

Entrepreneurship and Innovation Ecosystem: The Contamination Lab Experience

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Abstract

Purpose of the paper. *The paper offers an organic view of the topic of entrepreneurship-related innovation ecosystems.*

Methodology. *Starting with bibliometric analysis, a performance analysis was conducted to identify key trends in the intersection of entrepreneurship and innovation ecosystem. Then the contamination lab experience is examined to identify how it produces results in line with academic research.*

Results. *Through the results emerging from the performance analysis, the Contamination Lab, introduced in Italy in 2014, is examined as an example of university-led entrepreneurial support initiative.*

Managerial implications. *This study provides insights for researchers and practitioners to replicate models like the contamination lab in building constructive collaboration between entrepreneurship and innovation.*

Originality of the paper. *The paper helps to cover a notable gap in understanding how theoretical models and frameworks can be designed to maximize the role of entrepreneurship in fostering innovation ecosystems.*

Key words: *Entrepreneurship, Innovation, Innovative ecosystem, Startup, Contamination lab*

TRACK: Entrepreneurship

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1. Introduction

Innovative ecosystems serve as a cornerstone for economic and social progress, driving value creation through the collaborative interplay of diverse actors—ranging from businesses and institutions to universities and local communities. In today's fast-paced and competitive global landscape, entrepreneurship has emerged as a critical force in strengthening these ecosystems, enabling the spread of innovation, the generation of new opportunities, and the translation of ideas into tangible solutions (Dias Sant' Ana, T., 2020, Dedehayir, O. et al., 2018, Zahra and Nambisan, 2011). Yet, despite increasing academic and practical interest in this field, there remains a notable gap in understanding how theoretical models and frameworks can be designed to maximize the role of entrepreneurship in fostering innovation ecosystems.

In an interconnected world, innovation is no longer the product of isolated efforts but arises from intricate networks of collaboration among various stakeholders, including private enterprises, public entities, and social organizations (Adner, 2016). This shift has led to the conceptualization of innovation ecosystems, which provide a holistic perspective on the mechanisms driving change and the conditions necessary for sustainable development (Ritaala and Gustaffson, 2018). By framing innovation within an ecosystem, researchers and practitioners gain deeper insights into the dynamics that enable transformative evolution.

The growing emphasis on innovation and entrepreneurship ecosystems reflects their increasing relevance in both academic and practical contexts. This rise in attention is fueled by several factors, including the exponential growth of data, information, and knowledge, which has created new demands for collaboration and coordination among diverse organizations and individuals (Pustovrh, A. et al., 2020). Additionally, advancements in technology have facilitated unprecedented levels of interaction and cooperation among stakeholders (Ritaala and Gustaffson, 2018). However, despite this progress, the conceptualization of ecosystems within innovation and entrepreneurship research remains a subject of ongoing debate (Ritaala and Gustaffson, 2018).

This paper seeks to address this gap by conducting a performance analysis to identify and develop a robust, integrated theoretical framework. CLab (Contamination Labs), a new approach to entrepreneurship introduced in 2014 in Italy, prove to be a concrete realization of this framework, embodying non only the principles of collaboration, openness, and co-creation that form its foundation, but also the theoretical results of academic research. These hybrid spaces, where students, entrepreneurs, researchers, and professionals come together and collaborate, represent a tangible example of how the theoretical framework can be applied in practice to enhance innovative ecosystems. Through activities such as hackathons, workshops, and multidisciplinary projects, CLabs facilitate the exchange of knowledge and skills, accelerating learning and adaptation processes.

Moreover, they foster an entrepreneurial culture that not only generates new ideas but also transforms them into concrete solutions, thereby strengthening the socio-economic fabric of the contexts in which they operate. In this sense, CLabs demonstrate how models based on open and collaborative innovation principles can effectively improve innovation ecosystems through entrepreneurship. Such models may offer valuable insights into the functioning of innovation ecosystems by accelerating processes of learning, adaptation, and growth.

Through an examination of existing practices and empirical evidence, the paper provides actionable insights for policymakers, entrepreneurs, and other stakeholders committed to advancing transformative entrepreneurship. In summary, this work contributes to the existing body of literature by proposing a systemic approach that links entrepreneurship and innovation ecosystems, offering a foundation for future research and practical applications across diverse contexts. Starting with bibliometric analysis, which identified 208 articles of interest, performance analysis, as a subset of bibliometric methods, was used to identify key trends in the intersection of entrepreneurship and innovation ecosystem. The paper then briefly explores the Contamination Lab experience as an illustrative case that aligns with themes emerging from the literature.

Compared to significant studies of the theme, such as that of Schiuma and Carlucci (2018), this contribution analyses the role of partnerships with universities in the innovation ecosystem and offers

an exploratory perspective of how an actor, when implementing structured and systematic entrepreneurial programmes, can contribute meaningfully to the innovation ecosystem. Compared to other works, such as that of Schmitz et al. (2026), this study not only proposes an analysis of the literature through a bibliometric first step, but also offers a practical demonstration of how a model identified at a political level and introduced in the Italian context has theoretical foundation. This makes it possible not only to assess the applicability of the model in other contexts, but also to imagine, if not, which theoretical aspects might not have been respected or adapted in the new environment.

The remaining sections of the paper are explained below. Section 2 reviews the literature review, while the next section describes the experience of contamination labs as an actor in innovative ecosystems. Section 4 outlines the methodological approach and explains the dataset creation process. Section 5 explores the results of the performance analysis focusing on areas of research in entrepreneurship and innovative ecosystems. Section 6 shares the main findings and highlights key directions for managers and policymakers. The last section presents conclusions and future research directions.

2. Literature review

The concept of the innovation ecosystem has gained increasing prominence in the fields of strategy, innovation, and entrepreneurship (Gomes et al., 2018). Scholars have proposed various definitions and frameworks across different contexts, often using distinct labels and emphasizing diverse objectives. Foundational research on ecosystems has consistently highlighted the central role of innovation (Silva et al., 2024). Building on the distinctions between innovation ecosystem concepts proposed by Adner (2006) and Carayannis and Campbell (2009), numerous scholars have introduced different classifications of innovation ecosystems.

Nambisan and Baron (2013) identified several types of innovation ecosystems, including hub-based ecosystems, open-source communities, R&D consortia, and crowdsourcing ecosystems. They specifically described hub-based ecosystems as those in which a single firm assumes leadership, setting goals, defining the innovation platform, and exerting significant influence over the strategies and outcomes of other participants. These ecosystems are typically associated with well-established companies. The Italian experience of Contamination Lab can be classified as a hub-based ecosystem, where the university acts as the central node, orchestrating innovation and facilitating collaboration among students, local businesses, and public institutions. This model aligns with the principles of entrepreneurial universities (Guerrero et al., 2016), where academic institutions play a pivotal role in fostering innovation and entrepreneurship. The Contamination Labs' experience focuses on interdisciplinary collaboration and real-world problem-solving reflects the dynamics of innovation ecosystems, enabling participants to develop innovative solutions that address local challenges.

In the field of entrepreneurship, the innovation ecosystem framework has been used to examine venture creation. Zahra and Nambisan (2012), building on earlier work by Nambisan and Sawhney (2007), identified four distinct types of innovation ecosystems, connecting strategic thinking with entrepreneurship: Jam Central, Orchestra, Creative Bazaar and MOD Station. The Jam Central Model pertains to networks of independent organizations, including research institutions, that join forces to conceptualize and develop innovations in cutting-edge or emerging fields. The Orchestra Model describes a scenario where multiple companies collaborate to seize a market opportunity through a shared innovation framework or platform. This framework is clearly defined and governed by a leading entity, often referred to as the "keystone player". Creative Bazaar Model revolves around an ecosystem in which a prominent company seeks out innovations—such as new ideas, products, or technologies—on a global scale, akin to shopping in a marketplace. The company then integrates these innovations within its proprietary systems to refine and commercialize them. MOD Station Model refers to an approach that empowers users to actively participate in innovation. In this type of ecosystems customers are enabled by companies to create and share modifications or enhancements to their products.

The innovation ecosystem concept is particularly useful for analyzing entrepreneurial efforts to establish new businesses. Entrepreneurial action, in this context, extends beyond managing uncertainty at the firm level to addressing collective uncertainties that impact multiple actors within the ecosystem (Salerno et al., 2015). Establishing and managing an innovation ecosystem, therefore, becomes a strategic approach for entrepreneurs, aligning closely with the entrepreneurial model of innovation ecosystems.

Numerous studies highlight that innovation ecosystems, defined by interactions among diverse actors such as universities, businesses, and public institutions, are essential for generating and disseminating innovation (Tagliazucchi et al., 2024). Innovation often emerges from collaboration among companies, public entities, and local communities, as these partnerships enable the effective utilization of available resources and knowledge, creating synergies that drive technological and organizational progress. In particular, the collaborative approach has proven effective in the public sector as well, helping to address complex challenges and enhance institutional innovation capacity (Sacchetti and Ianes, 2024).

In this context, the crucial role of public-private partnerships and innovation-supporting policies is widely recognized. Measures that encourage cooperation between the public and private sectors, combined with targeted fiscal and financial policies, can significantly enhance companies' innovation capacity. For example, tax incentives for acquiring advanced technologies have accelerated the adoption of digital tools among Italian firms, improving their competitiveness and innovation potential (Pagano et al., 2021). At the same time, the establishment of publicly funded research centres has demonstrated a positive impact on regional innovation capacity and the development of highly skilled human capital. Moreover, numerous studies have documented the phenomenon of knowledge spillovers resulting from the presence of research centres in host regions, further strengthening local innovation ecosystems (Robbiano, 2022).

Innovation ecosystems have become a crucial environment for fostering entrepreneurship. However, entrepreneurs operating within these ecosystems encounter distinctive challenges, particularly in navigating the delicate balance between aligning with the objectives and priorities established by the ecosystem leader and pursuing the goals of their own venture (Nambisan and Baron, 2013).

Characterized by the presence of multiple actors and the growing importance of public-private partnerships, universities play a pivotal role in managing innovation ecosystems, leveraging their capacity to orchestrate learning and innovation processes to become entrepreneurial institutions essential to the development of such ecosystems (Amitrano and Bifulco, 2024). Innovation ecosystems are widely acknowledged as key drivers of local and regional socioeconomic development, as they foster job creation, income generation, and social well-being through innovation. While often analyzed at the city level, universities are also playing a transformative role within their environments. Acting as catalysts for an entrepreneurial mindset, universities bring together a diverse network of actors and resources, facilitating the conversion of knowledge into innovation (Bittencourt et al., 2019). However, the interaction among ecosystem actors does not always yield the desired outcomes, as evidenced by studies conducted in Italy. For instance, research has shown that businesses not affiliated with universities tend to achieve stronger sales growth than those linked to academia. This raises questions about the effectiveness of universities in supporting the development of innovative businesses during their early growth stages (Modina et al., 2024).

Closely tied to the concept of collaboration is the idea of open innovation, which involves organizations leveraging external sources of knowledge to accelerate their innovation processes (Del Sarto et al., 2024). The core principle of open innovation (OI) is to make the innovation process more accessible and collaborative (Cheng & Huizingh, 2014). A widely accepted definition of open innovation emphasizes the exchange of information—both inbound and outbound—to evaluate innovations internally while expanding the market for external applications of inventions (Chesbrough, 2003). It also suggests that businesses aiming to enhance their technological capabilities should leverage both internal and external ideas (Arvaniti et al., 2023). Consequently, the successful implementation of open innovation requires not only executive commitment but also the

allocation of human resources. The current study highlights that many businesses in developing countries are hesitant to embrace open innovation due to leadership reluctance (Haylemariam et al., 2024). Widely discussed in the literature, this approach has proven particularly effective in enhancing the organizational and innovative performance of companies (Haylemariam et al., 2024), especially small and medium-sized enterprises (SMEs) that often lack sufficient internal resources to drive innovation (Battistella et al., 2023). The literature highlights two key strategies adopted by large companies practicing open innovation: sourcing external knowledge by expanding networks to explore new markets and technologies; supporting innovative start-ups through mentorship programs. These efforts can foster the development of an open innovation ecosystem, enabling collaborative innovation among diverse actors (Marozzo et al., 2023). In joint open innovation initiatives involving large companies and SMEs, shared leadership, dynamic decision-making, and effective prioritization emerge as fundamental elements of successful collaboration (Giardino et al., 2022). Business acceleration programs and collaborations with other companies, universities, or research centres have enabled many firms to acquire the knowledge and skills needed to innovate more effectively. Some authors identify three key external sources of knowledge -coopetitors, educators, and investors - that influence start-up innovation in distinct ways. Coopetitors enhance incremental innovation by facilitating the exchange of tacit knowledge among similar start-ups, though they have little impact on radical innovation. Educators contribute to incremental innovation by strengthening professional skills through the development of social and human capital. Investors, such as venture capitalists and business angels, drive radical innovation by offering not only financial resources but also specialized knowledge and access to strategic networks.

Additionally, these actors, often operating within coworking spaces, support the creation of networks and the acquisition of new knowledge. A key element of innovation is the ability to develop new mechanisms and processes that enhance efficiency and competitiveness (Del Sarto et al., 2024). Innovation often arises as a response to challenging market conditions, such as those triggered by economic crises. Companies that adopt a proactive stance tend to continue investing in innovation during times of crisis, using it as a tool for survival and future growth (Brzozowski and Cucculelli, 2016). However, innovation is not just a reaction to crises; it is an ongoing process that can radically transform business models. "Business model innovation" refers to a fundamental shift in how a company creates and delivers value (Scuotto et al., 2023). The literature emphasizes the significance of innovation in business models, with technologies from Industry 4.0 and 5.0, such as the Internet of Things (IoT), artificial intelligence, and data analytics, reshaping traditional business models and enabling companies to discover new ways to create and capture value (Visvizi et al., 2022). The integration of digital technologies has allowed businesses to manage products and services more effectively, enhancing their ability to meet customer demands and respond to market changes. Key enablers of business model innovation include stakeholder and customer engagement, a collaborative environment, knowledge management, and sustainability (Botti and Baldi, 2024).

3. Contamination Labs as an actor of innovative ecosystems

Numerous studies show that innovation ecosystems, defined by interactions between different actors such as universities, companies and public institutions, are essential to generate and disseminate innovation (Tagliazucchi, et al., 2024). The role of universities in the development of innovation ecosystems, has attracted wide interest in the business and management literature. Innovation ecosystems play a key role in enhancing innovative entrepreneurship by facilitating the creation of new knowledge, the novel combination of existing knowledge or its reworking in innovative ways (Romano et al., 2014).

This process enables not only the emergence of new entrepreneurial ventures, but also the strengthening of the innovative capacity of existing organisations, fostering the development of new products, processes, markets and organisational models. This dynamic represents a crucial step for the economic progress and competitiveness of regions and countries (Malerba, 2010). In this context, universities play a key role in the growth of innovation ecosystems, as producers and catalysts of

knowledge. Through the generation, transfer, mediation, codification and dissemination of specialised knowledge, they actively contribute to the processes of knowledge creation and absorption. This support is essential for entrepreneurial and innovative development, as it provides both new and existing companies with the necessary tools to compete and innovate in a changing environment. This article examines the experience of the Contamination Lab, an innovative program in entrepreneurship education aimed at fostering entrepreneurial skills among university students (Secundo et al., 2021).

The Clab, aligned with the entrepreneurial university model (Guerrero et al., 2016), offers a collaborative environment where students, researchers, and aspiring entrepreneurs can develop innovative ideas, create startups, and design business models. The Italian concept has since become a key component of open innovation initiatives serving as collaborative spaces where universities, students, businesses, and workers connect, bridging academic knowledge with the practical world of production. In these settings, universities not only promote entrepreneurial learning but actively engage in creating innovative work models, addressing social and environmental challenges while reinforcing their transformative role in society. In lagging regions – those areas characterized by economic and technological underdevelopment - CLabs provide spaces for social experimentation and innovation, fostering new work practices, learning models, and collaboration.

Universities are particularly well-positioned to offer creative, interdisciplinary solutions to complex societal problems, encouraging teamwork and innovation across disciplines. The decision to analyze the CLab model is driven by their potential to play a significant role in local innovation ecosystems. They foster the transition to ‘strategic ecosystem partnerships’ from what can be called an ‘ad hoc approach’, in which university collaborations are first established by individual researchers with a focus on specific university-firm collaboration projects (Schiuma and Carlucci, 2018).

4. Methodology

In recent years, scientific output through journals, conferences, and other platforms has experienced substantial growth, exploring a wide range of contexts and characteristics using various methodologies. Consequently, it has become increasingly important to establish the current state of research on a specific topic by organizing existing knowledge and identifying gaps that require further exploration through a comprehensive literature review (Linnenluecke et al., 2020; Öztürk, 2021; Öztürk et al., 2024). Different methods can be employed to conduct a literature review (Singh et al., 2024; Zupic and Čater, 2015), such as bibliometric analysis, meta-analysis, systematic literature reviews, and framework-based reviews. The methodology used in this study follows a hybrid approach, combining part of bibliometric analysis, the performance analysis, and applying the results of the performance analysis to a case study. Bibliometric analysis is a method growing in importance due to the increasing number of scientific publication and utilizes techniques to quantify written communication. It is particularly useful for citation analysis, which helps identify key scientific papers and understand their interconnections (Chai and Xiao, 2012). As defined by Öztürk et al. (2024), bibliometric analysis provides a broad overview of a field by examining its scientific outputs. This method explores the evolution of publications over time, their citation impact, and identifies the most active and frequently cited authors, journals publishing the most articles, leading institutions and countries, and the top 10 most cited papers, along with the key topics they cover (Cobo et al., 2011; Merigó et al., 2016; Baier-Fuentes et al., 2019).

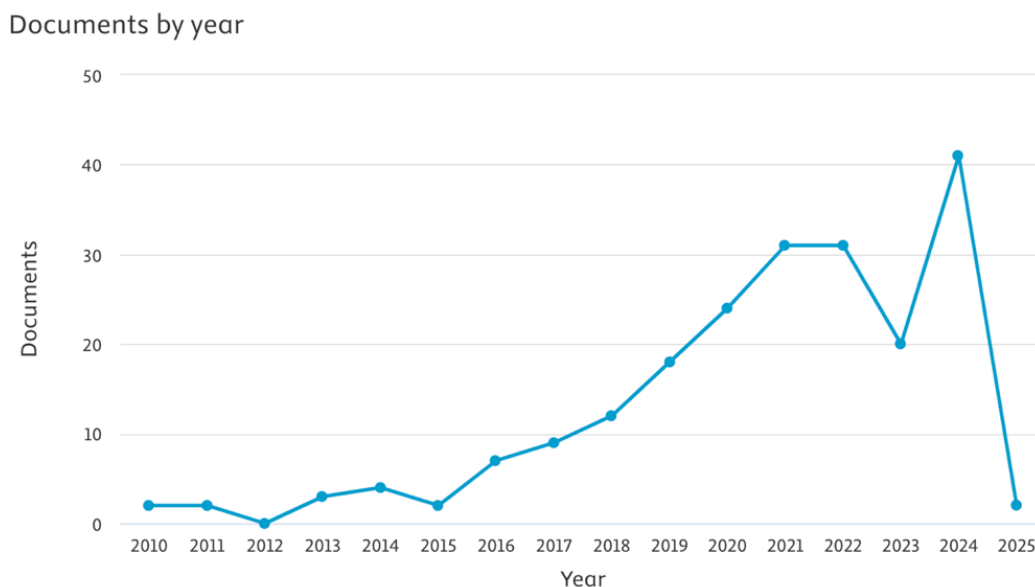
The lens of performance analysis, which is part of bibliometric analysis, were identified trends in the literature, highlight frequently discussed topics, and uncover gaps within the field. Through performance analysis, understood as a component of bibliometric methods, we identified the main theoretical streams within the literature on the intersection of entrepreneurship and innovation. These streams were then applied and compared to the case of the Contamination Lab (CLab) in order to explore the extent to which this practical initiative aligns with emerging academic trends. The choice of analysing CLabs is motivated by the fact that these centres can play an important role in local innovation ecosystems (Schiuma and Carlucci, 2018).

To conduct a thorough analysis of the existing literature, we selected Scopus as the search engine due to its reliability and comprehensive coverage in scientific research (Caviggioli and Ughetto, 2019). The search was carried out using the following string: TITLE-ABS-KEY ("entrepreneur*" AND "innovation ecosystem*"). The results were limited to articles within the "Business, Management, and Accounting" category to ensure relevance to the focus of the study. In this contribution, the performance analysis concentrates on identifying the topics related to the 10 most cited articles, aiming to highlight points of overlap or divergence. Subsequently, the framework that emerged from this analysis was applied to the case of the contamination lab.

5. Performance analysis

To study the evolution of the topic under investigation, a performance analysis was carried out in which was identified the trend over time of the theme and was carried out an analysis of the 10 most cited articles. The scientific output examined in this study covers a span of 15 years, with the first publication dating back to 2010. As shown in Figure 1, interest in the link between innovation ecosystems and entrepreneurship has progressively increased over time, albeit with some discontinuities. In particular, the period was characterised by sporadic and discontinuous production. Between 2015 and 2020, a steady increase in production was observed, which then reached a stabilisation phase in the period 2021-2022. However, this remains the period in which the most solid and continuous growth was recorded. This trend peaked in 2021, with 31 papers published, a figure that also remained constant in 2022. However, 2023 saw a decline compared to 2020, with around 20 papers published. In contrast, 2024, as shown in Figure 1, stands out as a particularly productive year, with a peak of 41 documents. Finally, the year 2025, having just begun, was not included in the analysis.

Fig.1: Evolution of the topic (2010-2025)



Source: our elaboration

In order to better understand the development of the theme of this work over the years, it is necessary to analyze the ten most cited articles (Tab. 1).

Tab. 1: Top 10 cited article

Authors	Year	Title	Cited by
Gomes L.A.D.V.; Facin A.L.F.; Salerno M.S.; Ikenami R.K.	2018	Unpacking the innovation ecosystem construct: Evolution, gaps and trends	469
Nambisan S., Baron R.A.	2013	Entrepreneurship in innovation ecosystems: Entrepreneurs' self-regulatory processes and their implications for new venture success	419
Audretsch D.B.; Cunningham J.A.; Kuratko D.F.; Lehmann E.E.; Menter M.	2019	Entrepreneurial ecosystems: economic, technological, and societal impacts	319
Guerrero M.; Urbano D.; Fayolle A.; Klofsten M.; Mian S.	2016	Entrepreneurial universities: emerging models in the new social and economic landscape	302
Palmiè M.; Wincent J.; Parida V.; Calgar U.	2020	The evolution of the financial technology ecosystem: An introduction and agenda for future research on disruptive innovation in ecosystems	207
Hayter C.S.	2016	A trajectory of early-stage spinoff success: the role of knowledge intermediaries within an entrepreneurial university ecosystem	202
Huggings R.; Williams, N	2011	Entrepreneurship and regional competitiveness: The role and progression of policy	154
Usman M.; Vanhaverbeke W.	2017	How start-ups successfully organize and manage open innovation with large companies	150
Chesbrough H.; Kim S.; Agogino A.	2014	Chez panisse: Building an open innovation ecosystem	149
Surie G.	2017	Creating the innovation ecosystem for renewable energy via social entrepreneurship: Insights from India	138

Source: our elaboration

The first article of Gomes et al. (2018) is a review that highlights the key papers on innovation ecosystems and traces a shift in the literature from business ecosystems (focused on value capture) to innovation ecosystems (focused on value creation). Gomes's study identifies six main research streams within innovation ecosystems: industry platform vs. innovation ecosystem, innovation ecosystem strategy and business model, innovation management, managing partners, the lifecycle of innovation ecosystems, and innovation ecosystems in new venture creation.

The second most cited article is that of Nambisan and Baron (2013) who analyse the importance of innovation ecosystems for entrepreneurship, focusing on the challenges faced by entrepreneurs in balancing the goals of their businesses with those set by ecosystem leaders. To effectively manage these dynamics, the role of entrepreneurs' self-regulation processes as a tool is explored.

Audretsch et al. (2019) critically analyse the concept of 'ecosystem', highlighting the lack of clear and consistent definitions in the academic, industry and policy literature. The paper explores the economic, technological and social dimensions of entrepreneurial ecosystems, focusing on the key elements that characterise them and the conditions under which firms influence their development and thinking within such ecosystems.

Guerrero et al. (2016) examines the role of entrepreneurial universities as drivers of innovation and entrepreneurial activities in the new socioeconomic environment. The authors propose a theoretical framework to analyse the role of these institutions.

Palmiè et al. (2020) defines disruptive innovation ecosystems and illustrates the impact that the financial technology (FinTech) ecosystem has had on disrupting the financial services industry, while the central focus of Hayter's (2016) contribution is to conceptualize and explore the structure and function of an entrepreneurial university ecosystem, specifically examining the role of social networks among faculty and graduate student entrepreneurs and the knowledge intermediaries that support them.

Hugging and Williams (2011) explore the multidimensional nature of regional entrepreneurship policy, which spans both economic and social drivers. The paper highlights a shift from cluster-focused policies to those fostering regional innovation ecosystems, noting that policymakers face pressure to prioritize short-term results over long-term development. Additionally, it discusses the tension between using enterprise policy to enhance regional competitiveness or address economic and social challenges.

Uman and Vanhaverbeke (2017) explore how start-ups engage in and manage open innovation with large companies to address challenges related to their early-stage size and inexperience. It underscores the unique strategies start-ups adopt, differing from those of larger firms, and examines the opportunities and obstacles of both inbound and outbound open innovation. The study highlights the critical role of experienced start-up managers, particularly those with prior exposure to large firms, in effectively fostering and sustaining this collaborative innovation effort.

Chesbrough et al (2014) in the Chez Panisse case study applies an open innovation framework to examine the restaurant's growth and success. It illustrates how a small firm flourished by cultivating a thriving business ecosystem centered on knowledge sharing, fostering individual development, and building trust among participants. This case study offers valuable insights for students into the factors behind Chez Panisse's business achievements.

Surie (2017) explores the role of social entrepreneurship, both at the organizational and institutional levels, in driving innovation and economic development. By integrating perspectives from national innovation systems (NIS), complexity theory, ecosystem dynamics, and social entrepreneurship studies, it proposes a framework for building innovation ecosystems through the lens of social entrepreneurship.

6. Results and main findings

The evolution of the relationship between entrepreneurship and innovation ecosystems reveals a progressive deepening and diversification of research on the topic that describe a theoretical framework. Initially, the focus was on business ecosystems and their role in value capture, but the literature has gradually shifted towards innovation ecosystems, emphasizing value creation. This transition is evident in studies that have defined key research streams, such as platform strategies, innovation management, lifecycle dynamics, and the role of ecosystems in new venture creation (Gomes et al., 2018).

Entrepreneurship is increasingly viewed as a critical component within innovation ecosystems. Research by Nambisan and Baron (2013) highlights the interplay between entrepreneurs and ecosystem leaders, emphasizing the need for entrepreneurs to balance their business objectives with broader ecosystem goals. Similarly, studies on entrepreneurial universities (Guerrero et al., 2016; Hayter, 2016) underscore the importance of these institutions in fostering innovation, entrepreneurial activities, and social networks that support knowledge exchange. The multidimensional nature of ecosystems is another recurring theme. Audretsch et al. (2019) critique the inconsistent definitions of ecosystems and explore their economic, social, and technological dimensions, while Hugging and Williams (2011) highlight the policy evolution from cluster-focused strategies to fostering regional innovation ecosystems. Specific cases and sectors also provide rich insights. Palmiè et al. (2020) explore disruptive innovation ecosystems, particularly in FinTech, while Uman and Vanhaverbeke (2017) examine how start-ups navigate open innovation with large firms to overcome early-stage challenges. Similarly, Chesbrough et al. (2014) showcase the success of the Chez Panisse business ecosystem, highlighting the role of trust, knowledge sharing, and individual growth.

Finally, Surie (2017) expands the discussion by integrating social entrepreneurship and innovation ecosystems, proposing a framework for leveraging entrepreneurial activities to drive economic and social development through ecosystem-building. In conclusion, the evolution of the entrepreneurship-innovation ecosystem discourse reflects a shift towards more holistic, interdisciplinary approaches, recognizing the complex dynamics of value creation, collaboration, and policy interplay across different contexts and scales.

The Contamination Lab (CLab) represents a practical embodiment of these theoretical advancements, illustrating how these programmes can play a pivotal role in fostering innovation ecosystems. By blending interdisciplinary collaboration, open innovation principles, and ecosystem thinking, the CLab illustrates how universities may function as hubs that connect students, researchers, businesses, and public institutions to address regional developmental challenges. As part of Italy's national initiative to cultivate entrepreneurial mindsets, the CLab model serves as a practical case that may provide insights for leveraging academic knowledge and entrepreneurial activities to drive socioeconomic growth.

Applying the results of the performance analysis to the CLab underscores its alignment with the multidimensional nature of innovation ecosystems (Adner, 2016). Operating in an economically and technologically disadvantaged region, the CLab leverages interdisciplinary collaboration to bridge gaps in innovation and stimulate regional development. The program facilitates interactions between diverse stakeholders, embodying the principles of open innovation, where external knowledge and resources accelerate the creation of startups and innovative business models. This reflects the findings of Uman and Vanhaverbeke (2017), who highlight the role of start-ups in navigating open innovation to overcome early-stage barriers.

The progression of the number of CLabs illustrates and demonstrate its increasing influence on the local entrepreneurial ecosystem, aligning with Surie's (2017) framework for leveraging entrepreneurial activities to drive economic and social development. By orchestrating a collaborative environment where academic research, industry expertise, and entrepreneurial action converge, the CLab exemplifies the hub-based ecosystem model (Chesbrough et al., 2014). Moreover, the CLab fosters business model innovation, enabling participants to develop solutions that integrate emerging technologies and address market needs. Its approach highlights the critical role of universities as ecosystem orchestrators, bridging public and private sectors while facilitating knowledge spillovers and startup acceleration. The CLab thus serves as a compelling case of how innovation ecosystems, grounded in systematic entrepreneurship and interdisciplinary collaboration, can promote sustainable and impactful regional development, even in underdeveloped areas.

7. Conclusions and further research

This paper explored the intersection between entrepreneurship and innovation ecosystems through a bibliometric performance analysis and an illustrative case study of the Contamination Lab (CLab) initiative in Italy. The performance analysis enabled the identification of key theoretical streams in the existing literature, which were subsequently reflected upon in light of the CLab experience. Positioned as a university-led entrepreneurial support initiative, CLab exemplifies how institutions can contribute to fostering innovation ecosystems by promoting interdisciplinary collaboration, experiential learning, and open innovation practices.

Rather than presenting a universal model, this study offers an exploratory contribution that links academic insights with a practical initiative, illustrating how ecosystem-oriented programmes may align with prevailing theoretical frameworks.

The findings underscore the potential value of structured collaboration among universities, entrepreneurs, and institutions in supporting entrepreneurial ecosystems, particularly in regions seeking to enhance innovation capacity and socio-economic development. Future research should further examine whether models like CLab produce comparable outcomes across different

institutional and cultural contexts. Such investigations could clarify which factors facilitate or constrain the success and adaptability of ecosystem-based entrepreneurial programmes.

Understanding these dynamics is essential for policymakers, educators, and ecosystem stakeholders aiming to strengthen entrepreneurial infrastructures through evidence-based and context-sensitive approaches.

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