management has to face. This may refer to any type of innovation that can be adapted to the specifics of the respective SME, as described above through the conceptualization of innovation, starting from any new idea that can conduct to product innovation, service innovation, close or open innovation, but being rather dependent on the available resources and management's ability to predict or strategically plan the approach for at least a medium term.

However, depending on each company's capabilities and resources, there may be a different business model suitable to be applied when envisaging suitable innovation management. This refers actually to a cluster of organizational capabilities, which is defined as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). Therefore, the bond between novel business models and the innovation management approach will focus on efficiency growth, revenue growth and organizational capabilities. The efficiency growth will include key performance indicators based on cost reduction, productivity and reduce time to market, while the revenue growth would regard new customers, new market, new value proposition, service bundling. As far as the organizational capabilities are concerned, they have an orientation towards innovativeness, entrepreneurship, organizational learning, opportunity recognition and organizational culture (Latifi et al., 2021).

According to Mitchell and Coles (2003), the innovation management referring to business models can be manifested in three different ways: on the one hand, business models can represent a form of innovation, by introducing new methodologies or modifying internal operations without affecting the core of the product/ service; on the other hand, a technological push consisting in a technological breakthrough, may enable the firm to

become the first mover on the market and not least, to maintain a cutting edge of innovation and maintain leadership on the market, firms develop initiatives that may include secondary products or adapted existing products to a different context (Trimi & Berbegal-Mirabent, 2012).

Performance is defined as an organization's ability to achieve the determined goals for preserving profit, having a competitive advantage, increasing market share and preserving long term survival, which depends on using appropriate organizational strategies and practical plans (Oyemomi et al., 2019; Soto-Acosta et al., 2016; Vătănescu et al., 2022d). Therefore, the creation of new or adjusted business models needs special attention as this triggers effects on medium to long term, through the supporting strategy. It might also be the case of not only one single business model, but different business models to be applied, therefore it is required a strategic approach depending on the company's needs and objectives. In the same time, the company can opt for a suitable innovation management type, depending on the available internal and external resources and also in conformity to the company's agility and openness towards change. Therefore, innovation management comprises a formula specific to the firm, that refers to searching and finding new ways of creating value and transferring value to the customers, suppliers and partners through its products / services.

### **Methodology of the bibliometric analysis**

The connection between the discussed concepts and their occurrence within the literature have been studied through unfolding a bibliometric analysis, with the aim of providing a more comprehensive overview of the different approaches adopted in these regards. It represents a multi-contextual quantitative method that brings diverse benefits in the academic community, being able to handle large volumes of data, through various lenses: publication analysis, citation analysis, keywords analysis and it does not resume only to the simple listing of scientific production or citation indexing, showing a great variety throughout the professional disciplines (Ellegaard, 2018, p. 2).

The benefit of the bibliometric analysis to academic research is that it provides an incipient wide overview, interconnections and trends that can help identifying the research gaps and, therefore, in guiding the study towards filling them in. For the start of the bibliometric analysis with respect to the four main constructs – innovation management, competitive advantage, agility and organizational performance, the information has been selected from the Web of Science Core Collection database (WoS) during February 2023 and their publication years varied from 1975 to 2023. The results were generated by applying a query through the Advanced Search function, that was focused on showing only the items that included any of the constructs in the Title section. In addition, the document types contained only articles and the English language has been the only one selected, being the basic language for the research paper.

Taking into consideration that the constructs are widely present in various activity fields and that at this stage the total number of generated results was of 11,864, in order to restrain the view towards a management perspective, a last filter has been applied for the Web of Science Categories section, which will include for analysis purposes only Management research papers. This selection has been performed also in accordance with the criteria included in WoS Meso-topics schema applicable starting 2022 (Citation Topics WoS, n.d.), obtaining a total number of 3,795 results.

The following step regarded the search of each of the constructs in the Title field, in order to understand the individual weight in the total number of 3,795 indexed articles. The

results emphasize that the first article was published in WoS in 1975, referring to “organizational performance” and from the all-time articles in this matter, 42.76% have been published in the past five years (2018 – 2023). Another significant weight is allocated to the articles published during the same past period of 5 years, 2018 - 2023, respectively: for “innovation management” – 51.6% of the entire number of 1,097 articles published within the year 1979 - 2023 and for “competitive advantage” – 33.25% of the total number of 803 articles.

“Agility” appeared firstly in an article published in 1994 and 65.72% of all articles including this construct in their title have been published in the past five years period, gaining an astonishing weight, given also the difficult times every organization had to face due to the COVID-19 pandemic and the companies’ need to adapt to changing conditions. Taking as a basis the above-mentioned information, it can be noted that in the past five years, these constructs have become incrementally more present in the management research papers, guiding the upcoming studies through new approaches in these perspectives (see Table 1).

**Table 1. Overview of the published articles indexed in WoS**

Construct	No. of articles indexed in WoS	Year of first indexation in WoS	No. of articles published in journals indexed in WoS during 2018-2023	Percent of the latest articles out of the total
Innovation Management	1,097	1979	566	51.6%
Competitive advantage	803	2018	267	33.25%
Agility	388	1994	255	65.72%
Organizational performance	1,527	1975	653	42.76%

Source: own processing

All the results filtered as described have been exported as a plain text file from the WoS database including full record information, such as: authors, titles, abstracts, sources, topics, publication years and references, details that are going to represent the root in the further analysis process.

Given the large volume of bibliometric data that is used in the academic researches, it has been noted by (Donthu et al., 2021, p. 286) that scientific databases such as Scopus and WoS have simplified the access to large volumes of data and bibliometric software, such as VOSviewer (Visualization of Similarities), and it enabled the data analysis in a very pragmatic way and with applicability for diverse fields, ranging from studying publications to collaboration patterns and keywords network.

## Findings and discussion

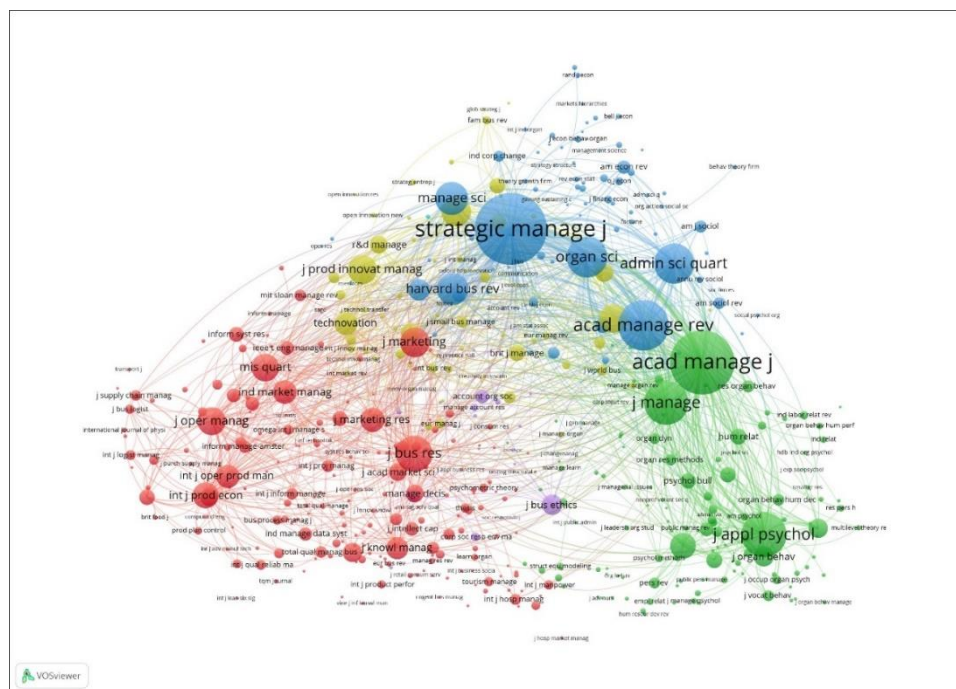
Based on the premise that the bibliometric analysis has been performed with a view over the development of the available academic resources existing for the four main constructs, Donthu states that if the objective of the analysis is to review the past, present and future of a research field, “then a combination of co-citation analysis (past), bibliographic coupling (present) and co-word analysis [...] (future) can be selected.” (Donthu et al., 2021, p. 292).

An excerpt of the most co-cited sources is presented in Table 2 and Figure 1, given the chosen threshold of 50 minimum number of citations of a source, resulting into a number of 527 sources that met the threshold, from the total number of 38,615 sources. 'A co-citation link is a link between two items that are both cited by the same document' (Van Eck & Waltman, 2023 p. 27).

**Table 2. Prominent co-cited sources**

Source	Citations	Total link strength
Strategic Manage J	9705	628912
Acad Manage J	8135	518870
Acad Manage Rev	5499	350082
J Manage	4412	297820
Organ Sci	3915	273511
J Appl Psychol	4597	253864
J Bus Res	3203	233585
Admin Sci Quart	3843	232502
Manage Sci	2783	175002
J Oper Manag	2154	157812
J Prod Innovat Manag	2262	156522
J Manage Stud	2178	155367
J Marketing	2341	152607
Res Policy	2326	151333
Harvard Bus Rev	2602	150799

Source: own processing

**Figure 1. Prominent co-cited sources and their clusters**

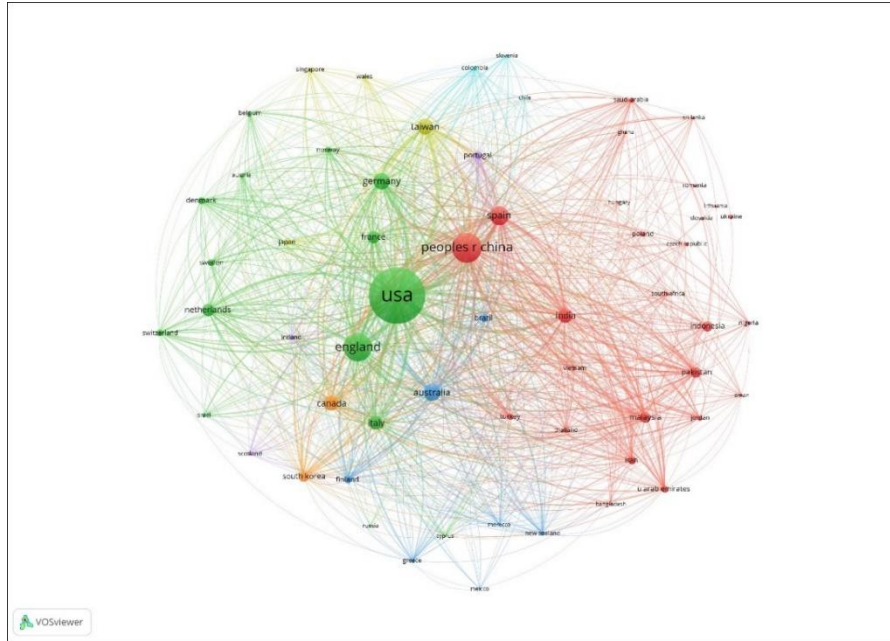
Source: own processing

An overview including the most co-cited authors in the selected articles has been achieved by selecting cited authors as a unit of analysis. In this case, the chosen threshold of 100 minimum number of citations of an author, resulting into a number of 199 authors that met the threshold, from the total number of 71,917 authors (see Table 3 and Figure 2).

**Table 4. Countries of the co-cited authors**

Country	Documents	Citations	Total link strength
USA	977	114718	1324748
Peoples R China	407	15036	809297
England	373	19144	623736
Spain	220	9770	522415
Taiwan	167	5370	398324

Source: own processing



**Figure 3. Countries of the co-cited authors and their clusters**

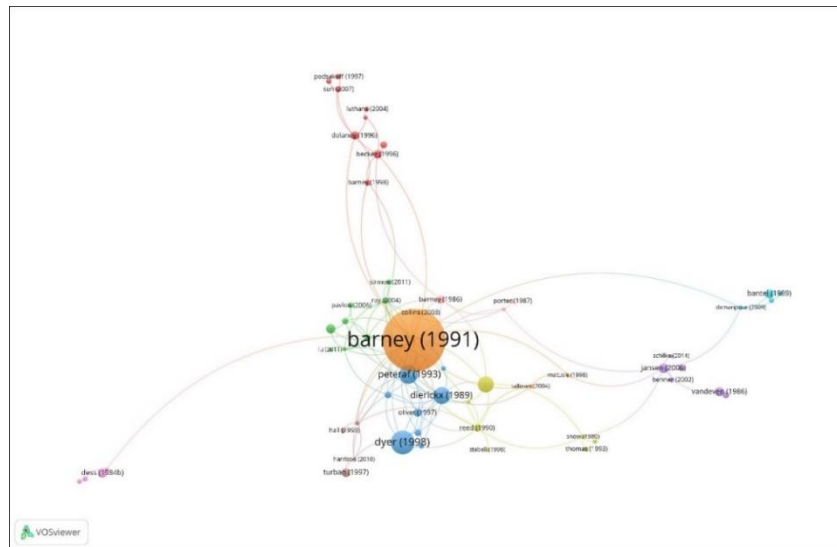
Source: own processing

With respect to the citation analysis (i.e., ‘A citation link is a link between two items where one item cites the other’, as posited by Van Eck & Waltman, 2023 p. 27), the most prominent authors cited are displayed in Table 5 and Figure 4. There has been selected a minimum number of citations of a document of 500, resulting into a number of 78 documents that met the threshold, out of the total number of 3,795 documents.

**Table 5. Most prominent authors retrieved from the citation analysis**

Document	Citations	Links
Barney (1991)	23674	24
Dyer (1998)	6184	8
Peteraf (1993)	4487	11
Dierickx (1989)	3888	13
Grant (1991)	3501	6
Porter (1990)	3123	0
Jansen (2006)	1761	8
Dess (1984b)	1698	1
Argote (2000)	1647	0
Porter (1985)	1632	3
Barney (1991)	23674	24
Dyer (1998)	6184	8
Peteraf (1993)	4487	11

Source: own processing



**Figure 4. Prominent cited authors**

Source: own processing

Continuing with the bibliographic coupling analysis, the most recurring cited authors are presented in Table 6. The selected threshold has been of minimum 5 documents of a single author and there have been selected 37 authors from the entire number of 8,680 authors. 'A bibliographic coupling link is a link between two items that both cite the same document', as stated by Van Eck & Waltman, 2023 p. 27).

**Table 6. Recurrent cited authors based on bibliographic coupling**

Document	Citations	Total link strength
Gligor, David M.	8	540
Volberda, Henk W.	7	2273
Van den Bosch, Frans A. J.	5	2200
Abdallah, Ayman Bahjat	6	178
Alegre, Joaquin	6	829
Chiva, Ricardo	5	654
Gunasekaran, Angappa	5	554
Jimenez-Jimenez, Daniel	5	135
Bruch, Heike	6	505
Li, Yuan	8	264
Goldsby, Thomas J.	5	250
Ilmudeen, Aboobucker	5	66
Baird, Kevin	7	218
Su, Zhongfeng	5	240
Ferreira, Joao J.	6	35
Mehralian, Gholamhossein	6	148
Kumar, Anil	5	78
Del Giudice, Manlio	5	286
Wang, Mo	5	146
Kraus, Sascha	5	125
De Massis, Alfredo	5	286
Ratten, Vanessa	5	38
Birkinshaw, Julian	5	1372
Beuren, Ilse Maria	5	11
Wu, Jie	5	116
Brem, Alexander	7	415
Golgeci, Ismail	5	50
Vrontis, Demetris	6	80
Choi, Jin Nam	5	395

Song, Michael	5	1008
Liu, Wei	5	23
De Clercq, Dirk	5	62
Barney, JB	7	5366
Dess, GG	5	3186
Ortt, Roland	6	3
Porter, Me	5	7240
Van Der Duin, Patrick	5	0

Source: own processing

VOSviewer supports the bibliometric analysis of all keywords' co-occurrence, facilitating from a visualization perspective the identification of a particular research gap, that would be available for further academic research. Continuing the quantitative analysis by querying the WoS database for the main four constructs, in order to select only the articles relevant for study, the following search was performed initially, only by considering the titles of the articles: (TI=(innovation management) AND TI=(competitive advantage) AND TI=(agility) AND TI=(organizational performance) AND TI=(SME)) AND (LA=="ENGLISH") AND DT=="ARTICLE" AND TASCA=="MANAGEMENT"), but the search generated no results. The operation has been repeated, but searching within the all fields of articles and there was one single result. Another search included the more flexible (generic) formula (((ALL=("innovation management")) AND ALL=("competitive advantage")) AND ALL=(agility)) AND ALL=(performance)), but only four results were retrieved.

Therefore, proceeding with the consideration of wider constructs, the analysis has been revised by using the concepts: *innovation*, *competitive advantage*, *agility* and *firm performance*, by taking into account only articles in English language and part of the Management category and by applying the following revised query: (ALL=(innovation) AND ALL=(competitive advantage) AND ALL=(agility) AND ALL=(firm performance)) AND (LA=="ENGLISH") AND DT=="ARTICLE" AND TASCA=="MANAGEMENT"). The concluded results for this query were 51.

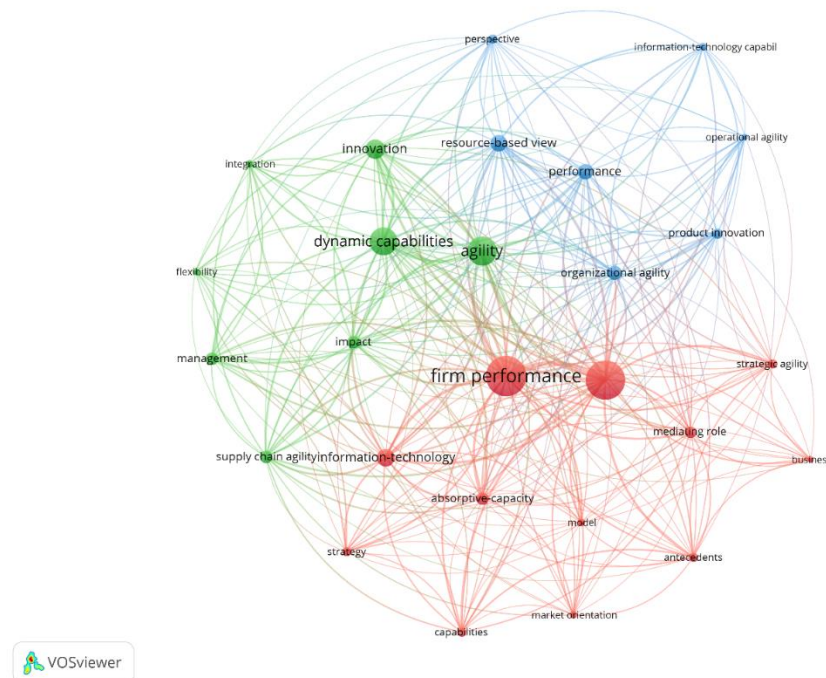
Moving forward with the VOSviewer keywords co-occurrence analysis, out of the 367 keywords, only 27 met the threshold of fulfilling minimum number of 5 occurrences of a keyword. Table 7 and Figure 5 offer visibility with regards to the keywords' co-occurrence network and their link strengths and their interpretation has to start from the fact that each node and word highlight the importance of the respective item within the network and subsequently and their weight is based on each item's frequency. The line between the nodes shows the link between these and the longer the link is, the weakest their connection, corroborated with the density of the line: if the line is thicker, this reflects that the respective constructs have been often used together.

**Table 7. Keywords, occurrences and total link strength**

Keyword	Occurrences	Total link strength
Competitive advantage	31	165
Firm performance	32	164
Dynamic capabilities	22	120
Agility	23	111
Information-technology	14	83
Resource-based view	13	83
Innovation	15	78
Performance	12	67
Impact	10	66
Supply chain agility	10	65
Organizational agility	11	58

Absorptive-capacity	10	55
Management	10	54
Mediating role	9	48
Product innovation	8	48
Antecedents	7	47
Capabilities	7	46
Strategic agility	7	43
Integration	6	40
Perspective	7	38
Strategy	7	35
Information-technology capability	6	33
Market orientation	6	32
Operational agility	5	31
Flexibility	5	30
Model	6	30

Source: own processing

**Figure 5. Keywords' co-occurrence network of WoS publications - by VOSviewer**

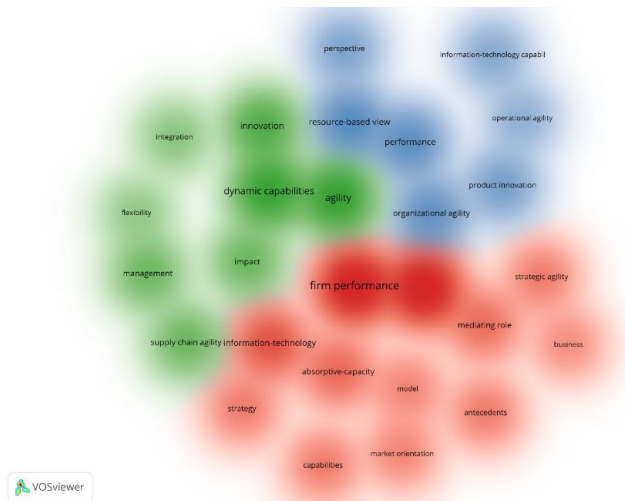
Source: own processing

Each color represents a particular cluster and it includes connected keywords, as organized by VOSviewer, according to Table 8 and Figure 6.

**Table 8. Keyword clusters**

Cluster 1 (12 items)	Links	Total link strength	Occurrences
Absorptive-capacity	23	55	10
Antecedents	21	47	7
Business	16	24	5
Capabilities	18	46	7
Competitive advantage	26	165	31
Firm performance	26	164	32
Information-technology	24	83	14
Market orientation	19	32	6
Mediating role	22	48	9
Model	18	30	6
Strategic agility	22	43	7
Strategy	20	35	7
<b>Cluster 2 (8 items)</b>			
Agility	25	111	23
Dynamic capabilities	25	120	22
Flexibility	16	30	5
Impact	21	66	10
Innovation	24	78	15
Integration	17	40	6
Management	20	54	10
Supply chain agility	21	65	10
<b>Cluster 3 (7 items)</b>			
Information-technology capability	14	33	6
Operational agility	17	31	5
Organizational agility	22	58	11
Performance	24	67	12
Perspective	20	38	7
Product innovation	22	48	8
Resource-based view	25	83	13

Source: own processing



**Figure 6. Density visualization and keyword clusters of WoS publications - by VOSviewer**

Source: own processing

According to the above Figure 6, the first cluster is highlighted in red and it focuses on the co-working between the main constructs: firm performance – competitive advantage –

absorptive capacity. It is the most representative one, given the total links strengths and it guides us towards researching on the existing dependencies between these constructs.

The second cluster pictured under green color concentrates on the connection between innovation (management) – dynamic capabilities – agility. Dynamic capability seems to be the trigger of innovation, supported by the co-occurrences of management, agility, flexibility, view that finds its applicability in the business environment nowadays, given that innovation requires a certain adaptable dynamic to keep in line with the market evolution and continuous concern of gaining competitive advantage.

The third cluster marked in blue color provides visibility over the triad resource-based view – performance – organizational agility, with highlighting that the perspective can be further analyzed, through the existing term included in the cluster. Consequently, based on the above analysis, the interconnections between the main four constructs initially considered – measured via the direct total link strength – are displayed in Table 9.

**Table 9. Dyads and total link strength**

<b>Dyads</b>	<b>Total link strength</b>
Innovation – Agility	7
Agility – Firm performance	13
Competitive advantage – firm performance (performance)	31
Innovation – Competitive advantage	8
Innovation – Firm performance	8
Competitive advantage - Agility	15

Source: own processing

Table 9 grants a good perspective regarding the potential areas of research, taking into consideration that the most interconnected constructs are competitive advantage – agility – firm performance. It can be observed that the innovation component has not been exposed in a representative manner within the existing research field and it provides a suitable research area for further study, through its combination with aspects of managing the innovation within organizations.

### **Final considerations**

The daily focus of the European SMEs is significantly rooted within the competitiveness approach, trying to identify the company's needs, resources and opportunities to gain competitive advantage on the market and keep the current performance or aiming to increase it, by leveraging agility and innovation (management). Despite the fact that the companies may be located in European countries that are more or less developed than others, they thrive to stay competitive on the global market, therefore the pressure to adapt, to stay flexible and be agile may become a burden on the management's shoulders.

The performed bibliometric analysis facilitates the understanding of the connection between innovation management, competitive advantage, agility and organizational performance and, furthermore, provides future direction towards analyzing the influence of innovation management over these variables and connects the innovation management process, through its multidisciplinary character with the need of the company to develop its agility, so that it may encourage the company's future competitive advantage and improve its organizational performance.

The final goal is therefore oriented towards the organizational performance, through a proper approach of innovation management within the company, by highlighting its

importance, in order to be aware of any negative impact and mitigate any potential risks. Subsequently, future analysis should be focused on the theoretical and empirical perspective of the topic, rooted in the bibliometric reports.

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