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INDUSTRIAL MARKETING IN THE CONTEXT OF INNOVATION DEVELOPMENT: REVIEW AND RESEARCH AGENDA

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Goal: to outline the structure of the research discussion on innovation industrial networks; to determine the state of the discussion regarding the participation of various actors in innovation networks at various stages of the innovation process; to identify fundamental works on this topic and to form the agenda for future research. **Methodology:** the study was conducted using two bibliometric approaches: keyword analysis and co-citation analysis using the Scopus database; also manual coding of 116 documents was used in order to identify "hot topics" and emerging topics (little-studied). **Findings:** five key areas of research were proposed, dividing the broad topic into narrower and more specific areas; the core of the most authoritative research in the field was proposed, demonstrating the implicit fusion of two disciplines: industrial marketing and innovation management. **Originality and contribution of the author:** The article presents the first bibliometric analysis of the existing literature in the studied area with a focus on the structural units of the network (actors) at various stages of the innovation process. The study makes a significant contribution to clarifying the interdisciplinary nature of the study of relationships between actors for innovation. The existing and emerging (little-studied) trends in research are highlighted.

Keywords: business-to-business, innovation, innovation network, innovation management, industrial marketing, actor.

JEL: O32, M31.

INTRODUCTION

Research on industrial marketing for innovation within the framework of external openness has been gaining popularity in recent decades, with a growing number of publications and an increasing number of approaches to the study of complex innovation processes. Industrial marketing includes the study of relationships between actors, especially B2B, as one of the central topics; in industrial marketing studies studying innovation, innovation provides the context. The network approach, as one of the dominant concepts of industrial marketing, has identified networks as the most promising

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form of innovation creation and development [Мцller, Rajala, Svahn, 2005; Кердnen et al., 2021] and has given rise to innovation networks that aim to create, develop and promote innovation.

Managing relationships between actors in an innovation context is an important part of modern business [Hoskins, Carson, 2022; Vigren, Kadefors, Eriksson, 2022; Fernández-Portillo et al., 2022] and the research claims high practical relevance. This field, however, also faces a number of challenges. For example, the literature on innovation network structure has focused on resource sourcing capabilities and innovation development and creation [Najafi-Tavani et al., 2018; Wang, Chung, 2020; Aarikka-Stenroos et al., 2017; Кердnen et al., 2021], while innovation promotion in the context of networks has remained under-reported. M. Z. Yaqub and co-authors identified a lack of research on the relationship between innovation diffusion and innovations created within innovation networks [Yaqub et al., 2020]. I. Jenson, R. Doyle and M. P. Miles highlight the role of intermediaries in marketing for the commercialization of innovations as a promising area of research [Jenson, Doyle, Miles, 2020].

On the other hand, research on innovation management also examines the possibility of innovation creation and development; the relationship between actors is considered as a context or factor. The dominant paradigm of open innovation suggests that valuable ideas can be generated both internally and externally; the same applies to the diffusion of ideas pathways can be both external and internal [Chesbrough, 2003]. Clarifying the concept of "open innovation" in its use in practice, open innovation is the deliberate managed inflow and outflow of resources (especially knowledge), to create, develop and accelerate innovation and push the boundaries for the implementation of innovation in the market [Chesbrough, Vanhaverbeke, West, 2006; Chesbrough, Heaton, Mei, 2021; Yang, Chesbrough, Hurmelinna-Laukkanen, 2021]. Within the framework of the described concept, resources can come and spread not only between or with the help of firms, but also with the help of other organizations (actors). The researchers identify firms, research organizations, government organizations and social institutions as the main groups of actors (see, e. g.: [Rampersad, Quester, Troshani, 2010; Lievens, Blažević, 2021; Bezerra Borges, Meyer Soares, Santana Silva, 2021]). Accordingly, when considering innovation networks, researchers should focus not only on the interaction of firms, but also on interaction with other organizations.

Despite the fact that such studies occur, they also mainly focus on the stages of developing ideas and developing innovations without much mention of marketing applications. The lack of consensus on the optimal composition of an innovation network, methods for its formation and management, and the lack of research on network types and management practices [Hurmelinna-Laukkanen, Möller, Nätti, 2022] also necessitates additional research on the topic.

Periodic reviews of the literature in a particular field contribute to a systematization of knowledge, existing contributions, and also allow a number of directions for future research to be reasonably identified. Such reviews also inform researchers about key contributors (authors), countries, topics, and articles [Anand et al., 2020].

Over the past decade, the field of industrial marketing has been subjected to periodic systematic analyses and literature reviews, the need for which is justified through the fragmentation of knowledge in this field [Kohtamäki, Rabetino, Möller, 2018], the gap between theory and practice, the loss of relevance of research (e. g.: [Möller, Nenonen, Storbacka, 2020]), as well as through the need to understand the path and promising directions for future research.

In 2022, K. Möller and A. Halinen conducted a meta-theoretical analysis of business marketing, examining the two most influential development paradigms promoted by two different communities: the North American mainstream tradition (NAM) or the indus-

trial marketing and purchasing (IMP) group [Möller, Halinen, 2022]. The authors call for an increase in the level of theorizing and design of business marketing, and as some gaps they name the following questions: "... What kind of market or network forms exist; how they evolve and why; what kind of channel systems or strategic networks exist; how they evolve and why; and how these various market forms can be effectively managed", which corresponds to other previously noted research concerns [Möller, Halinen, 2022, p. 296].

In other reviews, researchers pay attention to less broad theoretical boundaries, focusing on the development of the research agenda and conceptual foundations for relationship between actors alliances, networks, ecosystems (e. g.: [Möller, Halinen, 2017; Kohtamäki, Rabetino, Möller, 2018]).

Research in the field of relationships between actors and their impact on innovation development in previous works has also been subjected to systematic analysis and in-depth review (e. g.: [Silva, Guerrini, 2018; Gomes, Facin, Hourneaux Junior, 2019]). Scientists conducting such research offer a rich set of directions for future research, which indicates that this area of knowledge is developing, there is a lot of unexplored and, therefore, requires additional efforts to develop a deeper discourse in general and in certain narrower areas [Hurmelinna-Laukkanen, Möller, Nätti, 2022]. However, previous systematizations did not use the network structure as the main vector at various stages of the innovation process; the knowledge about them is fragmentary. Also, a significant gap is that the studied area is not covered by bibliometric methods.

Thus, the purpose of this article is: to use bibliometric analysis to outline the structure of the research discussion on innovative industrial networks; to determine the state of the discussion regarding the participation of various actors in innovation networks at various stages of the innovation process; to identify fundamental works on this topic and to form the agenda for future research.

Bibliometric methods using scientific mapping software allow for the identification and conceptualization of trends and key areas of the field under study, as opposed to other methods such as narrative, meta-analysis, and review [Gaviria-Marin, Merigy, Baier-Fuentes, 2019; Anand et al., 2020]. Quantitative assessment keeps the analysis objective and makes bibliometric analysis a tool for providing rigorous results [Koseoglu, 2016; Mariani, Borghi, 2019; Anand et al., 2020]. In this study, we use estimation and relational methods [Koseoglu, 2016; Anand et al., 2020]. The evaluative method aims to highlight quantitative indicators reflecting the state of scientific discussion (top articles, top authors, countries of publication, citations, etc.). The relational method focuses on determining the structure of the field under study (relationships between journals, authors, keywords, citations, etc.) and identifying theoretical frameworks and trends [Benckendorff, Zehrer, 2013; Gaviria-Marin, Merigo, Popa, 2018; Anand et al., 2020].

To ensure structure and consistency in this study, we propose a list of questions that will allow mapping the area under study and identify existing development trends. A similar approach to the navigation of bibliometric works is recognized by researchers (e. g.: [Anand et al., 2020; Anand, Brix, 2021; Gaviria-Marin, Merigo, Popa, 2018]).

RQ1. Which countries have contributed the most to the development of the study area?

RQ2. What are the most cited articles in the study area and their focus?

RQ3. What are the keywords and themes used to explore inter-firm relationships for innovation?

RQ4. What are the intellectual foundations of inter-firm relationships for innovation and their evolution?

RQ5. What are the trends in the field under study?

In this study, we conduct a bibliometric analysis of the existing literature on this topic, form a chronological view of its de-

velopment, and form a research agenda. Given the interdisciplinary nature of this topic, and its growing relevance, this study makes a significant contribution to the literature at the intersection of industrial marketing and innovation management. Through analysis and synthesis, we bring together and interpret the basic mechanisms and processes by which the merging of the two disciplines has occurred from a historical perspective. The methodology chosen allows us to combine knowledge from the two fields of study and present a comprehensive structure of the topic under study. In addition, as our contribution, we offer a program of future research to address the problems and identify theoretical gaps.

The next section will provide a detailed description of the research methodology: the selection of keywords and the selection of articles for analysis, the procedure for bibliometric analysis and manual coding. In the "Results" section, a description of the results of the analysis will be presented and answers to the first four research questions will be given. The last section will summarize the results obtained and provide an answer to the 5th research question about what are the trends in the field under study.

METHODOLOGY

In this work, we use a transparent methodology in order to obtain valuable, new knowledge, ensuring scientific rigor with respect to reproducibility of results. We use a five-step approach to conducting the review [Tranfield, Denyer, Smart, 2003; Anand et al., 2021; Anand, Brix, 2021].

At the first stages, we define the boundaries of our research by selecting keywords, databases and forming search strings [Tranfield, Denyer, Smart, 2003; Anand et al., 2020]. The key words of the study are essential, significant constructions defined by the authors as central and reflecting the actual content of the work [Anand, Brix, 2021].

In this study, the authors seek to identify the core of works at the intersection of industrial marketing, with a focus on the dominant concept of "network approach", as well as on the main function of marketing — promotion, and innovation management, with a focus on co-creation between firms. Following the recommendations of [Zupic, Čater, 2014], the key words were identified by researchers and clarified in consultation with an expert. Also, key words that do not have independent significance in the search for articles were excluded from the general list.

We selected Elsevier's "Scopus" database in order to identify the most relevant high-quality articles [Anand et al., 2020]. This database is the most widely used [Harzing, Alakangas, 2016]. Then a selection of studies was carried out, which we conducted through keyword search, using the identified keywords and features (filters) of the selected database (Table 1). Two groups of keywords for industrial marketing and joint innovations were identified, the combination of which made it possible to identify relevant articles at the intersection of these focuses. In order to provide more accurate search results, we have considered various keyword options for industrial marketing and collaborative innovation [Anand et al., 2020]. Using our set of words, we identified 353 articles. In addition to limiting the set of keywords, we have limited the subject areas "Business, Management, and Accounting", "Economics, Econometrics, and Finance", "Decision Science", and "Interdisciplinarity". We also limited the language to English and Russian, and the type of papers to articles published in journals. The restriction to journal articles is justified due to the highest methodological standard of such publications [Anand, Brix, 2021]. By performing a combined search on Scopus and limiting the topics of the articles to the relevant fields, we identified 128 relevant papers. The database was uploaded on April 29, 2022, therefore, at the time of publication, a similar search may yield more results.

Table 1

Keyword search string

Keyword protocol	Publication extracted
(TITLE-ABS-KEY (“*Industrial marketing*” OR “*b-2-b marketing*” OR “*b2b marketing*” OR “*business-to-business marketing*” OR “*Relationship* marketing*” OR “*promotion*” OR “*marketing strateg**” OR “*B2b*” OR “*B-2-b*” OR “*Business to business*” OR “*Business-to-business*” OR “*Innovation marketing*”)) AND (TITLE-ABS-KEY (“*Open innovation**” OR “*Innovation network**” OR “*Knowledge network**” OR “*Creation network**” OR “*Innovation ecosystem**” OR “*Knowledge ecosystem**” OR “*Creation ecosystem**” OR “*Knowledge flow**” OR “*Joint innovation**” OR “*Joint creativity**” OR “*B2b Value Co-creation*” OR “*B-2-b Value Co-creation*” OR “*Business-to-business Value Co-creation*” OR “*Industrial Value Co-creation*”))	128

We would like to express our gratitude to the anonymous reviewer who offered to conduct a reliability test. To verify the compliance of the articles with the research topic, cross-coding was carried out by two encoders. After discussing the results and controversial works, it was decided to exclude 12 articles from the analysis. Thus, the base for analysis is equal to 116 articles. The reliability of the intercoder is 0.95.

Based on the articles identified, the emergence of a growing trend occurred in 2003, and it was in that year that we found the first article related to our analysis of innovation networks and industrial marketing (Figure 1). This indicates the growth of innovation activity and the actualization of the request for the formation of networks for the creation, development and promotion of innovations over the past 20 years. In 2020 and in 2021, the highest number of relevant articles were published, indicating a growing interest in this issue, and accordingly requiring special attention.

In this study, we use evaluative and relational methods [Koseoglu, 2016; Anand et al., 2020]. The evaluation method is aimed at identifying quantitative indicators reflecting the state of scientific discussion (leading articles, leading authors, countries of publications, citations, etc.). The relational method, in turn, focuses on determining the structure of the research area (links between journals, authors, keywords, links, etc.), as well as identifying theoretical foundations and trends [Benckendorff, Zehrer, 2013; Gaviria-Marin, Merigo, Popa, 2018; Anand et al., 2020]. To answer the first two research questions, we use Scopus metrics, which give an idea of the authors and the most cited works based on quantitative indicators.

To answer the following research questions *RQ3*, *RQ4* and *RQ15*, we use keyword analysis, co-citation analysis of references (CCAR), and manual coding. The analysis of the repetition of keywords allows us to determine the conceptual structure of the research area, identify thematic clusters of research and establish relationships with other groups of research areas [Anand et al., 2020]. To identify the most influential works in the field under study, a CCAR was conducted based on the identified 116 articles. We use the VOSviewer program to identify jointly cited articles, determine a top list consisting of 16 articles, which we then analyze and form a chronological map of the development of the area under study [Belussi, Orsi, Savarese, 2019]. To determine the development of the topic, cross-coding was carried out by two encoders. The reliability of the intercoder is 0.928.

It is noteworthy that after the reduction of the database after cross-coding, repeat-

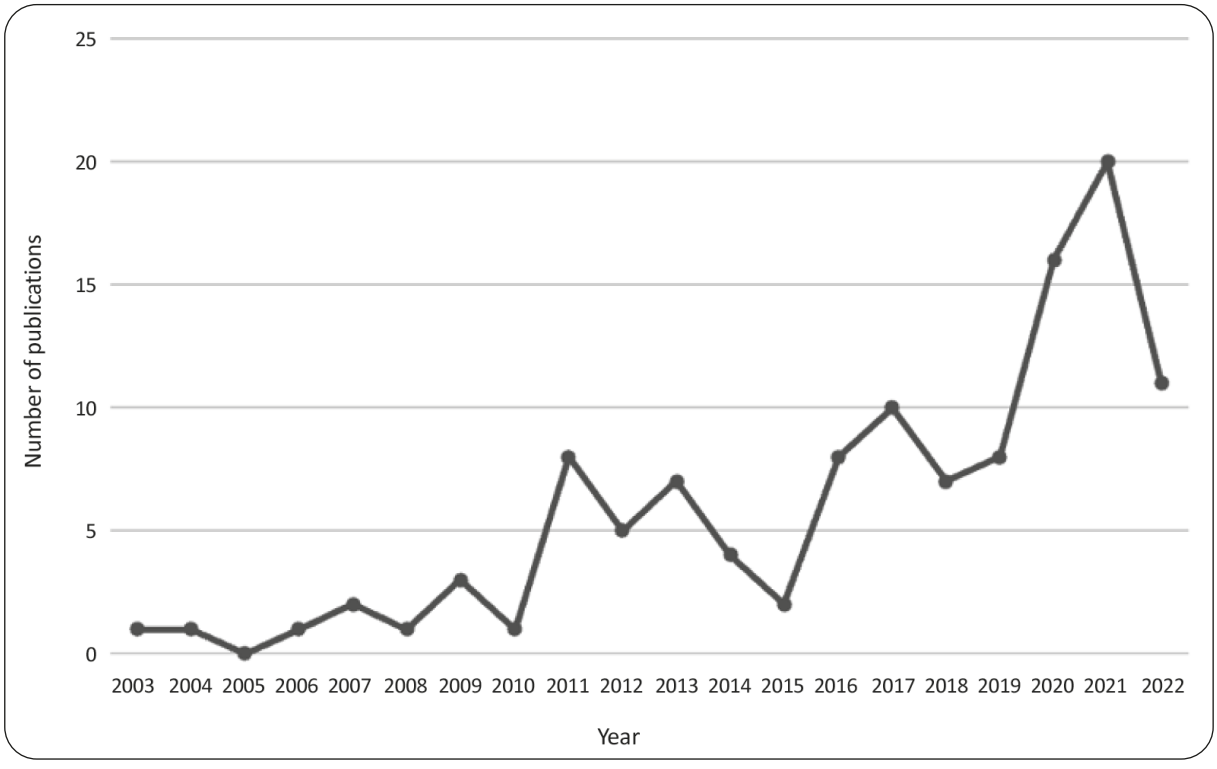

Fig. 1. Dynamics of publications on the topic of industrial marketing development in the context of innovation networks and open innovations, 2003–2022

Note: for 2022, the data for April 29 are indicated.

ed data analysis operations were carried out, during which it was revealed that the articles excluded during the re-analysis had an insignificant impact on the keyword map and had no effect on the final results of the joint citation analysis during the first analysis. This is due to the fact that the keywords and links to sources for these articles were very different from the topic under study, and they did not occur in other articles, and accordingly they did not pass the threshold of occurrence and did not get into the results.

RESULTS

In the conclusions section, we answer the first two research questions based on Scopus metrics. In this section, we highlight the evidence on research on inter-firm relationships for innovation. For the third and fourth questions, we answer using keyword analysis and clustering. For the fifth question, we apply co-citation analysis.

RQ1. Which countries have contributed the most to the development of the study area?

The graph in Figure 2 presents the distribution of the identified publications on the topic by country of origin. Country is defined through the affiliation of at least one author with a specific country [Lypez-Illescas, De Moya Anegyn, Moed, 2008; Anand, Brix, 2021]. This kind of information contributes to understanding the geographic breadth of the topic, the specificity of the context for certain concepts, and allows researchers to focus on countries where the development of the topic is already at a high

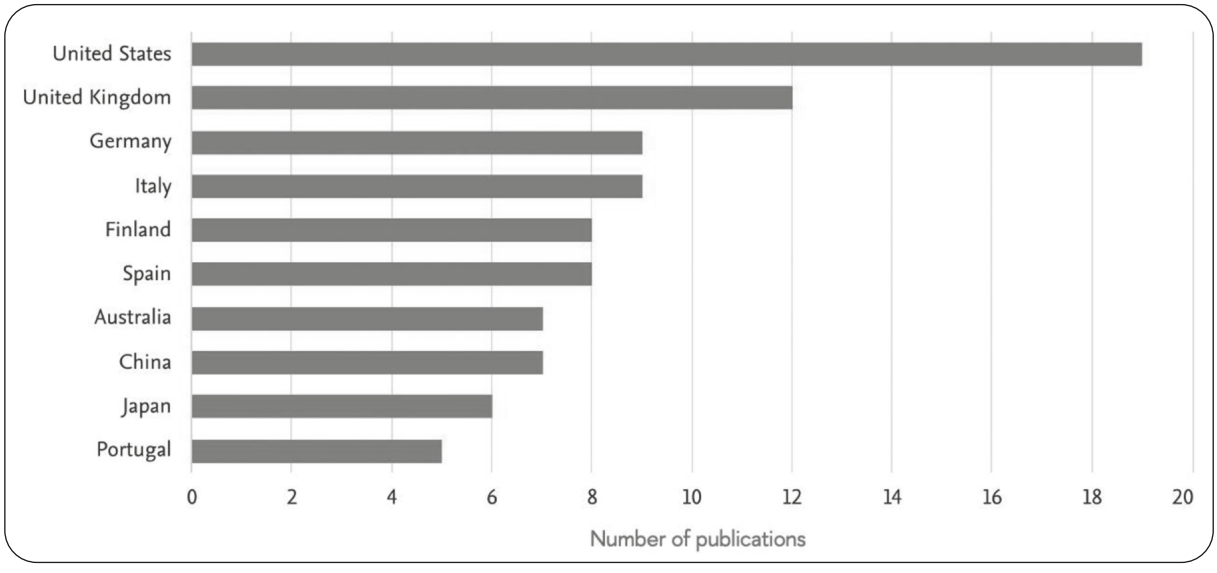

Fig. 2. Distribution of publications by countries

level and where it is still in its infancy [Anand, Brix, 2021].

Figure 2 shows the contributions of authors affiliated with certain countries. This means that the academic communities of these countries have contributed significantly to the publication activity devoted to the topic of studying B2B marketing in innovation networks and related terminology.

The most productive in terms of publications on the use of industrial marketing in innovation networks were the US (21 articles) and the UK (13 articles). For example, the most cited article in the US examines the factors that contribute to the emergence of innovation network leaders by mainstreaming the problem of community integration and relationship management [Fleming, Wag-Pak, 2007]. In another article, [Di Gangi, Wasco, 2009] the authors raise the issue of innovation promotion and the problems associated with it. The authors argue that promoting innovation requires a clear understanding of basic customer needs and concerns. While supporting the concern of creating and promoting innovation, other authors focus on the challenges and benefits of creating innovation with customers [Noordhoff et al., 2011], the impact of the marketing function on innovation efforts [Griffin et al., 2013], and changes in the buyer-supplier relationship in the context of digitalization [Obal, Lancioni, 2013].

Researchers from the UK are exploring this issue in terms of interactions not only between business and business, but also with government agencies and research organizations [Love, Roper, Bryson, 2011; Ahn, Lee, Mortara, 2020], which is generally consistent with a network approach focused on innovation. Other researchers have also focused on project network management for innovation development [Barbick et al., 2021; Gurka et al., 2021; Markovic et al., 2021]. Scholars from Italy have supported the inclusion of not only inter-firm but also university relationships [Moretti, 2019], shifting the focus from the firm to the university laboratory.

Based on the analysis of publications from different countries, we identified similar research directions in the area of innovation networks and relationship management. We also identified a number of unique areas, indicating the need for cross-cultural study of the problem to comprehensively understand best practices in creating and promot-

ing innovation through innovation networking.

RQ2. What are the most cited papers in the study area and their focuses?

According to [Anand, Brix, 2021], the most cited papers contain the most significant findings and "hot" topics. Table 2 contains the 10 most cited papers (according to Scopus data), excluding review articles as well as the main focuses. Analyzing the most cited publications (excluding bibliometric studies and reviews), we found that the most relevant topics are creating and developing innovation through competitions [Leimeister et al., 2009], leadership and management in innovation networks [Fleming, Waguespack, 2007; Love, Roper, Bryson, 2011; Rampersad, Kwester, Troshani, 2010] and customer-supplier relationships, promoting innovation [Di Gangi, Wasko, 2009].

The most cited articles found using the algorithm described above offer some insight into the development of the topic and an understanding of the most important issues. To identify theoretical gaps in the topic and the least studied areas, we conduct a keyword analysis using the VOSviewer.

RQ3. What are the keywords and topics used to explore inter-firm relationships for innovation?

Keywords in articles reflect the most significant constructs that the authors consider to be the focus of their research. Keywords in bibliometric analysis identify "hot spots" for research [Anand, Brix, 2021]. After uploading of downloaded file from Scopus to VOSviewer, the program identified 647 keywords in the dataset. By setting the minimum occurrence threshold to 3, the number of words detected was 29. Since the keywords were slightly below the threshold, as explained by [Anand et al., 2021], we decided to set the word occurrence threshold to 2, and this gave us a total of 86 most frequent keywords. After that, we removed 4 keywords denoting the research method, thus obtaining a database of 82 keywords of which 77 are interrelated. A two-dimensional word map was then constructed using VOSviewer (Figure 3), showing clusters of keywords by topic and the relationships between them.

We used keyword analysis to identify key terms that characterize specific areas of innovation-oriented industrial marketing research. We identified 6 meaningful clusters (Appendix 1) that have many connections and can be interpreted as a separate field [Anand, Brix, 2021]. For example, the red cluster characterizes research related to the dissemination of information and knowledge, the role of social networks in this process and the possibility of regulating these flows. The blue cluster shifts the focus slightly towards managing such flows in order to create value and innovation. The green cluster corresponds to the research of inter-organizational networks that are focused on the development of innovations in a market context. The blue cluster characterizes research on managing relationships with various stakeholders within the innovation environment. The purple cluster corresponds to research on service innovations in industrial chains, and the yellow one characterizes the work aimed at studying the relationship between technological development and industrial/innovative performance.

RQ4. What are the intellectual foundations of inter-firm relationships for innovation and their evolution?

According to [Anand et al., 2021], CCAR was conducted using VOSviewer to identify key articles in industrial marketing focused on innovation, identify innovative journals in the field, and observe and emphasize the intellectual framework (Figure 4).

By performing a combined search in Scopus and limiting article topics to relevant areas, we identified 116 papers. The database was then downloaded from Scopus and loaded into VOSviewer to perform CCAR. This software identified a total of 7.491 citations, of which 25 met the threshold of 4 citations. Following the VOSviewer algorithm, the total strength of citations for joint citations with other citations was calculated, and we limited the number of articles to 16 to select the strongest core of articles in this research

Table 2

The key focuses of the most cited articles from our data

Source	Topic/Focus	Notes/Remarks	Number of citations
[Leimeister et al., 2009]	Involving active participants in the ideas competitions	Exposes the problems of attracting external participants at all stages of innovation development	542
[Fleming, Waguespack, 2007]	Factors of the emergence of leaders of innovative communities	Exposes the problems of creating and coordinating innovation networks	447
[Di Gangi, Wasko, 2009]	Involving consumers in creating innovations	Exposes problems related to the needs, fears of users and innovative offer	270
[Love, Roper, Bryson, 2011]	The absorptive capacity and the impact of the firm's various relationships with other actors	Exposes the problems of knowledge flow management at each stage of the research process	189
[Noordhoff et al., 2011]	Involvement of consumers in the creation of innovations and their impact on the final result	Exposes the problems of reasonable management of customer participation in the creation of innovations	181
[Rampersad, Quester, Troshani, 2010]	Managing innovation networks	Exposes the problems of relationship management for the creation of innovations	170
[Sisodiya, Johnson, Grégoire, 2013]	Factors of successful use of open innovations based on the theory of resources and abilities	Exposes the problems of understanding innovation networks and their elements for correct management	132
[Collinson, Gregson, 2003]	Creation of regional knowledge networks for the creation of new business startups, network nodes [large companies]	Exposes the issues of integration of networks with different levels of knowledge to create joint products	78
[Obal, Lancioni, 2013]	Changing the relationship between suppliers and buyers in the context of digitalization and technology development	Exposes the issues of changes in relationship marketing in conditions of variability and innovation development	55
[Enz, Lambert, 2012]	The impact of cross-company cross-functional teams on achieving profitability growth of each company by creating joint value	Exposes the issues of results and related problems from the creation of joint value in inter-company networks	54

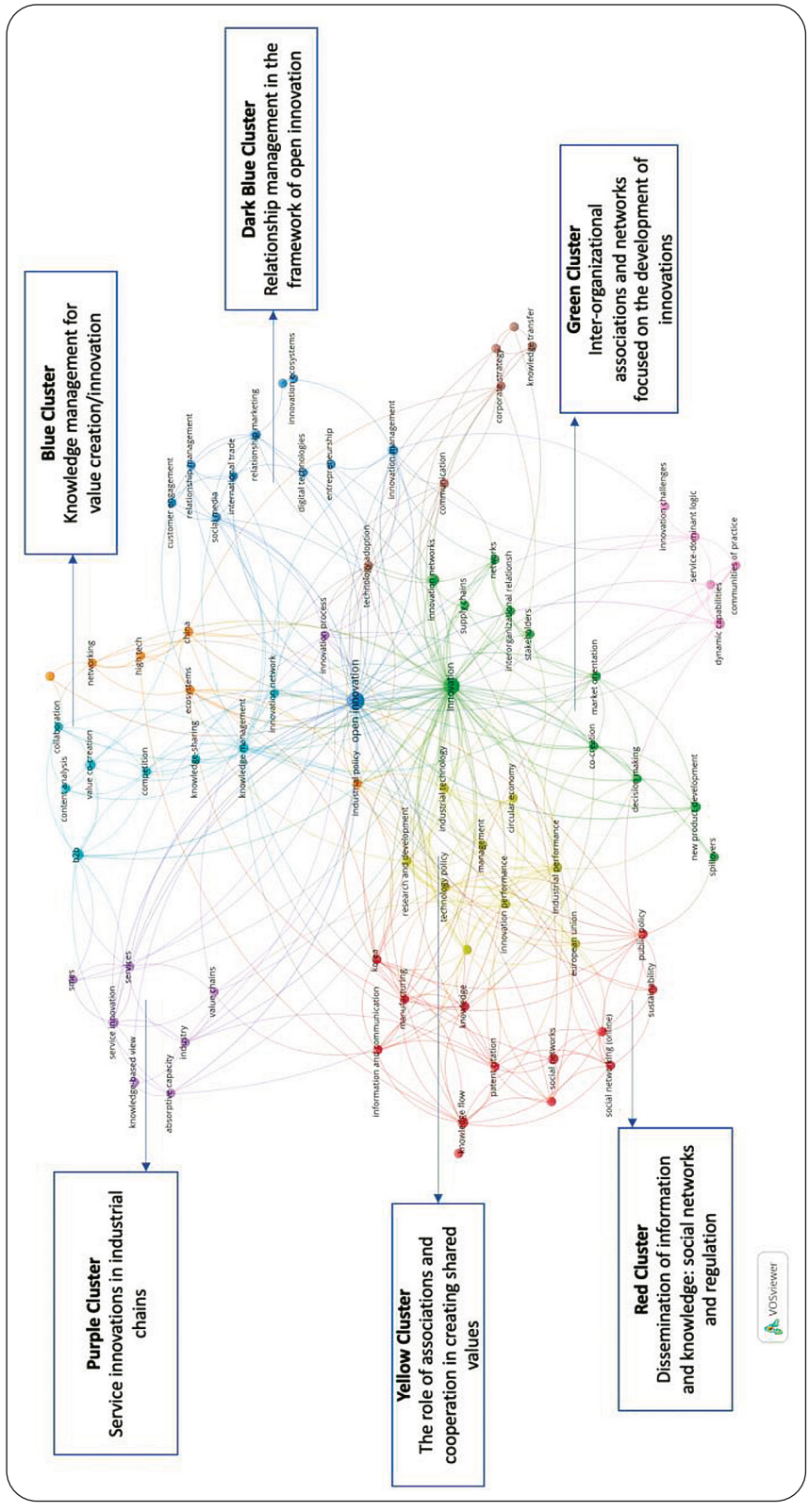

Fig. 3. Keyword analysis

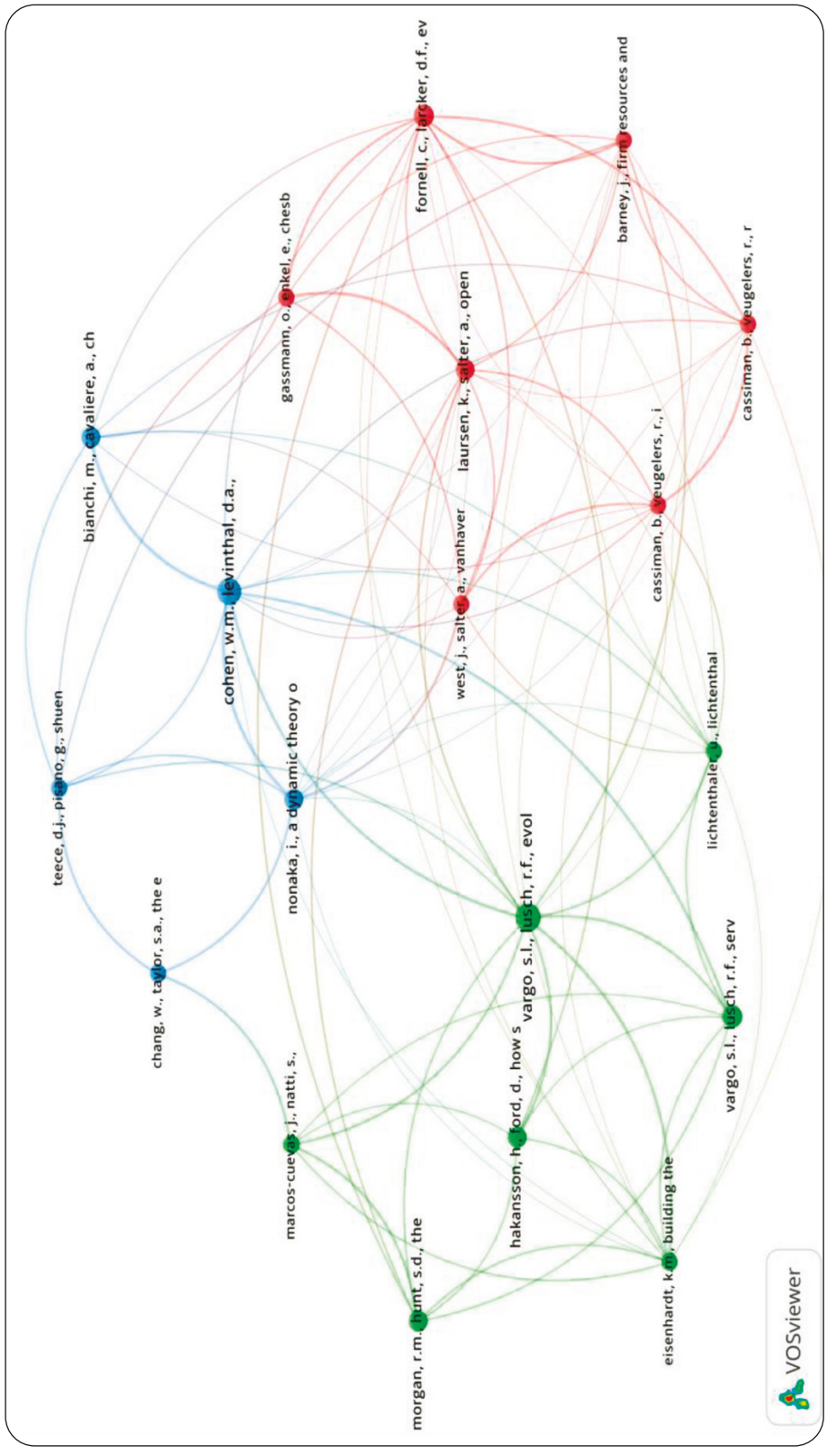

Fig. 4. Co-citation analysis of references

Table 3

The core of articles based on co-citation analysis of references

Source	Journal	Group	Number of citations
[Vargo, Lusch, 2004]	Journal of Marketing	Green	9
[Cohen, Levinthal, 1990]	Administrative Science Quarterly	Blue	8
[Vargo, Lusch, 2008]	Journal of Academy of Marketing Science	Green	6
[Bianchi et al., 2011]	Technovation	Blue	5
[Hakansson, Ford, 2002]	Journal of Business Research	Green	5
[Laursen, Salter, 2006]	Strategic Management Journal	Red	5
[Morgan, Hunt, 1994]	Journal of Marketing	Green	5
[Nonaka, 1994]	Orgnization Science	Blue	5
[Barney, 1991]	Journal of Management	Red	4
[Cassiman, Veugelers, 2006]	Management Science	Red	4
[Cassiman, Veugelers, 2002]	American Economic Review	Red	4
[Chang, Taylor, 2016]	Journal of Marketing	Blue	4
[Gassman, Enkel, Chesbrough, 2010]	R&D Management	Red	4
[Lichtenthaler, Lichtenthaler, 2009]	Journal of Management Studies	Green	4
[Marcos-cuevas et al., 2016]	Industrial Marketing Management	Green	4
[Teece, Pisano, Shuen, 1997]	Strategic Management Journal	Blue	4

area (Table 3). The date of publication is not a limitation, as the topic is new, given its interdisciplinary position.

Based on the identified core of the most cited works, which have had a significant impact on the development of the field, we have tried to trace its evolution (1990–2016) through an analysis of determinants, antecedents, and key mechanisms and digital connections (Table 4). One of the important features of this analysis is that it is possible to detect not only those concepts and approaches that are dominant (for example, the network approach, open innovation), but also those that are on the periphery (absorptive capacity, theory of organizational knowledge).

For example, some scholars initially focused on the study of knowledge and its sources [Cohen, Levinthal, 1990; Morgan, Hunt, 1994]. The concept of absorptive capacity has allowed us to explain how firms can recognize and retrieve knowledge from external sources and separate useful from unnecessary knowledge. The dynamic theory of organizational knowledge creation attempted to explain the process of knowledge creation using the principles of "explicit" and "implicit" knowledge acquisition and organization, as well as the synergy between the individual and the organization [Morgan, Hunt, 1994]. These concepts focused primarily on the firm itself, while external actors were factors and preconditions and were not full-fledged objects of study. In the field of innovation management, "dynamic capabilities" and "knowledge management" were important reasons for shifting the focus from the firm to its environment, relationships, and other actors

Table 4

The evolution of industrial marketing in the context of innovation networks

Issue / Focus	Unit of Analysis	Determinant / antecedent|/ enablers	Year	Key mechanism, process
Innovation capabilities	Firm	Absorptive capacity and R&D	1990	Recognition and absorption of knowledge through the development of internal R&D
Sustained competitive advantage: resource view	Firm	Strategic planning and management, resource provision	1991	Access to rare, imperfectly imitable, and non-substitutable resources
Inter-company relations and relationship marketing	Firm in the networks (interorganizational relationship)	Commitment-trust theory	1994	Commitment and trust are important for cooperation, reducing the risks of leaving the network, reducing uncertainty
Knowledge creation	Individual in the firm, firm, firm in the networks	Theory of organizational knowledge	1994	Knowledge is created by individuals, organizations support and expand their capabilities. Mobilization of implicit knowledge of individuals
Sources of competitive advantages	Firm	Dynamic capabilities	1997	Development of internal competencies and procedures. Responding to market challenges and creating innovations. R&D
Interactions in inter-company networks	Firms in the networks (nodes and flows)	Relationships and networks	2002	The interdependence of the company and relationships. Relationships, the network is both a tool of the company and decision-making factors
Development and commercialization of innovations	Firm in the network	Knowledge management, r&d co-operation, and spillovers	2002	Knowledge exchange, management of incoming information flows, assignment of spillovers from partners and non-partners. Preserving the benefits of innovation for the firm
Marketing	Firm-manufacturer	Service-centred view/service-dominant logic	2004	The consumer is always involved in production. Relationship development, network approach
Innovation performance	Firm	Absorptive capacity, the depth and breadth of openness	2006	The curvilinear relationship [inverted U-shape] between breadth, depth of openness and innovation performance
Innovation strategy and innovativeness	Firm	The concept of fit or complementarity, internal r&d and external knowledge	2006	Integration of internal and external knowledge within the framework of the company's innovation process. Creating the right context (knowledge of universities and research centers)

End of the Table 4

Issue / Focus	Unit of Analysis	Determinant / antecedent / enablers	Year	Key mechanism, process
Marketing	Firm	Service-centred view/service-dominant logic	2008	Service is the foundation of exchange. The client is involved in creating value
Knowledge management	Firm	Knowledge management, absorptive capacity, and dynamic capabilities	2009	Inventive, absorbing, transformative, connective, innovative and decorative potential as knowledge management capabilities
Innovation strategy	Firm and network	Open Innovation Paradigm	2010	The paradigm is widely spread, used in high-tech and low-tech industries, in large, medium, and small enterprises
Innovation strategy	Firm in the network	Open Innovation Paradigm, networks	2011	Modification of the innovation network, increase in the number of external partners, growth of the role of alliances
New product development	Firm and network	Value co-creation, customer engagement, absorptive capacity	2016	Customers as sources of knowledge for innovation
New product development	Firm in the network	Value co-creation, stakeholder engagement, absorptive capacity	2016	Development of relations with network partners, co-creation

Based on: [Vargo, Lusch, 2004; Cohen, Levinthal, 1990; Vargo, Lusch, 2008; Bianchi et al., 2011; Hakansson, Ford, 2002; Laursen, Salter, 2006; Morgan, Hunt, 1994; Nonaka, 1994; Barney, 1991; Cassiman, Veugelers, 2006; Cassiman, Veugelers, 2002; Chang, Taylor, 2016; Gassman, Enkel, Chesbrough, 2010; Lichtenthaler, Lichtenthaler, 2009; Marcos-cuevas et al., 2016; Teece, Pisano, Shuen, 1997].

[Teece, Pisano, Shuen, 1997; Cassiman, Veugelers, 2002; Cassiman, Veugelers, 2006; Lichtenthaler, Lichtenthaler, 2009]. This is where the first implicit merger of innovation management and industrial marketing occurred. Relationships with other organizations (knowledge sources) became an integral part of innovation and development. The open innovation paradigm [Chesbrough, 2003] expanded the research potential of innovation management, reinforcing external sources as one of the most important [Gassman, Enkel, Chesbrough, 2010; Bianchi et al., 2011].

In turn, industrial marketing focuses on finding optimal relationship configurations, managing them, and seeking a competitive advantage. The first works, which became an important basis for the topic, used a resource-based view of intercompany relationships [Barney, 1991] and studied relationship development factors in the context of psychological aspects (commitment-trust theory) [Morgan, Hunt, 1994]. The service-oriented

view focuses researchers' attention on the transition from product to relationship development [Vargo, Lusch, 2004; Vargo, Lusch, 2008]. The network approach as the dominant paradigm is used to explain large clusters of relationships [Hakansson, Ford, 2002; Cassiman, Veugelers, 2002; Gassman, Enkel, Chesbrough, 2010; Bianchi et al., 2011; Chang, Taylor, 2016; Marcos-Cuevas et al., 2016].

Examining the chronological development of the conceptual core for the industrial marketing of innovation, one can observe the gradual merging of the dominant paradigms of both scientific directions (the networking approach and the open innovation paradigm). Such a development of the investigated question strengthens the understanding of its interdisciplinary character and calls for unification of theories in the promotion and commercialization of innovations.

DISCUSSION

The current development of management, marketing, and innovation management theory requires a conscious approach to integrating knowledge, especially between closely related disciplines [Marcovik et al., 2021]. The topic of inter-organizational relationships for innovation requires an interdisciplinary approach to produce the most valuable and relevant results.

Present answers *RQ1–RQ5*.

Answer RQ1. Which countries have contributed the most to the development of the field under study? Based on the results of our analysis, the topic of inter-firm relationships for innovation has been most actively developed by authors from the US, the UK, Italy, Spain, and Germany. There is a need to integrate empirical knowledge from different countries, including developing countries to form an integrated thematic development [Anand, Brix, 2021].

Answer RQ2. What are the most cited articles in the study area and their focus? An analysis of the most cited articles showed that research on all phases of innovation (idea creation, innovation development, and promotion/commercialization) of innovation is significant in the research environment and contributes to the topic of innovation in the context of external engagement (networks, competitions).

Answer RQ3. What keywords and themes are used to explore inter-firm relationships for innovation? Using keyword analysis, we identified five clusters that characterize the specific focus of the topic and may also be useful for future research in selecting relevant literature. At the same time, we identified three "hot topics": the role of customer engagement in creating, managing, and promoting innovation through innovation networks; the role of stakeholder management in innovation networks; and the impact of participation in innovation networks on industry productivity.

Answer RQ4. What are the intellectual foundations of inter-firm relationships for innovation and their evolution? Examining the chronological development of scientific polemics, one finds an implicit confluence of the theories and paradigms of different scientific fields, which is most often due to the complexity and multidimensionality of the issues raised.

In this study, we found two parallel directions of the development of the question under study. In the field of innovation management, inter-firm interaction has been revealed through absorptive capacity (e.g.: [Cohen, Levinthal, 1990; Laursen, Salter, 2006; Lichtenthaler, Lichtenthaler, 2009]), knowledge management (e.g.: [Nonaka, 1994; Cassiman, Veugelers, 2002; Lichtenthaler, Lichtenthaler, 2009]), R&D collaboration, and open innovation (e.g.: [Gassmann, Enkel, Chesbrough, 2010; Bianchi et al., 2011; West et al., 2014]). The focus of such research has been primarily on the development of innovation, looking at inter-firm relationships as prerequisites, factors, and opportunities for such development. In the innovation management information space, partners, competitors, and other third parties

are considered in the context of the actually available sources of knowledge, and the main questions focus on how to extract and manage this knowledge. Industrial marketing, in turn, views relationships as the primary unit of analysis, using innovation as the context for forming new or changing old relationships. Theoretical development has occurred through strategic planning (e.g.: [Barney, 1991]), the resource-based view (e.g.: [Barney, 1991; Teece, Pisano, Shuen, 1997]), the service-oriented view (e.g.: [Vargo, Lusch, 2004; Vargo, Lusch, 2008], relationship management (e.g.: [Morgan, Hunt, 1994; Hakansson, Ford, 2002; Marcos-Cuevas et al., 2016], and the network approach (e.g.: [Hakansson, Ford, 2002]).

The specificity of marketing processes and the complexity of innovative products highlights the interdisciplinary focus of the problem under study and requires additional clarification of contextual choices. The development of innovation networks and innovation ecosystems should help to integrate the theory of both disciplines and combine the dominant paradigms to comprehensively cover the research topic.

Answer RQ5. What are the trends in the field under study? To identify key topics and trends in the study of inter-firm relations for innovation, the 116 publications on the topic from 2003 to 2022 were encoded into a table according to the following indicators: which actors are investigated in the article (networks/ecosystems, customers, firms, research organizations, political organizations, social institutions, different actors)? Which innovative stages are explored in the article (innovation stage: knowledge search; innovation stage: idea creation and innovation development; innovation stage: integration of innovation into the market (promotion, commercialization, implementation); innovation stage: in general)? (Appendixes 2 and 3). This approach allowed us to identify and study similar areas of research on the topic, which, however, offered different contexts and views [Anand et al., 2020]. We also studied the interaction of theories of industrial marketing and innovation management, as well as methodological approaches. Using this method, we identified several current trends and emerging topics in the study of inter-firm relations focused on innovation emerging topics.

Current tendencies:

- inter-organizational relations for the development of innovation in general, knowledge search and development;
- innovation networks and ecosystems (structure, management, potential);
- engaging customers and partners for innovation.

Emerging themes (little-studied):

- research, social and political institutions for the development of innovation;
- promotion and commercialization through inter-organizational networks and ecosystems.

Current tendencies

In addition to the findings of the literature review, coding has confirmed the widespread prevalence of research focusing on the creation and development of innovations through inter-firm relationships, innovation networks and ecosystems. Modern research focuses on the selection of partnerships to create innovations (e.g.: [Kiran, 2019; Love, Roper, Bryson, 2011; Morgan, Anokhin, Wincent, 2019; Park, Lee, 2018; Zhang, Xiao, 2020]) and network management (e.g.: [Ferenhof et al., 2022; Rampersad et al., 2010]). Of particular interest are the firm's relationships with clients and partner firms. Customer engagement is studied at the various stages of the innovation process (e.g.: [Enz, Lambert, 2012; Morgan, Anokhin, Wincent, 2019; Zhang, Xiao, 2020]) and its impact on innovation is assessed (e.g.: [Paasi et al., 2014; Noordhoff et al., 2011]). Also, our coding draws attention to the fact that inter-company relationships are also widely used for knowledge management. The widespread adoption of the open innovation paradigm has set researchers and practitioners the task of iden-

tifying the most significant sources of knowledge (e.g.: [Kani, Motohashi, 2017; Mooi, Osinga, Santos, 2022], flow management (e.g.: [Kitagawa, Robertson, 2011; Jiang, Goel, Zhang, 2017]) and knowledge network creation/integration (e.g.: [Jussila, Kärkkäinen, Leino, 2012; Zhang, Chen, 2021]).

Current trends, the growth of publications require researchers to carefully study frameworks that combine knowledge in the field of innovation and management of inter-company relations, which once again confirms the need for an interdisciplinary approach to the study of the topic.

Emerging themes (little-studied)

Few studies have been identified on the potential of a firm's relationship with research, political and social institutions for innovation. At the same time, a number of these few studies confirm the importance and significance of including these organizations in innovation networks and ecosystems. Researchers believe that research organizations should be included in modern innovation networks in order to exchange knowledge and form a base for the development of innovations (e.g.: [Love, Roper, Bryson, 2011; Ranga, Mroczkowski, Araiso, 2017; Weerasinghe, Dedunu, 2021]). The role of political institutions in the development of innovation also requires separate consideration, not only from the point of view of government strategies and programs (e.g.: [Sun, 2018]), but also from the point of view of their inclusion in innovation networks (e.g.: [Love, Roper, Bryson, 2011]). The inclusion of social institutions in innovation networks is the least covered area, although it is difficult to deny the importance of social processes for the development of innovation. Social pressure, recognition and non-recognition, approval and disapproval can have a significant impact on both innovations and those who create them, for example, scientists [Beck et al., 2019]. Given the importance of social processes, we believe that the involvement of social institutions in innovative networks will contribute to the management of such processes. Thus, the field of innovation development in the context of innovation networks requires additional research, including political, social and research organizations.

Knowledge and innovation are important factors of competitive advantage [Ferenhof et al., 2022], but using the wrong approaches to their commercialization, their effect can be reduced. As it was noted earlier, some researchers note a lack of research in the field of innovation promotion, however, some works can become a good foundation for further research on this issue. For example, authors of [Silva, Moutinho, Teixeira Vale, 2021] consider the impact of exhibitions on the promotion of innovations by SMEs. In article by [Wamser, Change, Schoenberg, 2013] the authors offer the prospect of promoting innovation in the context of regional development, with the support of political institutions. Despite the availability of research on commercialization and promotion of innovations, this aspect does not yet have a unified approach to understanding the main elements, features and factors of influence. This is a promising opportunity for future research.

CONCLUSION

In summary, this article makes a significant contribution to clarifying the interdisciplinary nature of the study of relationships between actors for innovation. We are convinced that research in this field should be based on literature from both scientific fields: innovation management and industrial marketing. This is necessary for a comprehensive study of the problem and to reduce the limitations associated with the specifics of each scientific field. The analysis of keywords allowed us to identify a number of clusters, the most relevant topics for research, which are based on "relationships for innovation", which can serve as a roadmap for future research. We highlight the promotion and

commercialization of innovations, as well as the inclusion of political, social and research organizations in innovation networks as the main trends.

We believe that the proposed results will contribute to the further development of the topic of innovation management in the context of inter-firm relations, which will allow achieving significant practical results.

Nevertheless, it is necessary to emphasize a number of limitations of this study. Despite our desire to conduct the most comprehensive analysis of the existing literature on inter-organizational relations focusing on innovation, we may have missed some fundamental articles due to the use of a single Scopus database, with language restrictions and peer-reviewed journal articles [Anand et al., 2020]. Future papers could include the texts of books, conference proceedings and materials published in other languages. The generalization of literature using quantitative methods may also be limited. Also, in this paper we have focused on the study of existing achievements that include a network approach and/or focused on the promotion of innovation, but for future research it is worth considering the possibility of expanding the theoretical basis for the integration of industrial marketing and innovation management. We also believe that the next stage, continuing this work, should be a qualitative analysis of the existing block of studies devoted to the participation of various actors for the implementation of various innovative stages. Nevertheless, this study makes a significant contribution to the development of the topic of inter-organizational relations for innovation and offers a new starting point for future research.

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Промышленный маркетинг в контексте развития инноваций: обзор и программа исследований

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Цель исследования: очертить структуру исследовательской дискуссии по инновационным промышленным сетям; определить состояние дискуссии относительно участия различных акторов в инновационных сетях на различных этапах инновационного процесса; установить фундаментальные работы по этой теме и сформировать повестку дня для будущих исследований. **Методология исследования:** исследование проведено с использованием двух библиометрических подходов — анализа ключевых слов и анализа совместного цитирования с применением базы данных Scopus; также задействовано ручное кодирование 116 документов с целью выявления «горячих» тем и возникающих тем (малоизученных). **Результаты исследования:** предложены пять ключевых областей исследований, разделяющих широкую тему на более узкие и специфические области; представлены наиболее авторитетные исследования в этой области, демонстрирующие неявное слияние двух дисциплин — промышленного маркетинга и управления инновациями. Выделены существующие и зарождающиеся (малоизученные) тенденции в исследованиях. **Оригинальность и вклад автора:** в статье проведен первый библиометрический анализ существующей литературы в изучаемой области с акцентом на структурных подразделениях сети (акторах) на различных этапах инновационного процесса. Исследование вносит значительный вклад в прояснение междисциплинарного характера изучения взаимоотношений между акторами инновационной деятельности.

Ключевые слова: бизнес для бизнеса, инновация, инновационная сеть, инновационный менеджмент, промышленный маркетинг, актор.

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Appendix

Appendix 1. Clusters of keywords

Keyword	Cluster	Description
Information and communication technology, knowledge, knowledge acquisition, knowledge flow, manufacturing korea, patent citation, patents and inventions, sustainability, public policy, social networking (online), social networks, social sciences computing	Red	Dissemination of information and knowledge: social networks and regulation
Co-creation, decision making, innovation, innovation networks, interorganizational relationships, market orientation, networks, new product development, spillovers, stakeholders, supply chains	Green	Inter-organizational associations and networks focused on the development of innovations
Relationship marketing, interorganizational collaboration, innovation management, customer engagement, digital technologies, innovation ecosystems, international trade, open innovation, relationship management, social media, entrepreneurship	Dark blue	Relationship management in the framework of open innovation
Innovation performance, industrial performance, industrial technology, circular economy, european union, management, research and development, technology policy, technological development	Yellow	The relationship between technological development and industrial and innovative productivity
Service innovation, services, innovation processindustry, knowledge-based view, absorptive capacity, smes, value chains	Purple	Service innovations in industrial chains
Knowledge-sharing, knowledge management, B2B, collaboration, competition, content analysis, innovation network, value co-creation	Blue	Knowledge management for value creation/innovation

Note: visualization of keyword connections is shown in Figure 3.

Appendix 2. The result of encoding articles

Focus/one of the focuses	Source	Number of articles
Networks/ ecosystems	[Collinson, Gregson, 2003; Magnusson, 2004; Gupta, Cadeaux, Dubelaar, 2006; Fleming, Waguespack, 2007; Ornetzeder, Suschek-Berger, 2008; Rampersad, Quester, Troshani, 2010; Abbate, Coppolino, 2011; Love, Roper, Bryson, 2011; Navarro, Martinez-Martinez, 2011; Perks, Moxey, 2011; Guinet, Meissner, 2012; Jussila, Kärkkäinen, Leino, 2012; Rampersad, Troshani, Plewa, 2012; Mu, 2013; Sisodiya, Johnson, Grégoire, 2013; Wamser, Nam, Schoenberg, 2013; Gumenna, Ganushchak-Yefimenko, 2014; Corsaro, Cantù, 2015; Dabic, Vlajcic, Novak, 2016; Katsikis, Lang, Debreczeny, 2016; Potra, Izvercian, Miclea, 2016; Randhawa, Wilden, Hohberger, 2016; Aarikka-Stenroos, Ritala, 2017; Hammarfjord, Roxenhall, 2017; Jiřinovб, Koliš, 2017; Kani, Motohashi, 2017; Lim, Kidokoro, 2017; Mudambi, Mudambi, Mukherjee, Scalera, 2017; Ranga, Mroczkowski, Araiso, 2017; Samford, Warrian, Goracinova, 2017; García Muciz, Cuervo, 2018; Park, Lee, 2018; Prokopenko, Omelyanenko, 2018; Stare, Križaj, 2018; Jiang, Goel, Zhang, 2019; Kiran, 2019; Li, 2019; Smol, Kulczycka, 2019; Maghssudipour, Lazzeretti, Capone, 2020; Ndubisi, Dayan, Yeniaras, Alhawari, 2020; Nguyen et al., 2020; Palmer, Chung, Park, Wang, 2020; Borges, Soares, Silva, 2021; Del Vecchio, Passiante, Barberio, Innella, 2021; Fang, Chen, Yang, 2021; Hartmann, Nduru, Dannenberg, 2021; Khan et al., 2021; Lievens, Blažević, 2021; Zhang, Chen, 2021; Ferenhof, Bonamigo, Rosa, Vieira, 2022; Krmela, Šimberová, Babiča, 2022; Li, Wang, Wang, Wang, 2022; Poblete, Kadefors, Kohn Redberg, Gluch, 2022; Santos, 2022; Silva, Moutinho, Teixeira Vale, 2022]	55
Customers	[Gupta, Cadeaux, Dubelaar, 2006; Lichtenthaler, 2007; Albors-Garrigos, Hervas-Oliver, Hidalgo, 2009; Di Gangi, Wasko, 2009; Love, Roper, Bryson, 2011; Noordhoff et al., 2011; Nordlund, Lempiälä, Holopainen, 2011; Enz, Lambert, 2012; Jussila, Kärkkäinen, Leino, 2012; Griffin et al., 2013; Obal, Lancioni, 2013; Wagner, 2013; Paasi, Lappalainen, Rantala, Pikkarainen, 2014; Potra, Izvercian, Miclea, 2016; Randhawa, Wilden, Hohberger, 2016; Agostini, Nosella, Soranzo, 2017; Diehr, Wilhelm, 2017; Jiřinovб, Koliš, 2017; Park, Lee, 2018; Haukipuro, Vainamo, Arhippainen, Ojala, 2019; Morgan, Anokhin, Wincent, 2019; Casais, Fernandes, Sarmento, 2020; Friend, Malshe, Fisher, 2020; Rampersad, Hordacre, Spoehr, 2020; Zhang, Xiao, 2020; Sales-Vivy, Gil-Saura, Gallarza, 2021; Tomita, 2022]	27
Firms	[Collinson, Gregson, 2003; Gupta, Cadeaux, Dubelaar, 2006; Lichtenthaler, 2007; Ornetzeder, Suschek-Berger, 2008; Albors-Garrigos, Hervas-Oliver, Hidalgo, 2009; Rampersad, Quester, Troshani, 2010; Kitagawa, Robertson, 2011; Love, Roper, Bryson, 2011; Perks, Moxey, 2011; Enz, Lambert, 2012; Jussila, Kärkkäinen, Leino, 2012; Sisodiya, Johnson, Grégoire, 2013; Wagner, 2013; Paasi, Lappalainen, Rantala, Pikkarainen, 2014; Corsaro, Cantù, 2015; Dabic, Vlajcic, Novak, 2016; Kazuyuki, 2016; Loya, Rawani, 2016; Lupton, Beamish, 2016; Agostini, Nosella, Soranzo, 2017; Jiřinovб, Koliš, 2017; Kani, Motohashi, 2017; Ranga, Mroczkowski, Araiso, 2017; Samford, Warrian, Goracinova, 2017; Park, Lee, 2018; Sun, 2018; Beck, Mahdad, Beukel, Poetz, 2019; Jiang, Goel, Zhang, 2019; Moretti, 2019; Smol,	43

Focus/one of the focuses	Source	Number of articles
Firms	Kulczycka, 2019; Ahn, Lee, Mortara, 2020; Crespo, Lages, Crespo, 2020; Friend, Malshe, Fisher, 2020; Rampersad, Hordacre, Spoehr, 2020; Borges, Soares, Silva, 2021; Calza, Ferretti, Panetti, Parmentola, 2021; Gurca, Bagherzadeh, Markovic, Koporcic, 2021; Marinello, Lolli, Gamberini, 2021; Markovic et al., 2021; Papa, Mazzucchelli, Ballestra, Usai, 2021; Sales-Vivy, Gil-Saura, Gallarza, 2021; Weerasinghe, Dedunu, 2021; Martins et al., 2022]	43
Research organizations	[Gupta, Cadeaux, Dubelaar, 2006; Albors-Garrigos, Hervas-Oliver, Hidalgo, 2009; Rampersad, Quester, Troshani, 2010; Kitagawa, Robertson, 2011; Love, Roper, Bryson, 2011; Wagner, 2013; Dabic, Vlajcic, Novak, 2016; Kazuyuki, 2016; Agostini, Nosella, Soranzo, 2017; Kani, Motohashi, 2017; Ranga, Mroczkowski, Araiso, 2017; Samford, Warrian, Goracinova, 2017; García Muciz, Cuervo, 2018; Yanto, Lusiana, 2018; Beck, Mahdad, Beukel, Poetz, 2019; Moretti, 2019; Smol, Kulczycka, 2019; Calza, Ferretti, Panetti, Parmentola, 2021; Weerasinghe, Dedunu, 2021; Sattiraju et al., 2022]	20
Political organizations	[Gupta, Cadeaux, Dubelaar, 2006; Rampersad, Quester, Troshani, 2010; Love, Roper, Bryson, 2011; Ranga, Mroczkowski, Araiso, 2017; Samford, Warrian, Goracinova, 2017; Sun, 2018; Ahn, Lee, Mortara, 2020; Rampersad, Hordacre, Spoehr, 2020; Borges, Soares, Silva, 2021; Calza, Ferretti, Panetti, Parmentola, 2021; Sattiraju et al., 2022]	11
Social institutions	[Gupta, Cadeaux, Dubelaar, 2006; Ornetzeder, Suschek-Berger, 2008; Beck, Mahdad, Beukel, Poetz, 2019; Borges, Soares, Silva, 2021]	4
Different actors	[Collinson, Gregson, 2003; Gupta, Cadeaux, Dubelaar, 2006; Rampersad, Quester, Troshani, 2010; Dries, Pascucci, Török, Tyth, 2014; Agostini, Nosella, Soranzo, 2017; Barbic, Jolink, Niesten, Hidalgo, 2021; Calza, Ferretti, Panetti, Parmentola, 2021; Grunwald, Schwill, Sassenberg, 2021; Lievens, Blažević, 2021; Mooi, Osinga, Santos, 2022]	10
Innovation Stage: Knowledge Search	[Collinson, Gregson, 2003; Magnusson, 2004; Lichtenthaler, 2007; Di Gangi, Wasko, 2009; Leimeister, Huber, Bretschneider, Krcmar, 2009; Abbate, Coppolino, 2011; Kitagawa, Robertson, 2011; Love, Roper, Bryson, 2011; Navarro, Martinez-Martinez, 2011; Noordhoff et al., 2011; Nordlund, Lempiälä, Holopainen, 2011; Jussila, Kärkkäinen, Leino, 2012; Liu, Ye, Liu, 2013; Wagner, 2013; Oganisjana, 2015; Dabic, Vlajcic, Novak, 2016; Kim, Kim, Kim, 2016; Lupton, Beamish, 2016; Potra, Izvercian, Miclea, 2016; Diehr, Wilhelm, 2017; Jiřinovб, Koliš, 2017; Kani, Motohashi, 2017; Mudambi, Mudambi, Mukherjee, Scalera, 2017; Meng, Xu, 2018; Stare, Križaj, 2018; Yanto, Lusiana, 2018; Beck, Mahdad, Beukel, Poetz, 2019; Jiang, Goel, Zhang, 2019; Kiran, 2019; Morgan, Anokhin, Wincent, 2019; Baizhou, Jingwei, Dan, Yi, 2020; Casais, Fernandes, Sarmento, 2020; Endres, Helm, Dowling, 2020; Ferras, Hitchen, Tarrats-Pons, Arimany-Serrat, 2020; Maghssudipour, Lazzeretti, Capone, 2020; Najar, Dhaouadi, 2020; Ndubisi, Dayan, Yeniaras, Al-hawari, 2020; Yi, Zhouzhou, Zhonghui, 2020; Zhang, Xiao, 2020; Barbic, Jolink, Niesten, Hidalgo, 2021; Khan et al., 2021; Weerasinghe, Dedunu, 2021; Zhang, Chen, 2021; Martins et al., 2022; Mooi, Osinga, Santos, 2022]	45

End of the Appendix 2

Focus/one of the focuses	Source	Number of articles
Innovation stage: idea creation and innovation development	[Di Gangi, Wasko, 2009; Leimeister, Huber, Bretschneider, Krcmar, 2009; Rampersad, Quester, Troshani, 2010; Abbate, Coppolino, 2011; Love, Roper, Bryson, 2011; Nordlund, Lempiälä, Holopainen, 2011; Griffin et al., 2013; Wagner, 2013; Oganisjana, 2015; Jiřinovб, Koliš, 2017; Kani, Motohashi, 2017; Park, Lee, 2018; Haukipuro, Vainamo, Arhippainen, Ojala, 2019; Kiran, 2019; Morgan, Anokhin, Wincent, 2019; Casais, Fernandes, Sarmento, 2020; Ferras, Hitchen, Tarrats-Pons, Arimany-Serrat, 2020; Zhang, Xiao, 2020; Barbic, Jolink, Niesten, Hidalgo, 2021; Calza, Ferretti, Panetti, Parmentola, 2021; Franco-Riquelme, Rubalcaba, 2021; Grunwald, Schwill, Sassenberg, 2021; Ferenhof, Bonamigo, Rosa, Vieira, 2022; Tomita, 2022]	24
Innovation stage: integration of innovation into the market (promotion, commercialization, implementation)	[Collinson, Gregson, 2003; Lichtenthaler, 2007; Albors-Garrigos, Hervas-Oliver, Hidalgo, 2009; Di Gangi, Wasko, 2009; Nordlund, Lempiälä, Holopainen, 2011; Perks, Moxey, 2011; Griffin et al., 2013; Obal, Lancioni, 2013; Wamser, Nam, Schoenberg, 2013; Loya, Rawani, 2016; Li, 2019; Moretti, 2019; Gkika, Anagnostopoulos, Ntanos, Kyriakopoulos, 2020; Franco-Riquelme, Rubalcaba, 2021; Harel, Schwartz, Kaufmann, 2021; Hartmann, Nduru, Dannenberg, 2021; Ferenhof, Bonamigo, Rosa, Vieira, 2022; Sattiraju et al., 2022; Silva, Moutinho, Teixeira Vale, 2022; Tomita, 2022]	20
Innovation: in general	[Gupta, Cadeaux, Dubelaar, 2006; Ornetzeder, Suschek-Berger, 2008; Rampersad, Quester, Troshani, 2010; Noordhoff et al., 2011; Perks, Moxey, 2011; Enz, Lambert, 2012; Guinet, Meissner, 2012; Jussila, Kärkkäinen, Leino, 2012; Rampersad, Troshani, Plewa, 2012; Shearmur, 2012; Mu, 2013; Sisodiya, Johnson, Grégoire, 2013; Wagner, 2013; Dries, Pascucci, Török, Tyth, 2014; Gumenna, Ganushchak-Yefimenko, 2014; Paasi, Lappalainen, Rantala, Pikkarainen, 2014; Corsaro, Cantù, 2015; Dabic, Vlajcic, Novak, 2016; Katsikis, Lang, Debreczeny, 2016; Kim, Kim, Kim, 2016; Potra, Izvercian, Miclea, 2016; Randhawa, Wilden, Hohberger, 2016; Aarikka-Stenroos, Ritala, 2017; Agostini, Nosella, Soranzo, 2017; Hammarfjord, Roxenhall, 2017; Kani, Motohashi, 2017; Lim, Kidokoro, 2017; Mudambi, Mudambi, Mukherjee, Scalera, 2017; Ranga, Mroczkowski, Araiso, 2017; Garcна Muciz, Cuervo, 2018; Meng, Xu, 2018; Prokopenko, Omelyanenko, 2018; Stare, Križaj, 2018; Sun, 2018; Kiran, 2019; Li, 2019; Moretti, 2019; Morgan, Anokhin, Wincent, 2019; Smol, Kulczycka, 2019; Ahn, Lee, Mortara, 2020; Baizhou, Jingwei, Dan, Yi, 2020; Crespo, Lages, Crespo, 2020; Ferras, Hitchen, Tarrats-Pons, Arimany-Serrat, 2020; Ndubisi, Dayan, Yeniaras, Al-hawari, 2020; Nguyen et al., 2020; Rampersad, Hordacre, Spoehr, 2020; Yi, Zhouzhou, Zhonghui, 2020; Zhang, Xiao, 2020; Barbic, Jolink, Niesten, Hidalgo, 2021; Borges, Soares, Silva, 2021; Calza, Ferretti, Panetti, Parmentola, 2021; Del Vecchio, Passiante, Barberio, Innella, 2021; Fang, Chen, Yang, 2021; Franco-Riquelme, Rubalcaba, 2021; Gurca, Bagherzadeh, Markovic, Koporcic, 2021; Harel, 2021; Harel, Schwartz, Kaufmann, 2021; Khan et al., 2021; Lievens, Blažević, 2021; Manuylenko et al., 2021; Marinello, Lolli, Gamberini, 2021; Markovic et al., 2021; Papa, Mazzucchelli, Ballestra, Usai, 2021; Weerasinghe, Dedunu, 2021; Du, Bstieler, Yalcinkaya, 2022; Ferenhof, Bonamigo, Rosa, Vieira, 2022; Li, Wang, Wang, Wang, 2022; Mooi, Osinga, Santos, 2022; Poblete, Kadefors, Kohn Redberg, Gluch, 2022; Santos, 2022]	70

Appendix 3. The result of coding articles at the intersection of "relations between actors" and "innovation stage"

Focus/One of the focuses		Innovation stage				Total articles
		Knowledge search	Idea creation and innovation development	Integration of innovation into the market (promotion, commercialization, implementation)	Innovation in general	
Relations between actors	Networks/ ecosystems	18	8	7	38	55
	Customers	13	12	7	12	27
	Firms	14	7	6	27	43
	Research organizations	8	5	3	12	20
	Political organizations	1	3	1	8	11
	Social institutions	1	0	0	3	4
	Different actors	3	4	1	8	10
Total articles		45	24	20	70	

Notes: there may be several focuses in one study; networks/ecosystems — networks/ecosystems in the focus of research; customers — the study highlights customer relationships; firms — the study highlights relationships with firms; research organizations — the study highlights connections with research organizations; political organizations — the study highlights connections with state/state organizations; social institutions — the study highlights connections with social institutions; different actors — the study highlights connections with several groups of factors; innovation stage: knowledge search — the research highlights the stage of knowledge search; innovation stage: idea creation and innovation development — the research highlights the stage: the creation of an idea and the development of an innovation; innovation stage: integration of innovation into the market (promotion, commercialization, implementation) — the study highlights the stage of integration of innovation into the market (promotion, commercialization, implementation); innovation stage: in general — the study does not single out a specific innovation stage or consider a set of stages.