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PROJECT MANAGEMENT AS A VALUE CREATOR AGENT OF INNOVATION AND BUSINESS ECOSYSTEMS: AN INTEGRATIVE MODEL PROPOSAL

GESTÃO DE PROJETOS COMO UM AGENTE DE CRIAÇÃO DE VALOR NOS ECOSSISTEMAS DE INOVAÇÃO E NEGÓCIOS: UMA PROPOSTA DE MODELO INTEGRATIVO

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Abstract
This study introduces a structural model that examines the intricate correlation between innovation and business ecosystems, with a special emphasis on the role of project management as a pivotal integration factor. Furthermore, we propose an exploration of how this model aligns with the life cycle of products, services, or outcomes. In this research, we employ a hybrid methodology that seamlessly combines content and network analysis, bibliometrics, and statistical techniques to provide theoretical underpinnings for our correlation model. Our investigation reveals a robust correlation between the nature of a given ecosystem and the interconnections that companies within it establish. Furthermore, we demonstrate that the overall health and vitality of an ecosystem are closely linked to its specific type. We acknowledge that certain limitations within this study stem from the methodological choices made by our research team. This research underscores several practical advantages, including the potential for value creation through the development of novel products and services, as well as the enhancement of existing projects, all while minimizing waste and optimizing profitability. However, it should be noted that one limitation of our study is the absence of real-world application of the framework to validate our theoretical-conceptual construct. The concept of Innovation Ecosystems continues to garner significant attention among practitioners, academics, and businesses alike, offering a promising avenue for the rapid and flexible development of innovative solutions within existing markets.

Keywords: Project management. Innovation ecosystem. Business ecosystem. Value creator. Life cycle of products. Innovation.

Resumo
Este estudo apresenta um modelo estrutural que examina a correlação entre inovação e ecossistemas de negócios, com ênfase especial no papel da gestão de projetos como fator chave de integração. Além disso, propomos uma exploração de como esse modelo se alinha com o ciclo de vida de produtos, serviços ou resultados. Nesta pesquisa, empregamos uma metodologia híbrida que combina de forma harmoniosa análise de conteúdo e de rede, bibliometria e técnicas estatísticas para fornecer fundamentos teóricos para nosso modelo de correlação. Nossa investigação revela uma sólida correlação entre a natureza de um ecossistema específico e as interconexões que as empresas dentro dele estabelecem. Além disso, demonstramos que a saúde geral e a vitalidade de um ecossistema estão intimamente ligadas ao seu tipo específico. Reconhecemos que algumas limitações deste estudo decorrem das escolhas metodológicas feitas por nossa equipe de pesquisa. Esta pesquisa destaca várias vantagens práticas, incluindo o potencial de criação de valor por meio do desenvolvimento de produtos e serviços inovadores, bem como a melhoria de projetos existentes, tudo isso minimizando o desperdício e otimizando a lucratividade. No entanto, deve-se observar que uma limitação de nosso estudo é a ausência de aplicação do framework no mundo real para validar nossa construção teórico-conceitual. O conceito de Ecossistemas de Inovação continua a atrair atenção significativa entre profissionais, acadêmicos e empresas, oferecendo uma promissora via para o desenvolvimento rápido e flexível de soluções inovadoras dentro dos mercados existentes.

Palavras-chave: Gestão de projetos. Ecossistema de inovação. Ecossistema de negócio. Criação de valor. Ciclo de vida dos produtos. Inovação.

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1 Introduction

Innovation in business models is a construct of great interest in the literature, but its implementation in organizations still needs clarification. The success rate of business model innovation initiatives is low, which reflects a high failure rate (Minatogawa *et al*., 2018). When related to project management, organizations must systemically establish business model innovation capabilities consistent with project artifacts. In project-oriented organizations, projects are the essence of survival and maintenance of competitive advantage (Barbosa & Saisse, 2019). Therefore, the business model literature can take advantage of the strategies developed for project management to establish means of managing innovative projects in innovation environments (Clemente *et al*., 2019).

There are numerous ways to define the context of a project in an industry, a company, an alliance, or a value chain, among others. Understanding how the project is surrounded by context is essential (Eriksson *et al*., 2019). In this article, as Eriksson *et al*. (2019) stated, we propose defining the project context as a business ecosystem. The growing interest in business ecosystems is driven by the substantial value created by companies such as Amazon, Airbnb, and Uber, which disrupt traditional industries by reorganizing businesses across boundaries to create systems. A similar phenomenon occurs with innovation ecosystems with rapidly growing literature, typically with a business and strategy origin and focus (Granstrand & Holgersson, 2020).

The organization must cultivate its business ecosystem, looking for innovation to succeed. Thus, while business networks focus on the relationships between individuals, the ecosystem focuses on the products, services, and innovations companies offer and how they can complement other solutions to provide customers with the integrated solutions they want and need (Madsen, 2020). An ecosystem lens goes beyond business model innovation, considering the business model of partner companies as critical as that of focal companies (Konietzko *et al*., 2020).

Projects are one of the tools used to generate innovation and competitive advantage. Projects are used as tools to support organizations in strategic restructuring due to changes in the market (Alves *et al*., 2022). Several studies indicate that project success is closely related to project management proficiency (Pacheco, 2018). Project management initiatives can help in value-capture processes. Generally, value capture is seen as acquiring new customers,

forming partnerships, increasing brand recognition, and expanding their network of contacts. These are all critical points in building business ecosystems (Radziwon *et al*., 2017).

The research problem held forth in this text is the need to explain the interaction between business ecosystems and innovation ecosystems in the context of project management. While both ecosystems focus on business strategies, how they interact in project contexts still needs to be clarified, and the literature on this topic is rare. The text highlights the importance of understanding these interactions, which can be critical to project success and value creation. By bridging the gap between project management and ecosystem literature, the study aims to provide a framework to guide organizations in cultivating their ecosystems for innovation and success.

Thus, this study aims to bridge the project management and ecosystem literature by answering the following research questions: RQ1- How do the innovation and business ecosystems interact? RQ2- What is the contribution of project management to the interaction of ecosystems?

To answer these research questions, the methodological approach adopted was a systematic literature review, and the main contribution was the delivery of a framework relating to the business ecosystem and the innovation ecosystem. The samples used in the elaboration of the study were taken from the Web of Science (WoS) and Elsevier Scopus databases. The VOSviewer software and the NVIVO software for content analysis were also used to perform bibliometric analyses.

The theoretical contribution of this paper is the framework that correlates business ecosystems and innovation ecosystems in the context of project management. The text exposes that the ecosystem lens goes beyond business model innovation and considers the business model of partner companies as critical as that of focal companies. The framework can support organizations in identifying potential risks, mitigating delays, identifying opportunities, and creating value for all ecosystem members.

This paper is structured in six sections. The following section reviews the ecosystem-related literature and its inclusion in project management. Section 3 describes the methodology followed in order to carry out the study. Section 4 presents the results of the analyses performed. In section 5, the conclusions are presented, and in section 6, the study's limitations and future work are presented, just before the references.

2 Theoretical background

2.1 Business ecosystem

A general concept of a system is that it is composed of a set of components and a set of relationships between these components. Systems analysis is the exercise to characterize both. A joint characterization of a dynamic, open system is in terms of transforming inputs into outputs through activities performed by agents or actors interacting with an environment (Granstrand & Holgersson, 2020). The ecosystem generally refers to a group of interacting companies that depend on each other's activities. Jacobides (2018) posits that there are emphases on different aspects of an ecosystem depending on the unit of analysis.

When reviewing the literature, two major groups of articles were identified: 1) a "business ecosystem" flow, which focuses on a company and its environment; 2) an "innovation ecosystem" stream, focused on a particular innovation or new value proposition and the plethora of actors that support it. In the business literature, Moore's (1993) seminal paper entitled "Predators and Prey: A New Ecology of Competition" was the first to link the biological ecosystem to the business ecosystem (Lee & Yin, 2020). Furthermore, Moore (1993, 1996) introduced the term business ecosystems to describe the networks of organizations and individuals that work cooperatively and competitively to produce goods and services of value to customers who are members of the ecosystem.

The business ecosystem is a system of workflows contributing to a common system-level business goal. The definition implies a bottom-up perspective with micro-level workflows, and the boundaries of the business ecosystem are determined by how these workflows contribute to a macro-level business ecosystem goal (Eriksson *et al*., 2019).

A constitution of business ecosystems uses the project as a constituent form of this ecosystem. In the proposal by Eriksson *et al*. (2019), "*business ecosystem constitutes a context for the project in which its workflows are coordinated with those of the business ecosystem. Thus, the business ecosystem depends on the project to contribute to business ecosystem performance*.". At a macro level, ecosystems are seen as communities of associated actors defined by their networks and platform affiliations, where the managerial focus is on breaking down traditional industry boundaries, building platforms, and the potential for symbiotic relationships in productive ecosystems (Iansiti & Levien, 2004; Rong *et al*., 2013; Koch-Ørvad *et al*., 2019).

On the other hand, at a micro level, focusing on a particular organization, ecosystems are seen as configurations of activity defined by a value proposition (Adner, 2006; Adner & Kapoor, 2010; Koch-Ørvad *et al*., 2019). Adner (2017) states that an ecosystem is characterized by four elements: the activities necessary for the value proposition to materialize, the actors or partners who perform these activities, the positions of actors in the flow of activities (who delivers to whom?), and the content of links or transfers between actors, for example, material, information, influence, or funds.

Central to an ecosystem's strategy is aligning partners, ensuring that all of them are satisfied with their positions in the system and their relationships or interactions with other partners (Adner, 2017; Koch-Ørvad *et al*., 2019).

2.2 Innovations ecosystem

An innovation ecosystem is the evolving set of actors, activities, artifacts, institutions, and their relationships, including complementary and surrogate connections, which are essential to the innovative performance of an actor or a population of actors (Granstrand & Holgersson, 2020). In this definition, artifacts include tangible products and services, intangible resources, technological and non-technological resources, and other system inputs and outputs, including innovations (Granstrand & Holgersson, 2020).

Adner (2006) and Lee and Yin (2020) use the concept of innovation ecosystems as a construct that reflects the complexity arising from innovation activities carried out by ecosystem members. Innovation is a valuable potential result of interactions and encounters with actors involved in co-creation (Schreier *et al*., 2012).

An innovation ecosystem may include a system of actors with collaborative (complementary) and competitive (substitute) relationships with or without a focal company and an artifact system with complementary and surrogate relationships (Granstrand & Holgersson, 2020). Innovation ecosystems consider the actors involved and their business models (their value proposition, value creation and delivery, and value capture mechanisms), the risk they bring, the dependency between them (how dependent an actor is on the other and the entire ecosystem), an ecosystem value proposition (an integrated end-user solution) and user segments addressed by the ecosystem value proposition (Madsen, 2020).

Furthermore, innovation ecosystems describe how legally independent actors can create value together. This perspective focuses on a technology or new value proposition that requires

the joint efforts of several actors to be successfully implemented (Adner, 2016; Konietzko *et al*., 2020). These innovation ecosystems can be dominated by one actor, for example, the platform owner or the primary provider of collaborative innovation opportunities, sometimes referred to as the vital actor or orchestrator (Konietzko *et al*., 2020).

Moreover, innovation ecosystems promote scientific knowledge creation and increase specific industries' independent innovation capabilities through value chain integration and inter-organizational collaboration; they can help companies in emerging economies gain competitive advantages (Xie & Wang, 2020). Consequently, growing and nurturing an ecosystem is an iterative process that can connect many different networks. Taking a holistic view of the ecosystem can help identify unforeseen risks and delays, identify new solutions to mitigate risks, and ultimately lead to integrating innovations into the ecosystem (Madsen, 2020). Companies in open innovation ecosystems expand organizational resources and enable collaborations between organizations, which can promote the flow, aggregation, and integration of resources in business network ecosystems (Xie & Wang, 2020).

2.3 Project management for innovation ecosystems

The project literature can contribute to the innovation ecosystem literature by providing archetypes of management-oriented projects that involve individuals and organizations. Previous literature on project management focuses on the interactions between individuals and organizations, knowledge, skills, and standards skills needed to support successful project delivery in the future. The same can be applied to the development of innovative projects, which is the case of innovation ecosystems (Donald, 2023).

Innovation ecosystems associated with project management presume an interaction of different stakeholders in an organization whose objective is the execution of a strategic plan to generate innovation (Sandhu *et al*., 2018). Davies and Hobday (2005) use the term "project business" to refer to organizations that implement projects to achieve critical business objectives, including all companies that design and produce complex products and systems.

The business ecosystem for projects is based on the life of projects in a temporary environment, where workflows are interconnected and play a specific role in a business ecosystem. The focus of business ecosystems is primarily on how project-based organizations profit from the system, appropriating a larger share of its total value creation (Sandhu *et al*., 2018).

The project business is related to specific relational context, time limitation, value creation properties, type of complexity, and its high degree of uncertainty and limited possibilities for standardization. Business models can play an essential role in the company's repertoire of responses to the specific nature of the project's business. What seems critical, therefore, is to explore the business models that operate in the project business and how they operate across single and multiple companies, across single projects and business networks (Wikström *et al*., 2010).

Business models must adequately align with the focal company's specific strategy, structures, culture, and industry logic. The nested nature of the project business with competition and collaboration across project and enterprise boundaries can be particularly relevant to business model ideas and literature networks (Wikström *et al*., 2010).

3 Materials and methods

The systematic literature review was selected to answer the research questions presented in this study's introductory section. Systematic literature review is a research process that aims to locate, critically analyze, synthesize, and interpret data obtained from preexisting research. A systematic literature review is a rigorous methodological review of research results, aiming not only to group existing works on the subject but also to help develop evidence-based guidance for practitioners involved in the field of study (Kitchenham, 2004).

3.1 Data collection procedures

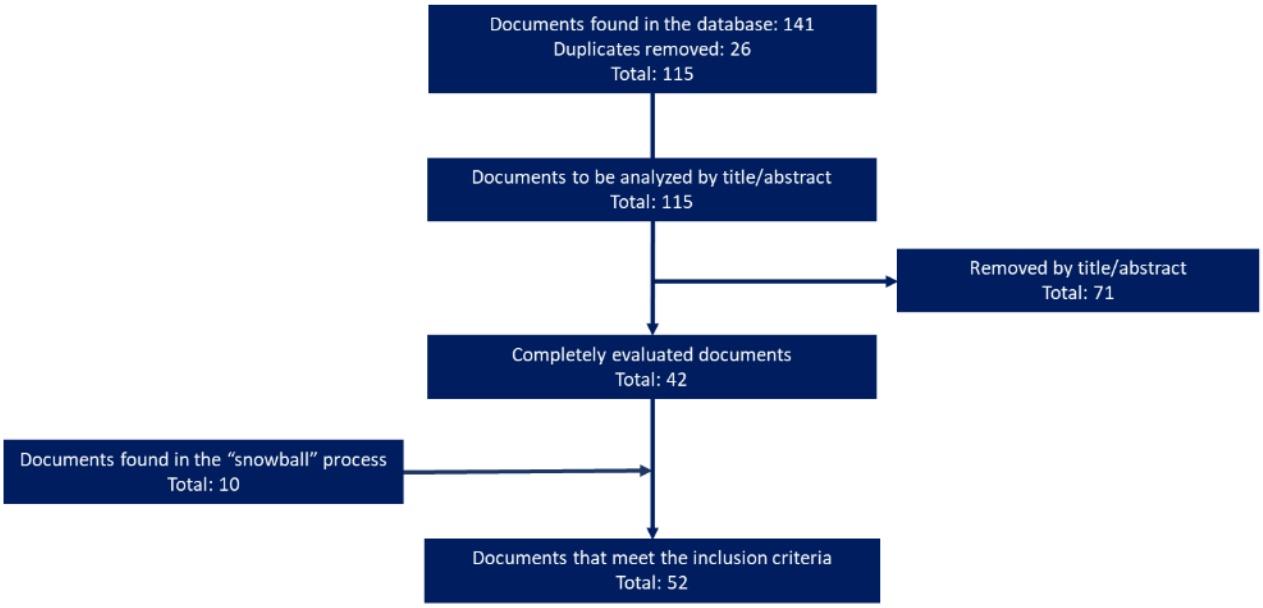
This research data was obtained from the scientific databases Web of Science (WoS) and Elsevier Scopus. These bases were chosen because the search engine could reach all indexed journals with an impact factor calculated by the Journal Citation Report (JCR). The keywords used for the database search were "Project Management" and "Ecosystem.".

The authors initially searched using the constructs mentioned above, considering all years in both databases, which resulted in a sample of 9,253 articles in Elsevier Scopus and 4,841 in Web of Science. The following filters were then applied: the language of publications (English), keywords ("Project Management" and "Ecosystem"), types of documents (articles and reviews), and areas (management, business, and industrial engineering). The filtering resulted in 141 articles (81 from the Web of Science database and 60 from Elsevier Scopus).

There was a first screening in which duplicate documents were eliminated, producing 115 articles. In the second screening, the researchers read the titles and abstracts of the 115 articles identified; articles not aligned with the research scope were excluded. This screening resulted in 42 articles. Articles considered strategic for the literature were incorporated into the review through the snowball process at the author's discretion. More than ten articles were added later, totaling 52 in the final sample; all can be found in the references. Figure 1 demonstrates the entire process of the research method performed (Alves & Debres, 2023)

Figure 1.

Research Method Process



Source: The Authors.

3.1.1 Data Analysis Procedure

Data analysis used qualitative and quantitative research strategies guided by bibliometrics and content analysis methods. Bibliometric analysis combines methods for conducting quantitative analyses of scientific research to assess the contributions of researchers or different fields of research. In this article, bibliometrics was applied to analyze and identify studies with a significant impact, in addition to evaluating references in the literature on the relationship between project management and ecosystem constructs.

Content analysis is performed with outlier publications identified by the NVIVO software; the selection criterion for this process was the average citation value of the publications. The VOSviewer software was also used to perform the bibliometric analyses. Content analysis provides a detailed study. The process ranges from the keyword composition strategy and selection of databases to a detailed analysis of the final sample. NVIVO offers a variety of tools to organize data and analyze it flexibly (Sinkovics, 2016). It can store data types like bibliometric information imported from reference management software. NVIVO is designed to remove rigid divisions between data and interpretation and offers different ways to connect the parts of a project, integrating reflection and recorded data.

4 Results

This section is dedicated to presenting the results found in the study. The results of this research seek to analyze the evolution of the ecosystem in project management to identify the theme's relevance for the academy, besides presenting an overview that may motivate future research.

4.1 Sample demographics

In our sample, it was possible to identify publications in 56 journals, highlighting the "International Entrepreneurship and Management Journal," "Industrial, Marketing Management," and "Project Management Journal," which have ten publications representing 26% of the total analyzed. In the analysis of the publications of each journal, it is possible to notice a low concentration of publications, with 43% of the total publications in 13 articles.

Based on the classification available in the database, it was possible to identify the areas with the number of publications. The areas of "Management" and "Business Management" had the most publications, with 40% and 20%, respectively. Table 1 presents the synthesis of the content analysis.

Table 1.

Coding Schema: Content Analysis

	Codes	Occurrences	%
T1 - Kind of study	A – modeling	1	3%
	B - theoretical-conceptual	10	25%
	C - literature review	3	8%
	E – survey	1	3%
	F - case study	23	58%
	G - action-research	3	8%
T2 - Affiliation	CO – company	6	15%
	RI - research institution	3	8%
	UM – university	32	80%
T3 - Financial support (Y/N)	No	31	78%
	Yes	10	25%
T4 - Analysis period	CONT – contemporary	16	40%
	LO – longitudinal	10	25%
	RET – retrospective	15	38%
T5 - Approach	DE – descriptive	6	15%
	QL – qualitative	33	83%
	QT – qualitative	2	5%
T6 - geographic scope	IN – international	15	38%
	NA – national	20	50%
	RET – regional	6	15%
T7 - Analytic unit	PE – Person	1	3%
	COM – companies	13	33%
	GP/PR - groups/ projects	12	30%
	OU - organizational unit	15	38%
T8 - sources of evidences	Questionnaire	3	8%
	Interview	8	20%
	Interview & document analysis	4	10%
	Interview & press information	1	3%
	Document analysis	13	33%
	Public data	3	8%
	Public data & press information	1	3%
	Bibliography	5	13%
	Interview, document analysis &public data	1	3%
	Interview, document analysis, public data & press information	1	3%
KE - Kind of ecosystem	KE1 - Business ecosystem	18	45%
	KE2 - Innovation ecosystem	23	58%
ES - Evolutionary stages	ES1 – birth	21	53%
	ES2 – expansion	13	33%
	ES3 – leadership	3	8%

	Codes	Occurrences	%
	ES4 - self-renewal	4	10%
TC - Types of connection	TC1 - Commodity supply	8	20%
	TC2 - Bi-directional	7	18%
	TC3 - Multi-directional	15	38%
	TC4 - New entity	8	20%
	TC5 - New legal entity	3	8%
EH - Ecosystem health	EH1 – productivity	21	53%
	EH2 – robustness	6	15%
	EH3 - niche creation	14	35%
EC - Ecosystem characteristic	EC1 – symbiosis	13	33%
	EC2 – platform	14	35%
	EC3 - co-evolution	14	35%

Note: Relative percentages compared to 42 articles in content analysis.
Source: The Authors.

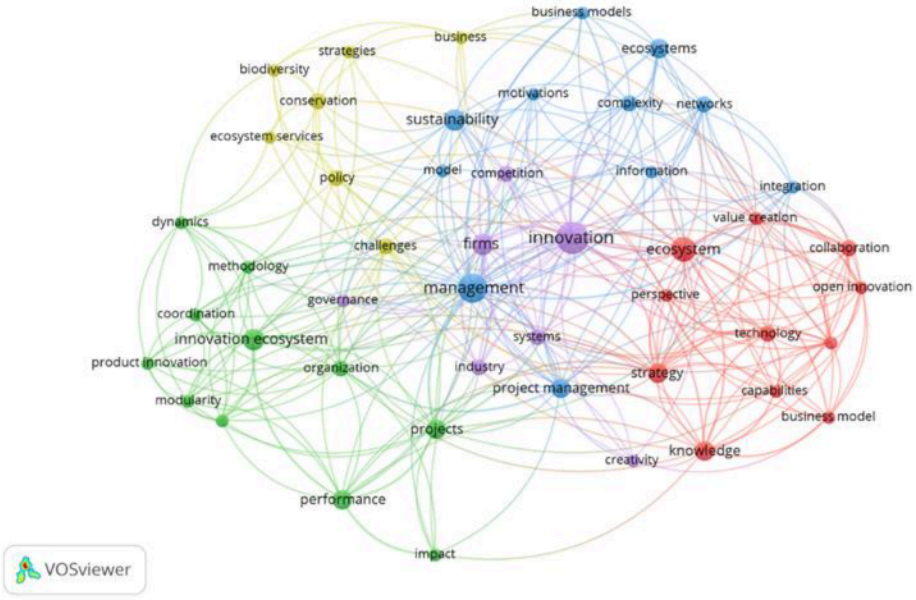
The detailed coding scheme and the relative value (column "%") present the content analysis results. The relative value is calculated from the ratio of occurrences to the total number of articles analyzed (n = 42). The articles from the systematic literature review process were used, and those added in the snowballing process were disregarded to avoid bias in the subsequent analyses. The articles selected for content analysis were analyzed in detail by the researchers.

4.2 Core themes

The keyword network was generated in the VOSviewer software. The analysis of the network generated allows us to observe the terms associated with the themes and categories defined in the abstract reading phase, such as management, innovation, and sustainability.

Figure 2.

keywords Network



Source: The Authors.

Notably, the network generation resulted in the formation of 5 clusters in total. Of these, those that contain articles of interest for this research focus on innovation ecosystem clusters (green) and clusters related to value generation / new business models (blue and red). The yellow cluster contained several works focused on managing natural (biological) ecosystems outside the scope of this research. The words shown in Figure 2 are listed in Table 2. The presented map indicates a deep relationship between the different keywords, which leads us to the need for an integration factor among the different ecosystems.

Table 2.

keywords Analysis

Clusters	Word
Cluster 1 (Green)	Dynamiscs Methodology, coordination, product innovation, modularity, innovation ecosystem, organization, performance, projects, and impact
Cluster 2 (yellow)	Biodiversity, strategies, conservation, ecosystem services, policy, challenges, and business
Cluster 3 (blue)	Management, model, sustainability, Project management, business model, ecosystem, complexity, networks, information, and integration
Cluster 4 (purple)	Competition, firms, innovation, industry, governance, system, and creativity
Cluster 5 (red)	Ecosystem, perspective, strategy, knowledge, business model, capabilities, technology, open innovation, collaboration, and value creation

Source: The Authors.

Core–periphery analysis was performed to identify the relation between code categories. Core-Periphery analysis is a widely-used method in fields like economics, and business management. Its purpose is to differentiate elements within a network or system into a "core" and a "periphery."

The "core" represents central, highly connected components, while the "periphery" encompasses less connected elements. This differentiation reveals insights into network dynamics, structures, and distribution.

Core elements are highly interconnected and play central roles in shaping the system, while peripheral elements have limited influence and rely more on the core. Researchers employ Core-Periphery analysis to uncover patterns, hierarchies, and disparities, enabling a deeper understanding of complex systems. This aids decision-making processes by clarifying relationships and dynamics within the network. The analysis uncovered the primary associations between different elements in our study. Specifically, it showed that Business Ecosystem (KE1) and Innovation Ecosystem (KE2) are primarily linked with Birth (ES1), Productivity (EH1), Multi-directional (TC3) connections, and Symbiosis (EC1). This association was particularly strong, with a core/periphery fit of 0.7732, as depicted in Figure 2.

Figure 3.

Core/Periphery Analysis

	1 KE	2 KE	3 ES	12 EH	9 TC	15 EC	6 ES	8 TC	5 ES	10 TC	11 TC	4 ES	13 EH	14 EH	7 TC	16 EC	17 EC
1 KE1	17		6	13	7	6	1	5	2		1	8	3	1	4	8	3
2 KE2		23	15	8	8	7	3	2	1	8	2	4	2	13	3	5	11
3 ES1	6	15	21	11	6	7		1		6	1			10	7	4	10
12 EH1	13	8	11	21	8	7	2	5		3	1	8			4	9	5
9 TC3	7	8	6	8	15	7	1		2			6	1	6		3	5
15 EC1	6	7	7	7	7	13	1	2		1		5	2	4	3		
6 ES4	1	3		2	1	1	4	1		1	1		1	1		1	2
8 TC2	5	2	1	5		2	1	7				5	2			5	
5 ES3	2	1			2				3		1		2	1		2	1
10 TC4		8	6	3		1	1			8		1	1	4		3	4
11 TC5	1	2	1	1			1		1		3		1	1		1	2
4 ES2	8	4		8	6	5		5		1		12	2	2		6	1
13 EH2	3	2			1	2	1	2	2	1	1	2	5			2	1
14 EH3	1	13	10		6	4	1		1	4	1	2		14	3	2	8
7 TC1	4	3	7	4		3								3	7	1	3
16 EC2	8	5	4	9	3		1	5	2	3	1	6	2	2	1	13	
17 EC3	3	11	10	5	5		2		1	4	2	1	1	8	3		14

Note: The acronyms can be found in Table 1.
Source: The Authors.

4.3 Exploring ecosystems relationships

The intensities of the correlations and how the constructs relate to each other play a pivotal role in shaping the framework outlined in the discussion section. Analyzing the strength of correlations among the investigated elements provides crucial insights for configuring the proposed conceptual model. Furthermore, the manner in which these constructs interact with one another significantly influences the structure of the framework, as it directly impacts how these elements mutually interact and influence each other.

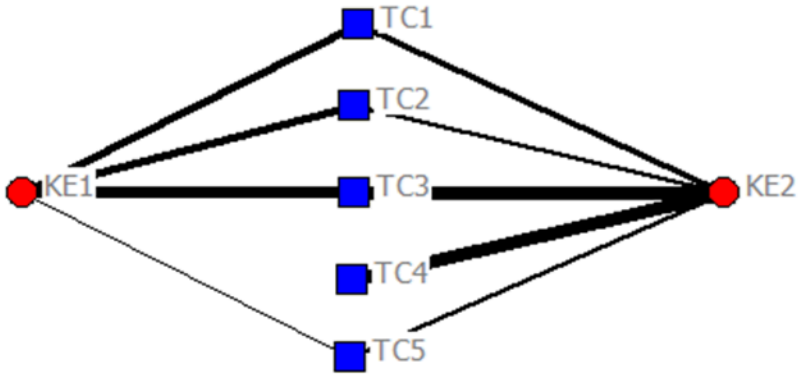
Our research relies on the information extracted from the identified correlations, using them as essential inputs in constructing the theoretical framework. Through this framework, we aim to offer a more comprehensive and precise representation of the intricate relationships among the constructs addressed in our study. Examining the interactions among these elements enables a deeper understanding of the underlying dynamics and contributes to a clearer and

more informed view of the practical and theoretical implications of our research in the business context.

Figure 4.

Kind of Ecosystem and Types of Connection Correlations

	TC1 - Commodity supply	TC2 - Bi-directional	TC3 - Multi-directional	TC4 - New entity	TC5 - New legal entity
KE1 - Business ecosystem	4	5	7	0	1
KE2 - Innovation ecosystem	3	2	8	8	2



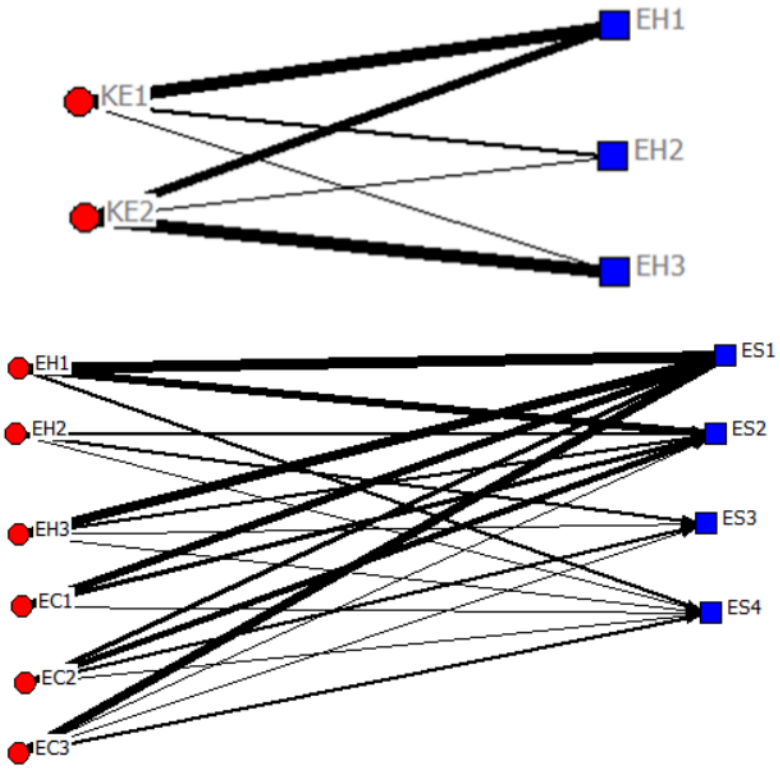
Source: The Authors.

Focusing on clarifying the relationships among ecosystems and thus answering the RQ1, we established two networks based (Fig. 4 and Fig. 5) on the cross-tabulation data in Net Draw software. The thickness of the lines indicates the relations between them: the thicker the line, the stronger the relationship. The Tables 3 and 4 indicate the strength of the correlations by the intensity of the colors.

Figure 5.

Kind of Ecosystem and Ecosystem Health Correlations

	ES1	ES2	ES3	ES4
EH1	11	8	0	2
EH2	0	2	2	1
EH3	10	2	1	1
EC1	7	5	0	1
EC2	4	6	2	1
EC3	10	1	1	2



Source: The Authors.

Our analysis delved into the intricate relationships between various elements within the context of ecosystems, mainly focusing on the Innovation Ecosystem and the Business Ecosystem. This examination involves a close study of connection types and the health of these ecosystems.

Figure 4 offers a comprehensive visual representation of the connections involving the Innovation Ecosystem. It pinpoints two specific connection types: Multidirectional and New Entity. Understanding these connections is crucial as it sheds light on the dynamics and

interactions within the Innovation Ecosystem. Multidirectional connections suggest a broad and complex web of interactions, while New Entity connections may signify the emergence of novel components, potentially driving innovation and change.

In Figure 5, we focus on the Business Ecosystem and the Innovation Ecosystem's connection with Ecosystem health. In the former, we observe a substantial connection with Ecosystem health, particularly in Productivity. This suggests that the health and vitality of the Business Ecosystem are closely linked to its Productivity, a vital factor for its sustainability and competitiveness.

In the case of the Innovation Ecosystem, we identify a strong association with Ecosystem health, focusing on Niche Creation. This connection underscores the Innovation Ecosystem's role in carving out unique niches or markets, often a hallmark of innovation-driven environments.

The importance of these insights cannot be overstated. They provide a clearer understanding of how different elements within ecosystems are interrelated and how they contribute to these ecosystems' overall health and dynamics. By visually mapping these connections, we enable stakeholders and researchers to identify strategic opportunities, potential areas for improvement, and avenues for fostering innovation and sustainability.

In summary, Figures 4 and 5 offer valuable visual representations illuminating the intricate relationships between Innovation and Business Ecosystems, various connection types, and ecosystem health. This knowledge is invaluable for anyone navigating and enhancing these ecosystems effectively.

5 Discussion

After reviewing the existing literature, it was possible to correlate the proposed constructs. A framework called “project management value creation-capture circle” was proposed using project management to create innovation and new business models — Table 5 and Figure 7 overview some critical concepts in the framework below.

Table 5.

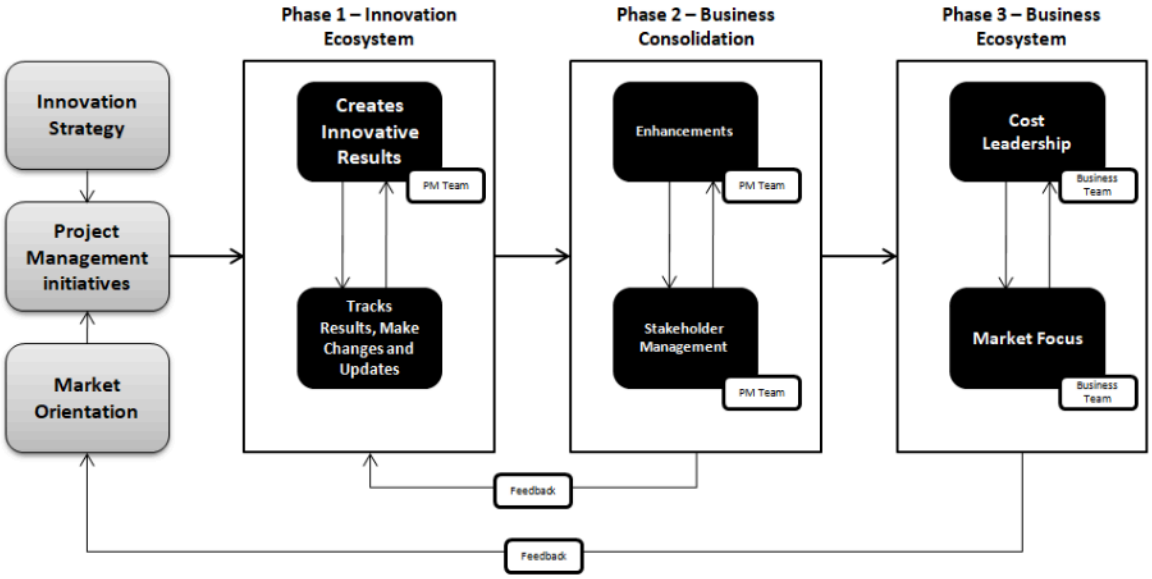
Key Concepts on Project Management Value Creation-Capture Circle Based on Literature Review

Topic	Result	Main Reference
Project Management initiatives	Value Capture and Value Creation actions organized as project pipeline	Alves *et al*., 2022 Souza *et al*., 2022 Ramalho *et al*., 2019 Do Vale *et al*., 2018
Innovation Strategy	Objectives and key results organized into actions to achieve the result of innovation	Lee *et al*., 2020 Abdner *et al*., 2017 Davies *et al*., 2014 Dunn *et al*., 2003 Nepelski *et al*., 2020
Market Orientation	Stakeholder inputs (customers, suppliers, partners, etc.) that guide project management initiatives	Emmanuel *et al*., 2019 Madsen, 2019 Elia *et al*., 2016
Business Consolidation	Stage of business maturity, in which market trends dominate.	Nica, 2021 Porter, 1989
Business Ecosystem	Community of organizations, institutions, and individuals that impact the enterprise value capture	Lee *et al*., 2020 Madsen *et al*., 2019 Press *et al*., 2019 Sandhu *et al*., 2019 Lappi *et al*., 2017 Naggar *et al*., 2015
Innovation Ecosystem	Community of organizations, institutions, and individuals that impact the enterprise value creation	Xie, 2020 Nepelski *et al*., 2020 Sjödin, 2018 Randhawa *et al*., 2018 Radziwon *et al*., 2018

Source: The Authors.

Figure 7.

Framework Proposed



Source: The Authors.

We include project management initiatives as an initiator for innovation and business ecosystems since these initiatives are used as tools to support organizations in implementing strategic changes due to changes in the market (Carvalho, 2018). In this model, we classify the innovation ecosystem as the first phase (phase 1) to create and achieve the result of project management initiatives as a way of adding multi-dimensional perspectives and new business entities, as demonstrated in the analysis of networks and Core/Periphery Analysis shows in-depth relations between Innovations Ecosystem and types of connection: Multidirectional and New Entity. These correlations indicate that the ecosystems interact independently in the project's initial phase. The innovation ecosystem is created to extract value from the so-called "innovative performance." The innovation ecosystem is presented as the starting point of the "framework" to harbor new ideas and knowledge, focusing on generating value and creating new market niches (Nagar, 2015). In this pillar, project management initiatives are carried out to develop new products, services, or results, to improve projects (incubation) (Guimont & Lapointe, 2016), or even to use/value capture processes (Radziwon *et al*., 2017).

This framework can be further supported by the solid and average correlations shown in Figure 6, in which it is possible to identify a strong correlation between stage 1 of birth with productivity, niche creation, and co-evolution. These three characteristics are common in

innovation environments where ecosystems seek to stabilize the business. It is also possible to identify a robust and medium correlation in the second stage of business maturation in the expansion phase, where the characteristics of symbiosis, expansion, and platform are perceived. Indicating a new degree of maturity, seeking more partnerships after stabilization.

The launch of new products requires a strategic network of contacts with different actors in the value chain so that projects can be consolidated in new technologies (Dunn, 2003). It is, therefore, essential to correlate success factors, such as the composition of the network, a governance structure, process management, and relationship factors between the actors, as shown in the center of the framework (Planko *et al*., 2017).

Including an "Idea Management" stage within the innovation ecosystem is a deliberate choice. A well-rounded ecosystem must consider the interests of its stakeholders and proactively manage factors that can influence outcomes, reducing risks during the Business Consolidation phase (Pellicelli, 2020). This "Idea Management" phase aligns with the ecosystem's goal of fostering innovation and sustainable growth. It engages stakeholders in generating and refining ideas, tapping into a valuable source of creativity and expertise. This enhances the chances of developing innovative solutions that resonate with the market and support successful business consolidation.

Additionally, it underscores the ecosystem's adaptability and responsiveness, critical qualities in today's dynamic business environment. Actively managing ideas allows the ecosystem to stay agile and ready to address evolving market demands and technological shifts. (Pellicelli, 2020)

The "Idea Management" stage promotes cohesion within the ecosystem, creating a collaborative environment that nurtures innovation and supports the ecosystem's mission. This approach reduces risks associated with business consolidation and fosters a culture of continuous improvement, reinforcing the ecosystem's resilience and long-term viability.

Integrating an "Idea Management" stage is a strategic move reflecting the ecosystem's commitment to holistic development, collaboration, and proactive risk reduction. It recognizes that successful business consolidation is a purposeful journey driven by all stakeholders' collective intelligence and creativity. (Naggar, 2015)

This leads us to consider that the participants in Innovation Ecosystems are subject to specific knowledge to achieve business success. In a single case study, Kopera *et al*. (2018) analyzed how interdisciplinary skills and knowledge of management and business can be

developed in these environments. He highlighted interdisciplinarity as essential and considered social skills that lead to effective communication and cooperation to ensure the company's success.

After this Innovation Ecosystem phase, when the business foundations are created, the "business consolidation" stage begins, where the business objectives are more precise, and a market niche has already been found. After the maturity of this phase, the business seeks results in scale and increased productivity, which initiates the business ecosystem phase, as indicated by the core-periphery analysis. Verifying a solid connection between the Business Ecosystem and Ecosystem health – Productive and Innovation Ecosystem and Ecosystem health – Niche Creation is also possible.

Another important factor, if not the main one, is the alignment of partnerships within the network. It is necessary to ensure that network actors are comfortable and satisfied with their position and relationship with other actors. For this reason, the proposed framework establishes conditions of constant feedback between the different ecosystems (Adner, 2017). Moreover, it should be highlighted that strategic networks can generate tensions and barriers that must be promptly broken. Stakeholder management is present in the Business Consolidation phase precisely because it is one of the tools to deal with this conflict since tensions are usually present between contractors and customers (Sezera & Bosch-Sijtsema, 2020).

Radziwon *et al*. (2017) investigated how a set of small and medium-sized companies can develop business models within a regional innovation ecosystem based on the case of a Danish manufacturing company, which developed its local Ecosystem in an innovative automation project. The authors concluded that an ecosystem's success is mainly determined by the value capture process that occurs at the inter-organizational level; thus, the management of knowledge flows in the innovation ecosystem must fit into a multi-layered business model structure.

In this sense, Theodoraki *et al*. (2018) analyzed innovation factors that affect the sustainability of an ecosystem supported by incubators for three different universities. From the application of social capital theory, the authors made some recommendations: Incubators must create strong relationships with other members of the Ecosystem to compensate for the limited material and non-material resources at their disposal, and they must develop shared values, norms, and culture and decrease the number of opportunistic behaviors.

When the objective of the innovation ecosystem is reached, the maturing and consolidation of the business begins (Levitt, 1965). At this point, continuous improvement initiatives are to be used to reduce waste and maximize profit (Toledo *et al*., 2020). Thus, once the business proficiency stage is reached, initiatives seeking cost leadership, business differentiation, and target audience attraction are initiated (Porter, 1980). At this moment, there is an increase in the network of contacts and governance aiming at generating a symbiosis between different businesses (Alfaro & Miller, 2014). This evolution of organizations, derived from the evolution of ecosystems, is similar to the product life cycle of development, growth, maturity, and decline, as discussed by Levitt (1965). During the development phase, a new product is first placed on the market (new ideas generated in the innovation ecosystem). Then demand starts to accelerate, and the total market size expands rapidly (business maturation and consolidation) (Levitt, 1965).

The difference occurs in the decline phase when the organization can use the symbiosis developed with other actors in the Ecosystem to maintain the profitability of the business or seek to reinvent itself (Levitt, 1965) entirely. This framework's advantages are a set of values generated by the development of new products, services, or improvement of existing projects, in addition to reducing waste and maximizing profit.

6 Final remarks

References were systematically analyzed using a hybrid approach using different literature review methods to identify the correlations between innovation ecosystems and business ecosystems. Regarding the methodological approach, the articles analyzed more frequently presented retrospective case studies. With the objective to endeavors to bridge the realms of project management and ecosystem literature by addressing the following research questions: RQ1 - How do the innovation and business ecosystems interact? RQ2 - What is the contribution of project management to the interaction of ecosystems?

In general, the references described the benefits in the authors' perceptions of the different ecosystems. Therefore, this article analyzed the existing literature in-depth by merging different methodologies for a systematic literature review, analyzing trends and connections between different data sources. There is a great interest among academics and practitioners in understanding the correlations between the ecosystems studied. Figures 3 and 4 allowed verifying a high correlation between the search terms in the network analysis and considering

the articles in Figure 1 and the findings in Table 2. It was possible through the framework indicated in Figure 6.

The proposed framework proposes that project management initiatives can create innovation and business ecosystems that generate value and create new market niches. The framework also highlights the importance of stakeholder management, feedback, and alignment of partnerships within the network. The framework contributes to the literature by integrating project management, innovation, and business ecosystems to achieve value creation and capture. It provides a practical approach to implement strategic movements due to changes in the market.

Correlations between ecosystems are vital for innovating corporate strategy, increasing dynamic competencies, knowledge management, and stakeholder management. It was possible to prove the strong correlations between the types of ecosystems and the connections within these businesses and their health in search of results, albeit only little addressed in the literature. Another possible future research involves the possibility of case studies to validate the proposed framework.

The proposed framework provides a solid foundation for comprehending the dynamics between project management, innovation, and business ecosystems, ultimately facilitating the creation of value and the development of market niches. It underscores the significance of stakeholder management, feedback mechanisms, and partnership alignment, offering a pragmatic approach to navigate through the ever-changing market landscape.

The observed correlations between ecosystems accentuate their importance in shaping corporate strategy, enhancing dynamic capabilities, managing knowledge, and nurturing stakeholder relationships. While this study has brought to light numerous insights, it beckons further research in the field, particularly through case studies, to validate the proposed framework and explore its applicability across diverse sectors and contexts. The limitations found in this article are the result of the methodological choices made by the researchers. Bibliometric analyses may have deviations or trends since they are performed based on the number of citations of each article; the most cited articles can generate temporal trends. Therefore, content analysis and snowball techniques were applied as mitigation tools.

Another area for improvement in this article is the need to apply the framework to some organizations to validate the theoretical-conceptual construction and witness the results from the analyses in different sectors and contexts. It is a limitation for applying this framework, as

it is the umbrella of innovation and business ecosystems. Finally, these articles conclude that there should be more field research into the correlations between innovation and business systems and how project management can be used to achieve results and meet objectives.

The findings presented in this research make substantial contributions toward addressing the research questions outlined at the beginning of this study. RQ1, which investigates the interaction between innovation and business ecosystems, has been elucidated through the demonstrated correlations between these ecosystems. The evidence suggests that these ecosystems interact significantly, impacting corporate strategy, dynamic capabilities, knowledge management, and stakeholder relationships. These insights provide a solid foundation for future research and practical applications in this domain.

Turning to RQ2, which delves into the contribution of project management to the interaction of ecosystems, our proposed framework shines a light on the vital role of project management in creating and nurturing innovation and business ecosystems. The framework emphasizes the importance of stakeholder management, feedback mechanisms, and partnership alignment within these ecosystems. By doing so, it offers a practical approach to navigating the evolving market landscape and creating value. However, this research also highlights the need for further empirical studies to validate the framework's theoretical-conceptual construct and witness its real-world impact across different sectors and contexts. Therefore, future research endeavors should focus on conducting field research to explore the correlations between innovation and business ecosystems and how project management can be effectively leveraged to achieve tangible results and meet strategic objectives.

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