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Strategic Actors in the Structuring and Activation of Innovation Ecosystems

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Abstract

Innovation ecosystem is related to the formation of networks for collaboration and sharing of knowledge and structures. Thus, the objective of this research is to prospect in the scientific literature for strategic actors that integrate innovation ecosystems. It is bibliographical research, carried out from the survey and analysis of theoretical references about the object of study. Furthermore, it is qualitative in terms of approach and exploratory in terms of purpose. The survey of scientific production was carried out in the SCOPUS database, from the application of filters and temporal delimitation. Fifteen scientific articles were selected and analyzed according to the following elements: year of publication; title; authors; summary; key words; theoretical foundation, results, conclusion and number of citations. Data were organized and tabulated in electronic spreadsheets and the results were presented in the form of graphs and tables. The results demonstrate an increase in the volume of scientific production, showing that the theme has been receiving attention from researchers. Through the qualitative analysis of the selected scientific production, it was possible to perceive a heterogeneity of actors in the process of structuring and activating innovation ecosystems, depending on the sector of activity. However, it was observed that the actors that make up the Triple Helix can be considered strategic actors, regardless of the sector in which the innovation ecosystem operates.

Keywords

Collaboration Networks, Triple Helix, Innovation Environments, Technology Transfer

1. Introduction

Scientific and technological development is a process dependent on the action of actors, public and private, who act in a given context. This configuration contributes to the formation of innovation ecosystems. These structures are composed of networked, interconnected and interdependent actors, who jointly aim to create and/or capture value (Gomes et al., 2018). This means that the actors of an innovation ecosystem are oriented towards the pursuit of collective purposes. To this end, there is a reciprocal relationship between them that enables collaboration in specific activities, as well as the sharing of knowledge and structures.

This mutual relationship is fundamental, given the complexity of the process of generating scientific and technological development. In this way, the actors present a relationship of mutual dependency in some phases of the innovation generation process, as each actor collaborates according to their specializations and capabilities. Therefore, these characteristics and the operating logic of the innovation ecosystem demonstrate that the actors connect to strengthen themselves and produce knowledge and innovation in a shared way. In this context, national, regional or local innovation ecosystems favor the development process of science, technology and innovation.

Audy (2017) explains that innovation has the continuous purpose of creating and adopting evolutionary changes for the common good, based on functional and aligned knowledge. In this sense, Pigford et al. (2018) explain that innovation ecosystems, called innovation communities, present a work logic that can increase collective and integrated efforts to create intersectoral and multi-actor innovation niches capable of sustaining new technological trajectories.

The importance of innovation ecosystems is even more evident when the topic is pioneering innovations. According to Walrave et al. (2018), this type of innovation naturally challenges the prevailing socio-technical regime in a given segment that tends to be resistant to change, which represents a major challenge for enterprises. Thus, to overcome this resistance, increasingly complex groupings of organizations are emerging in the form of innovation ecosystems, in which actors interact and collaborate with each other to create, deliver and appropriate value.

Innovation ecosystems aim to face the challenges of global competition. These structures emerge from deliberate collaborative activities of actors, based on their market-validated needs and motivations. Therefore, they are formed from the combination of market forces, actors' efforts and value transactions, constituting sophisticated collaboration environments (Russell & Smorodinskaya, 2018).

Innovation ecosystems present operating methods that favor the transfer of knowledge and the exchange of information between the various stakeholders, contributing to the processes of generating innovation in products and services (Bacon et al., 2019). In this way, these environments stimulate the development of radical or incremental innovations and entrepreneurship, important elements

of economic and technological growth (Oliveira & Godoi, 2022).

However, the effectiveness of the innovation ecosystem in this process depends on its actors and their relationships with each other, as well as on the structure of the political, economic and institutional environments. In this perspective, Gonzalo et al. (2022) point out that the structural conditions are defined at each moment and that space is a specific configuration of actors and factors on which some dynamics and forces happen. In this context, this research was guided by the following question: which actors are considered strategic in the process of structuring and activating innovation ecosystems, thus allowing the creation of a favorable environment for collaboration, innovation generation and technology transfer? Thus, it has the objective of prospecting in the scientific literature strategic actors that integrate the innovation ecosystems. In addition, based on the analysis of the identified literature, it presents different approaches on innovation ecosystems according to the different contexts of action.

2. Theoretical Reference

2.1. Innovation Ecosystems: Concepts and Characteristics

Scientific studies show that the concept of innovation ecosystem is presented, above all, from the need to understand the phenomenon of joint action of different actors in the process of generating innovations. In this sense, over time the topic has been addressed in the scientific literature, such as innovation systems, business ecosystems, innovation networks and entrepreneurship ecosystems (Felizola & Aragão, 2021).

According to Bobsin et al. (2020), in the mid-1990s, the innovation ecosystem was based on the concept of a business ecosystem, which can be explained as a set of organizations that interact with each other in order to expand their business knowledge. For Audy (2017) the innovation ecosystem resembles natural ecosystems, where life is created, adapts and evolves with intense interaction and synergy. Thus, even though it is not a biological system, in an innovation ecosystem it is also possible to observe the interaction and collaboration between different agents, such as universities, research centers, companies, public and private institutions and governments.

From this perspective, the innovation ecosystem is related to the formation of networks for collaboration and sharing of knowledge and structures, with the aim of generating innovation and improving conditions in society. However, Jacobides et al. (2018) explain that ecosystems do not arise spontaneously, being the result of experimentation and determined engineering by different agents. Also for the authors, ecosystems are formed from the articulation and interaction between different organizations that present a complementary relationship and are united by the objective of investing collectively in the development of the place where they are inserted.

Social Innovation Ecosystems, for example, involve actors from different spheres (governmental, business and civil society) and segments or causes (edu-

cation, health, environment, among others), who seek to develop innovations and support activities to solve public problems from certain locations (Andion et al., 2020). However, in a market view, the innovation ecosystem favors the integration and cooperation between the actors, aiming to carry out collaborative actions for the development of innovations in a competitive way, with a focus on conquering new markets (Bartz et al., 2020). Di Dio and Correani (2020) point out that the formation of collaborative networks between organizations favors the sharing of Research and Development efforts, the reduction of marginal costs and the increase of quality.

According to the Legal Framework for Science, Technology and Innovation in Brazil, innovation ecosystems represent one of the dimensions of innovation-promoting environments in local, regional and national contexts. In this sense, environments that promote innovation are spaces conducive to innovation and entrepreneurship and articulate companies, different levels of government, Scientific, Technological and Innovation Institutions, development agencies or civil society organizations. However, for innovation environments to be able to act and meet their objectives, innovation ecosystems and entrepreneurship generation mechanisms must exist (Brasil, 2018).

In this context, innovation ecosystems are spaces that add infrastructure and institutional and cultural arrangements, which attract entrepreneurs and financial resources; they are places that enhance the development of the knowledge society; and include, among others, science and technology parks, smart cities, innovation districts and technology hubs. And the mechanisms for generating ventures are tools that promote innovative ventures and support the development of nascent technology-based companies. These mechanisms involve innovative businesses, based on technological differentials and seek to solve social and environmental problems or challenges; offer support to turn ideas into successful ventures; and include, among others, business incubators, business accelerators, open spaces for cooperative work and open laboratories for prototyping products and processes (Brasil, 2018). Thus, given the diversity of factors involved in the process of generating innovation, it is essential to strategically guide the local and national innovation system so that the results are enhanced.

2.2. Innovation Ecosystems: Theoretical Models and Strategic Actors

Effectively, innovation ecosystems have the ability to improve collaboration for innovation between different actors. However, it is essential to identify the interests of the actors involved and define aspects related to collaboration, favoring joint effort and development. Thus, the future vitality of the ecosystem may be related to the ability of its actors to manage strategic and dynamic interactions in the innovation generation process (Valkokari et al., 2017).

In this way, Bittencourt and Figueiró (2019) suggest that the development and maintenance of an innovation ecosystem are results of the creation of shared value. In this context, the conceptual model of innovation ecosystem arises from

the shared value between the different actors. Thus, the network is strengthened to the extent that the interaction and cooperation between companies, universities, society and government fosters the creation of value for all those involved.

According to Bobsin et al. (2020), the innovation ecosystem is based on the relationship between universities, industries and government. In this ecosystem model, universities and research institutions play a fundamental role in the process of generating innovation, as they can promote interaction between research and commercial application, stimulating the production and dissemination of knowledge and new technologies. In addition, da Silva et al. (2022) explain that universities act in the development of knowledge and creation of solutions; industries produce and market innovations; and the State provides incentives and adjustments in the legislation.

Therefore, the existence of an innovation ecosystem is based on the relationships between the actors and their respective roles, as well as on the cooperation and corresponding benefits (Hakala et al., 2020). For Trischler et al. (2020) these ecosystems are important, since the current innovation challenges cannot be faced by isolated organizations. In this sense, some theoretical models emerged, presenting the process of generating innovation from the connection between strategic actors.

The Triple Helix model, for example, provides for cooperation between universities, industry and government to generate innovation and entrepreneurship, promoting economic and social development based on knowledge. According to this model, the simultaneous action of these three actors in relation to regional problems and potential can favor the emergence of innovations and new business models (Etzkowitz & Zhou, 2017). da Silva et al. (2022) highlights the direct connection between these actors, emphasizing that universities act as fields of study and knowledge generators; companies as agents that promote industrialization; and the government as an agent that stimulates and adjusts the legalization of interests for the development of technological innovations.

Presenting a different approach from models that consider industry or government as the main agents in the process of generating innovations, the Triple Helix, a universal model of innovation, focuses on the university as the main source in the development of technologies, innovations and entrepreneurship (Etzkowitz & Zhou, 2017). However, given the constant changes in the global scenario and in the dynamics of the innovative process, the model was updated, from the insertion of society (Quadruple Helix) and the environment (Quintuple Helix) (da Costa Mineiro et al., 2018).

The Quadruple Helix (HQ) model is adopted from a combination of organized civil society, allied with universities, companies and government. Bearing in mind that civil society is directly related to the cultural aspects of each region, generating greater support for the evolution of the innovation and entrepreneurship ecosystem (da Costa Mineiro & de Castro, 2020). Even so, the model gained another acting agent, the Quintuple Helice. It emphasizes that natural environments should be described as driving technological advances in the pro-

duction of knowledge and innovation. The general idea of the two terms is the direct modeling of the principles of the Triple Helix (Dal-Soto et al., 2021).

According to da Costa Mineiro et al. (2018), the Quintuple Helix represents knowledge under a place with a socioecological vision and natural environments. In this sense, the Helix is defined as investors and consumers who use social factors, such as increasing wealth in the society where they are inserted. Thus, the author points out that the potential of the place contributes to scientific, technological and innovative development.

Felizola and Aragão (2021) presented a hybrid innovation ecosystem model. According to the authors, the ecosystem is characterized by the presence of actors with the potential to innovate, and active leaders, connected in the form of physical or digital networks. These actors, willing to act in collaboration, are inserted in varied and competitive environments.

3. Methodological Aspects

This research is classified as qualitative in terms of approach and exploratory in terms of purpose. As for the technical procedures, it is bibliographical, as the analysis of the object was based on scientific publications available in databases.

To achieve the research objective, a search was carried out in the SCOPUS database, on January 10, 2023, from the application of filters. Initially, the research search string was defined: "innovation ecosystem*" AND actors. Subsequently, the inclusion criteria and time frame were defined.

In the first stage of the research, the search string "innovation ecosystem*" AND actors was inserted and the fields "Title of the article", "Abstract", "Keywords" were selected. Thus, the search made it possible to identify the scientific production that presented the search string in the title, abstract or keywords.

In the second stage of the research, other filters were inserted to refine the results. The filters "Type of document Article" (scientific article only) and Year (2012 to 2022) were applied. The objective was to identify the most recent publications available in scientific journals. These data are important for an analysis of the variation in the number of publications on the subject over time.

Subsequently, two more filters were applied: "Open access: All Open Access" to select scientific articles with an open access policy; and "Sort on: Cited by (highest)" in order to select scientific articles that were cited by other research (30 citations, at least). Thus, it was possible to compose a sample with open access scientific articles, published in journals, which presented the search string in the title, abstract or keywords, and which were cited in at least 30 researches.

Finally, the selected articles were analyzed according to the following elements: year; title; authors; summary; key words; theoretical basis, results, conclusion and number of citations. Data were organized and tabulated in electronic spreadsheets and the results presented in the form of graphs and frames.

4. Results

Considering only the first filters applied in data collection, "Document type Ar-

ticle" (scientific article only) and Year (2012 to 2022), a total of 114 articles were identified. It is possible to observe that the volume of publications has changed over time, registering the highest volumes in the last years of the period. In this sense, it is observed that 66.7% of the identified works were published in the period 2020-2022 (Figure 1).

After applying the filters "All Open Access" and "Sort on: Cited by (highest)", 15 articles were selected for analysis (Figure 2). Together, the selected articles received a total of 963 citations. In this scenario, three articles stand out, all published in 2018, as responsible for 41.4% of the total citations received (Figure 2). It should be noted that, according to the data available in the database, the article published by Oliver Alexy et al. (2013) received a quantity of 237 citations. However, the publication did not integrate the sample of this research, since the article does not fit the "All Open Access" criterion.

From the analysis of the 15 selected articles, several strategic actors were identified in the process of structuring and activating innovation ecosystems, as well as different theoretical approaches on the subject, as shown in Table 1.

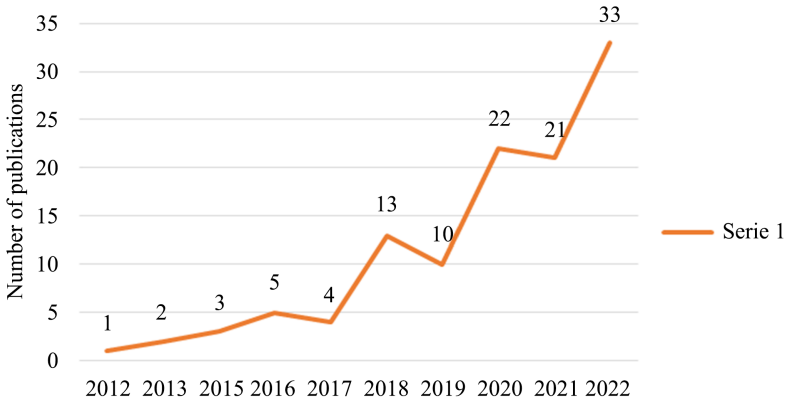

Figure 1. Number of publications identified in the period 2012-2022 in the Scopus database. Source: Research data (2023).

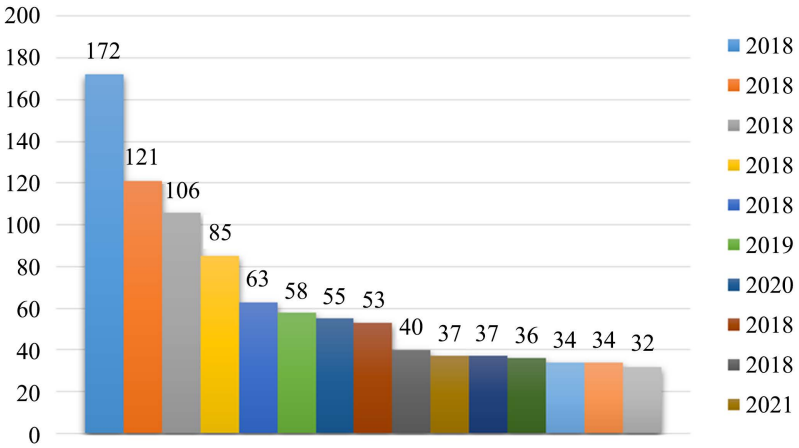

Figure 2. Volume of articles selected after applying the filters "All Open Access' and 'Sort on: Cited by (highest)". Source: Research data (2023).

Table 1. Strategic actors and approaches on innovation ecosystems, according to the selected articles.

Strategic Actors	Approach to Innovation Ecosystems	Review article	Number of Citations
Farm-Centric Actors: universities, businesses, non-profit organizations, decision makers, government institutions, financial markets, farmers; public sector bias.	Consider the Agricultural Innovation Systems (AIS) approach. They use Innovation Ecosystems thinking to consider ways in which it can enhance efforts to create cross-border, intersectoral, and multi-stakeholder innovation niches that are able to support transitions to sustainable agricultural systems at multiple scales.	Pigford, A-A. E., Hickey, G. M., & Klerkx, L. (2018)	172
Niche Actors and Multifunctional Group: different Innovation Ecosystems (applying related technologies), Universities, Scientists, NGOs, Associations and Policy makers.	They present a multi-level perspective on the development of the innovation ecosystem that integrates internal alignment and external viability. The article contributes to the literature on innovation ecosystems by explicitly considering the socio-technical viability of the innovation ecosystem around a pioneering innovation.	Walrave, B., Talmar, M., Podoynitsyna, A. K. S., Romme, G. L., & Verbong, G. P. J. (2018)	121
System Operators (incumbent service providers), Providers of terminals and base stations, Distributors/Resellers (of terminals) and Users (such as public authorities and private users).	They present a discussion around mobile telecommunications systems. They explain that relationships in innovation ecosystems are rarely symmetrical and asymmetries can change over time. In addition, they highlight the roles of collaborating and competing actors and complementary and substitute technologies in innovation ecosystems.	Holgersson, M., Granstrand, O., & Bogers, M. (2018)	106
University, Industry, Government.	They analyze innovation ecosystems through the lens of the science of complexity, considering them as open non-linear entities, which are characterized by changing multifaceted motivations of networked actors, high receptivity to feedback and persistent structural transformations. They describe the generic properties of innovation ecosystems in terms of the science of complexity, seeing them as complex adaptive systems, especially highlighting the complexity of innovation clusters.	Russell, M. G., & Smorodinskaya, N. V. (2018)	85
Entrepreneurial company, Suppliers, Investors, Complementors, Customers.	They argue that the innovation ecosystem provides a useful approach for the management of collective uncertainties, as it helps the entrepreneur in defining the actors that need to be prioritized in the generation of the value cycle. They built a conceptual framework of uncertainty and combined it with the innovation ecosystem approach. This combined approach allowed identifying the key actors in each innovation ecosystem, the decisions and uncertainties associated with the most significant events involving these actors at different times.	Gomes, L. A. V., Salerno, M. S., Phaal, R., & Probert, D. R. (2018)	63

Continued

Three main types of partners: multinationals, PMEs and universities.	They explain that open innovation ecosystems involve the transfer of knowledge between various stakeholders to contribute to the innovation of products and services. The results indicate that combinations of knowledge, relationships and organizational characteristics contribute to the success of knowledge transfer between ecosystem actors.	Bacon, E., Williams, M. D., & Davies, G. H. (2019)	58
Organizations, Institutions, Communities, Individuals.	They developed a strategy tool to map, analyze and design (model) innovation ecosystems. The tool also supports managers in the analysis and decision-making process on the ecosystem strategy. In addition, they discuss the interaction of actors in the creation and capture of value.	Talmar, M., Walrave, B., Podoynitsyna, K. S., Holmström, J., & Romme, A. G. L. (2020)	55
National innovation system: Government, Industry (companies), Research Institutes and Universities (public and private), International companies. Sectorial system of innovation and production: firm-type organizations (users, producers and suppliers of inputs); Other organizations (Universities, Financial institutions, Government agencies, Unions or technical associations.	The article focuses on how NASA structures its new innovation policy, moving away from a classic supply-oriented investment in P&D through NASA itself, towards a policy of orchestration and combination of instruments. In this sense, they discuss innovation ecosystems from a multi-actor perspective, a combination of private, non-profit and public actors. In addition, based on the literature, they present differentiations between national, local and sectoral innovation systems.	Mazzucato, M., & Robinson, D. K. R. (2018)	53
Social and technological networks: human and non-human actors; interdependent and heterogeneous actors (suppliers, distributors, competitors, customers, government and other institutions).	They present innovation ecosystems as structures composed of human and non-human actors (technologies). To do so, they analyzed the evolution of an innovation ecosystem in the energy industry. They used the Actor-Network Theory (ANT) to analyze how actors interact with each other, based on their specific interests, and thus configure the ecosystem at its base. The results provide an integrated view of the interaction between technological and social entities and how they affect the dynamics of an innovation ecosystem.	Kolloch, M., & Dellermann, D. (2018)	40
Intersectoral actors: companies, public organizations, non-profit organizations, knowledge/research institutes and users.	They explain that innovation ecosystems with sustainability goals are made up of cross-sectoral partners and need to manage three tensions: the tension of creating value versus capturing value, the tension of mutual value versus individual value, and the tension of gaining value versus losing value. They propose that innovation ecosystems that develop sustainable business models engage in a valuation process in which they seek results that satisfy all actors.	Oskam, I., Bossink, B., & Man, A-P. (2021)	37

Continued

Industry and research-based ecosystem actors (Universities, Research Institutions).	They present a vision about innovation ecosystems as structures that allow the co-creation of value by several actors. They highlight the need to encourage the active participation of ecosystem actors in the value co-creation process, as well as support actors in forming new connections and sharing knowledge and resources in a concrete way. They point out that a greater diversity of actors in the ecosystem enhances support for innovation and co-creation of value.	Ketonen-Oksi, S., & Valkokari, K. (2019)	37
Research Institutions, Non-Governmental Organizations (NGOs) and Individuals.	They conceptualize the diffusion of user innovations from a service ecosystem perspective. And they point to the need for research related to the definition of an innovation infrastructure that considers the role and contribution of users in sustainable innovation. The authors propose that an ecosystem perspective contributes with three assumptions that help to better understand the (non)diffusion of sustainability-oriented user innovations: 1) the diffusion of innovations is a phenomenon at various levels and actors; 2) an actor-to-actor orientation integrates innovative users into the ecosystem; 3) the service perspective defines the diffusion of innovation as a co-created evolutionary process.	Trischler, J., Johnson, M., & Kristensson, P. (2020)	36
Universities, Accelerators, Incubators, Research centers, Technology parks, Small and medium-sized companies.	They sought to know the contribution of training to the creation of new companies, and its role in the processes of innovation and technology transfer, from the perspective of the participants. In this sense, they recognize the importance of the role of Universities in creating synergies between actors in the innovation ecosystem that strengthen social and economic growth. However, they explain that to achieve this growth, it is necessary to define long-term development plans with a clear vision, adequate infrastructure for its implementation and the participation of actors in the innovation ecosystem.	Castro, M. P., Scheede, C. R., & Zermeño, M. G. G. (2019)	34
Voluntary organizations, Social entrepreneurs, Communities, Intermediary agent (connects community and social innovator).	They describe the market and social forces that influence the induction of social innovations through various processes, highlighting the ecosystem for open social innovations as an environment to connect companies and communities.	Gupta, A., Dey, A., & Singh, G. (2017)	34

Continued

Industries, Companies, Communities, Users, Incubators, Innovators.	They trace the evolution of the Open Innovation Theory, studying the different aspects of the relationship between knowledge providers and knowledge seekers that make the system truly reciprocal, responsible and responsive. They explain that when systems become open, the cost of searching for inclusive innovation will automatically fall and the knowledge system will also become more symmetrical and inclusive. They advocate for more reciprocal, respectful and responsible knowledge exchanges between the formal and informal sectors, adding value to the contributions of innovators.	Gupta, A. K. et al. (2016)	32

Source: Organized and systematized by the authors (2023).

5. Discussion

The increase in the volume of publications verified (**Figure 1**) demonstrates that the theme has been receiving attention from researchers. This scenario was also observed by de Araujo Gomes Júnior et al. (2021) when they carried out a scientometric study on the subject and found that there was an increase in the number of publications from the year 2015 onwards. In addition, they noticed a division of the theme into four research topics: Ecosystems, innovation and strategy; Service ecosystem; Entrepreneurial ecosystems; Technological innovation and entrepreneurship.

This observed evolution may be a reflection of a series of factors, such as the formation of scientific collaboration networks, the increase in academic production on a world scale, as well as the expansion in the number of journals indexed in the databases (Nunes-Silva et al., 2021).

Considering the research sample, it is possible to observe that the three highlighted articles, published in 2018, (**Figure 2**) have a greater impact when compared to the others that make up the researched series, since the volume of citations represents one of the main indicators of the impact of the research (de Moura Ribeiro et al., 2022).

Caregnato and Vanz (2021) explain that the evaluation of science in the different areas of knowledge is based on the application of scientometric indicators. According to the authors, the expansion in the number of scientific publications was the factor that generated the need to define science evaluation indicators. This situation was decisive for the emergence of the Science Citation Index (SCI), an indicator that considers the average frequency of citations received, evidencing its impact factor.

From the qualitative analysis of scientific production, it was observed that there are several strategic actors in the process of structuring and activating innovation ecosystems. In addition, the existence of different approaches on the subject was verified, confirming the results found by de Araujo Gomes Júnior et

al. (2021), Ecosystems, innovation and strategy; Service ecosystem; Entrepreneurial ecosystems; Technological innovation and entrepreneurship (Frame 1).

It is possible to verify in some articles that the actors considered strategic in the structuring and activation have a direct relationship with the sectors of activity of the innovation ecosystems. In this sense, Pigford et al. (2018) highlight the plurality of actors in agricultural innovation ecosystems centered on the farm; and Holgersson et al. (2018) explain in the context of open innovation ecosystems, that the company is part of a system of interconnected actors, resources, activities and innovation institutions, linked by organizational and market relationships.

However, despite the existence of this direct relationship, it is observed that 73.3% of the analyzed articles present at least one of the actors that form the Triple Helix model, University, Industry and Government. The model assumes a methodology to investigate local strengths and weaknesses and complement gaps in the relationships between universities, industries and governments with the aim of developing successful innovation strategies (Etzkowitz & Zhou, 2017).

For Walrave et al. (2018), the success of an innovation ecosystem depends on the internal alignment of the actors in the value creation process, as well as on its external viability, determined by the broader socio-technical environment. Thus, researchers define innovation ecosystems as a network of interdependent actors that combine specialized but complementary resources and/or capabilities in the quest to co-create and deliver a comprehensive value proposition to end users and appropriate the gains received in the process.

Therefore, in the structuring and activation of institutionalized innovation ecosystems, the participating actors collaborate with each other, making use of relational contracts and coordinating their activities within the framework of a joint strategy. In this way, collaboration implies various types of complex relationships, as well as specific dynamic equilibria within an ecosystem (Russell & Smorodinskaya, 2018).

In the approach to open innovation ecosystems, it is the heterogeneity of actors that contribute to the successful transfer of knowledge and technology, based on the combination of knowledge, relationships and organizational characteristics (Bacon et al., 2019). Thus, the more diversity there is among the actors in the ecosystem, the greater the support for innovation in the process of co-creation of value and technology transfer (Ketonen-oksi & Valkokari, 2019).

6. Final Considerations

In the scientific literature, several strategic actors are presented for structuring and activating innovation ecosystems, thus allowing the creation of a favorable environment for collaboration, innovation generation and technology transfer.

Through the qualitative analysis of the selected scientific production, it was possible to perceive that the actors considered strategic in the composition and activation of innovation ecosystems depend, to a large extent, on the sectors in

which these ecosystems operate. This means that in the composition of an agricultural innovation ecosystem, the strategic actors tend to be different from those considered strategic in an innovation ecosystem in the energy sector.

Despite this, given the expressiveness of the actors that make up the Triple Helix (universities, industries and governments) in the analyzed articles, it is understood that they can be considered strategic actors, regardless of the Sector in which the innovation ecosystem operates. Thus, the structuring and activation of innovation ecosystems presupposes the existence of actors so that innovation strategies are planned and implemented, encouraging collaboration and integration to better face market and social challenges.

As limitations of the research, it is evident that data collection was carried out on a single base and the defined period of time. Thus, future research is suggested with the diversification of the database and expansion of the time frame. This will enable the return of a higher number of publications, which may imply the identification of other strategic actors.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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