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Bibliometric Review of Research on Startup Ecosystems with Identification of Key Authors Countries and Emerging Themes for the Period 2010–2024

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ABSTRACT

Research on startup ecosystems has expanded rapidly over the past decade as entrepreneurship has become a key driver of innovation, technological advancement, and economic development. Despite the growing body of literature, a comprehensive understanding of the intellectual structure, collaboration patterns, and emerging themes in startup ecosystem research remains limited. This study aims to map the development of research on startup ecosystems through a bibliometric analysis of publications indexed in the Scopus database from 2010 to 2024. Using VOSviewer as the primary analytical tool, this study examines publication trends, co-authorship networks, country collaboration patterns, and keyword co-occurrence structures to identify influential authors, leading countries, and major research themes. The results show a significant growth in publications during the analyzed period, indicating increasing global academic interest in startup ecosystem studies. The co-authorship analysis reveals several collaborative clusters with a number of key scholars acting as connectors within the research network. Country collaboration analysis highlights the dominance of the United States, India, and several European countries as major contributors to the field. Furthermore, keyword analysis indicates that entrepreneurship, startup, innovation, and ecosystems form the conceptual core of the literature, while emerging topics such as artificial intelligence, blockchain, fintech, and crowdfunding reflect the growing influence of digital transformation on entrepreneurial ecosystems.

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1. INTRODUCTION

The global proliferation of startup ecosystems over the past decade has attracted considerable academic interest, as scholars and practitioners increasingly recognize the strategic importance of entrepreneurial hubs in driving innovation, economic growth, and technological advancement [1]. Startup ecosystems—comprised of interconnected actors such as entrepreneurs, investors, universities, policymakers, and support organizations—function as dynamic environments that enable nascent ventures to access resources, knowledge, and networks critical for growth [2], [3]. Unlike traditional industry clusters, startup ecosystems emphasize flexibility, rapid iteration, and cross-sectoral collaboration, which together create fertile ground for disruptive innovation [4]. As a result, countries and cities worldwide

have invested heavily in ecosystem-building strategies, from accelerator programs and entrepreneurial education to favorable regulatory frameworks and public-private partnerships. The rapid evolution of this field underscores the need for systematic understanding of how scholarly research has tracked, interpreted, and contributed to ecosystem knowledge over time.

` Empirical research on startup ecosystems has grown significantly since 2010, reflecting broader trends in entrepreneurship studies as well as shifts in global economic priorities [5]. Initially, scholarship focused on defining ecosystems, comparing regional strengths, and identifying structural components that differentiate successful hubs from less vibrant ones [4]. Early contributions emphasized Silicon Valley and other established centers as archetypes, with subsequent studies exploring how contextual variations shape ecosystem performance [6]. Over time, the field has diversified, incorporating insights from economic geography, innovation studies, network theory, and institutional analysis to explain complex interactions among actors [7]. The accumulated body of work not only charts conceptual progression but also reveals emerging domains of inquiry—such as digital ecosystems, gender dynamics in entrepreneurship, and the role of micro-policies in ecosystem resilience.

Another dimension of the research growth is the increasing geographic scope of studies. While early research often prioritized Western contexts, more recent scholarship has expanded attention to emerging markets and transitional economies, recognizing that localized ecosystem conditions can significantly influence startup creation and scaling. For example, studies have examined ecosystems in East Asia, the Middle East, and Sub-Saharan Africa, highlighting how cultural norms, institutional voids, and resource constraints shape entrepreneurial outcomes [8]. These investigations suggest that ecosystem frameworks developed in developed economies may not fully account for the realities in diverse socio-economic settings, thus prompting more nuanced theorization [9], [10]. Consequently, a bibliometric review that captures this geographic diversification is crucial for understanding where knowledge production is concentrated and where gaps persist.

The methodological evolution in ecosystem research further illustrates the field's maturation. Initial studies tended to be qualitative case analyses or conceptual papers aimed at establishing terminology and key constructs (e.g., Isenberg's ten elements of ecosystem success). However, as the discipline expanded, researchers began employing quantitative techniques, social network analysis, and comparative frameworks to map relationships among ecosystem actors, measure performance indicators, and assess policy impacts. This methodological plurality has enriched the literature, enabling more robust insights into systemic properties such as connectivity, knowledge spillovers, and systemic resilience. Nonetheless, the rapid accumulation of diverse research outputs has also resulted in fragmentation, making it increasingly difficult for scholars to synthesize findings, trace intellectual lineage, and identify future research directions.

Against this backdrop, bibliometric analysis has emerged as a powerful tool for synthesizing research landscapes because it allows objective, data-driven mapping of publications, authorship networks, thematic clusters, and temporal trends [11]. By leveraging citation patterns, co-authorship linkages, co-occurrence of keywords, and other bibliometric indicators, scholars can uncover the structural contours of a research domain and highlight its intellectual foundations. Such analysis is particularly valuable in interdisciplinary fields like startup ecosystems, where contributions span multiple disciplines and research communities. Through systematic examination of scientific output, bibliometric studies facilitate understanding of not only what topics have been explored, but also which authors, countries, and institutions shape discourse and influence emergent themes. Importantly, bibliometric reviews can help chart trajectories of scholarly attention,

offering insights into how research priorities have shifted over time.

Despite the increasing number of individual studies on startup ecosystems, few efforts have systematically quantified the evolution of the field across a wide temporal span such as 2010–2024. Existing literature reviews tend to be narrative, focused on specific geographic regions, or limited to particular ecosystem components such as knowledge networks or policy interventions. While these contributions are valuable, they do not provide a holistic, data-driven picture of knowledge production that encompasses global patterns, influential contributors, and thematic progressions. In particular, there is a lack of comprehensive mapping of key authors who have shaped the academic discourse, countries that lead in ecosystem research, and clusters of emerging themes that signify new frontiers of scholarship. This gap inhibits collective understanding of how the field has developed and where it may be headed, potentially slowing cumulative progress. To address these limitations, this study conducts a bibliometric review of research on startup ecosystems for the period 2010–2024, with the dual purpose of identifying key authors, leading countries, and emerging thematic trends in the literature.

2. METHOD

This study employs a quantitative bibliometric research design to systematically map and analyze the development of scholarly literature on startup ecosystems between 2010 and 2024. Bibliometric analysis is particularly suitable for examining the intellectual structure, productivity patterns, and thematic evolution of an academic field because it applies statistical and network-based techniques to large sets of publication data [11]. The study follows a structured procedure consisting of database selection, data extraction, data cleaning, and performance and science mapping analyses. To ensure comprehensiveness and reliability, peer-reviewed journal articles written in English were selected as the primary unit of analysis. The time frame of 2010–2024 was chosen to capture the significant expansion of ecosystem-related research during the past decade and to reflect contemporary developments in entrepreneurship scholarship. The search strategy involved the use of relevant keywords such as “startup ecosystem,” “entrepreneurial ecosystem,” “innovation ecosystem,” and related terms in titles, abstracts, and keywords. Inclusion criteria focused on empirical and conceptual studies directly addressing ecosystem dynamics, actors, policies, or performance, while conference papers, book chapters, and non-scholarly documents were excluded to maintain quality and consistency.

After data collection, bibliographic information—including authors, titles, abstracts, keywords, citations, affiliations, and countries—was exported in compatible formats for analysis. The dataset underwent a cleaning process to remove duplicates, standardize author names, and harmonize keyword variations (e.g., singular/plural forms and synonymous expressions). Citation analysis was used to identify influential authors and highly cited publications, reflecting intellectual impact within the field. Additionally, co-authorship analysis was performed to map collaboration networks among researchers and countries, revealing patterns of international research cooperation. These performance indicators provide a quantitative overview of productivity and scholarly influence in startup ecosystem research over the selected period.

To explore the conceptual and thematic structure of the field, science mapping techniques were applied, including co-citation analysis and keyword co-occurrence analysis. Co-citation analysis helps identify clusters of foundational works that are frequently cited together, thereby revealing the intellectual base of the domain. Keyword co-occurrence analysis was employed to detect major research themes and emerging topics by examining how frequently specific keywords appear together within publications. Network visualization software was utilized to generate maps that illustrate relationships among authors, institutions, countries, and thematic clusters.

3. RESULTS AND DISCUSSION

Co-Authorship Analysis

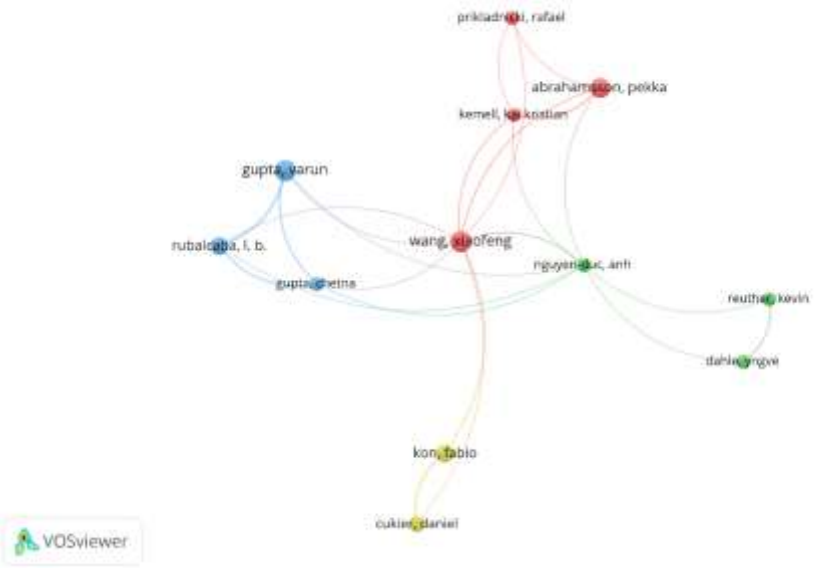

Figure 1. Author Visualization
Source: Data Analysis

Figure 1 illustrates the collaboration structure among key authors in startup ecosystem research. The map reveals several clusters representing groups of researchers who frequently collaborate with one another. The red cluster appears to be the central hub of the network, where Wang Xiaofeng acts as a connecting node linking multiple authors such as Abrahamsson Pekka, Kemell Kai Kristian, and Prikladnicki Rafael, indicating a strong collaborative relationship within this group. Another cluster, shown in blue, includes authors such as Gupta Varun, Rubalcaba L. B., and Gupta Chetna, who demonstrate close collaboration but relatively fewer connections with other clusters. The green cluster highlights Nguyen Duc Anh as a bridging author connecting to Reuther Kevin and Dahle Yngve, suggesting regional or thematic collaboration within this group. Meanwhile, the yellow cluster consisting of Kon Fabio and Cukier Daniel represents a smaller but closely linked partnership.

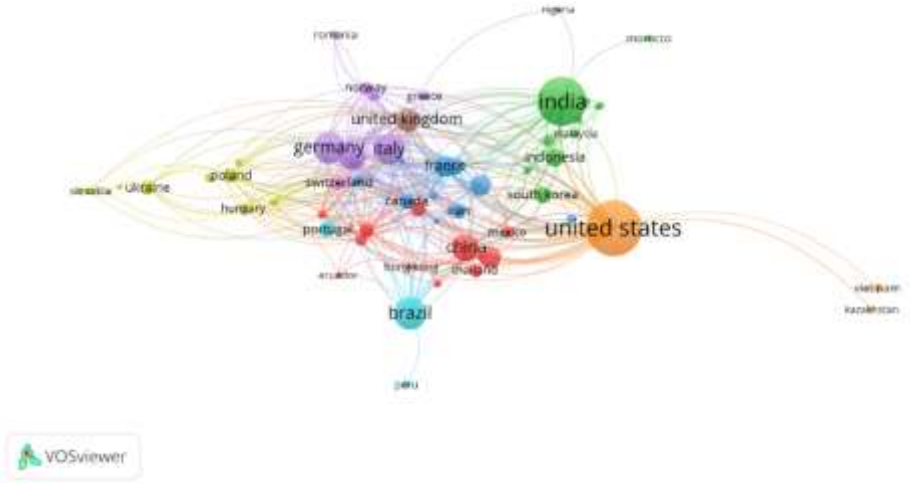

Figure 2. Country Visualization
Source: Data Analysis

Figure 2 shows the global structure of research collaboration in startup ecosystem studies. The United States appears as one of the most dominant and central nodes, indicating its significant role in international research collaboration and its extensive connections with multiple countries, including China, India, and several European nations. India also emerges as a major contributor, forming a strong collaboration cluster with countries such as Malaysia, Indonesia, Morocco, and Nigeria, suggesting active research engagement within emerging and developing economies. European countries such as Germany, Italy, the United Kingdom, and France form another interconnected cluster, reflecting strong regional academic cooperation within Europe. Meanwhile, China and Brazil are also notable contributors, linking with various countries and indicating growing research participation from Asia and Latin America.

Citation Analysis

Table 1. Top Cited Literature

Citations	Authors and Year	Title
1,080	[12]	Fintech: Ecosystem, business models, investment decisions, and challenges
820	[13]	Startups in times of crisis – A rapid response to the COVID-19 pandemic
600	[14]	Startup Communities: Building an Entrepreneurial Ecosystem in Your City
512	[15]	The emergence of entrepreneurial ecosystems: A complex adaptive systems approach
351	[16]	A typology of circular start-ups: Analysis of 128 circular business models
346	[17]	The resilience of entrepreneurial ecosystems
310	[18]	The design of startup accelerators
296	[19]	An emerging ecosystem for student start-ups
275	[20]	Nurturing a FinTech ecosystem: The case of a youth microloan startup in China
242	[21]v	Blockchain-enabled supply chain: analysis, challenges, and future directions

Source: Scopus

Keyword Co-Occurrence Analysis

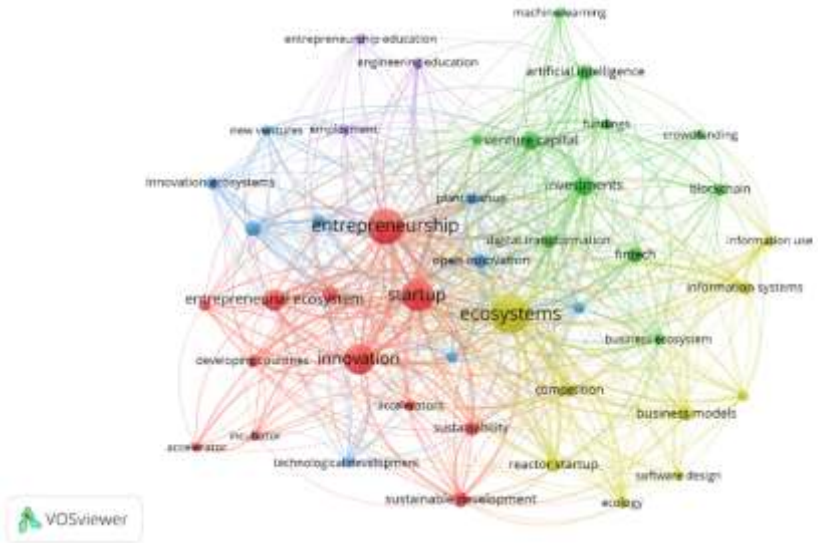

Figure 3. Network Visualization
Source: Data Analysis

Figure 3 illustrates the conceptual structure of research on startup ecosystems and entrepreneurship. The visualization highlights several major clusters that

represent dominant research themes within the field. At the center of the network, keywords such as "entrepreneurship," "startup," "innovation," and "ecosystems" appear as the most prominent and highly connected nodes. Their central position indicates that these concepts form the theoretical core of the literature, linking various research streams related to entrepreneurial activities, innovation processes, and the development of startup ecosystems. The red cluster primarily focuses on the relationship between entrepreneurship, startups, innovation, and entrepreneurial ecosystems. Keywords such as innovation, entrepreneurial ecosystem, developing countries, incubator, accelerator, and sustainable development appear within this cluster, suggesting that a significant portion of the literature examines how ecosystem structures support startup creation and innovation-driven economic development. This cluster also reflects growing scholarly attention to the role of institutional support mechanisms, including incubators and accelerators, particularly in emerging economies.

The green cluster represents research themes related to investment, digital technology, and emerging financial infrastructures that support startups. Keywords such as venture capital, funding, investments, fintech, blockchain, artificial intelligence, and machine learning appear in this group. This indicates that many studies explore how technological advancement and financial innovation influence startup ecosystems. The presence of fintech and digital technologies also suggests that recent research increasingly focuses on the digital transformation of entrepreneurial ecosystems. Another important thematic area is reflected in the yellow cluster, which highlights topics associated with business systems and organizational strategies. Keywords such as business models, information systems, competition, and business ecosystem appear prominently in this group. These terms suggest that scholars are examining how startups operate within broader digital and competitive environments, including how technological infrastructures and strategic management practices influence startup growth and sustainability. The blue cluster emphasizes innovation ecosystems and venture creation processes, including keywords such as innovation ecosystems, new ventures, and employment. This cluster suggests that research also investigates how innovation networks contribute to job creation and the formation of new enterprises.

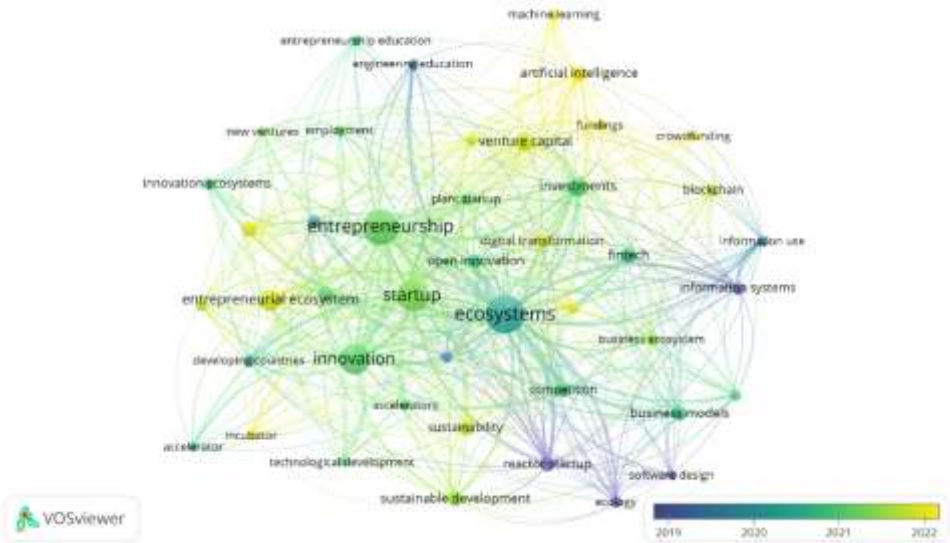

Figure 4. Overlay Visualization
Source: Data Analysis

Figure 4 illustrates the temporal evolution of research themes in the startup ecosystem literature between approximately 2019 and 2022. Core concepts such as

"entrepreneurship," "startup," "ecosystems," and "innovation" appear at the center of the network and are colored in green tones, indicating that these topics have been consistently studied across the observed period. Their large node sizes and strong connections with other keywords show that they serve as the foundational concepts linking various research streams in startup ecosystem studies. Earlier research themes, represented by darker blue tones, focus primarily on organizational and technological infrastructure topics, such as information systems, software design, business models, and competition. These topics reflect earlier academic attention to how technological platforms, digital infrastructures, and organizational strategies support startup development within broader innovation ecosystems. Such themes highlight the early stage of ecosystem research where scholars focused on understanding the structural and managerial aspects of entrepreneurial environments.

More recent themes, shown in yellow, indicate emerging directions in startup ecosystem research. Keywords such as "artificial intelligence," "machine learning," "blockchain," "crowdfunding," and funding-related concepts appear among the most recent topics. This suggests that contemporary research increasingly explores how advanced digital technologies and new financial mechanisms are transforming entrepreneurial ecosystems. The presence of these emerging themes reflects a shift toward studying the role of digital transformation, fintech innovation, and data-driven technologies in shaping the future of startup ecosystems and entrepreneurial activity.

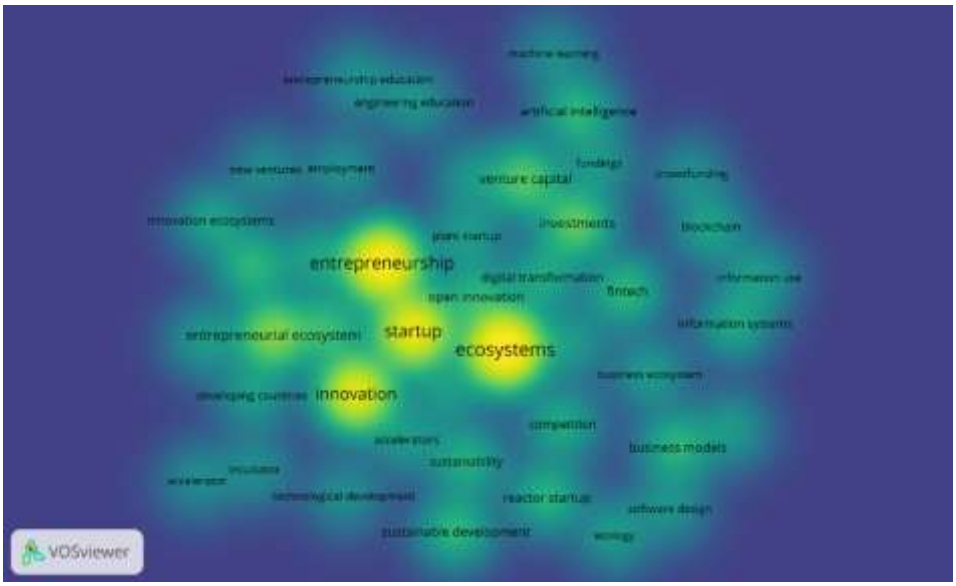

Figure 5. Density Visualization
Source: Data Analysis

Figure 5 illustrates the concentration of research topics within the startup ecosystem literature. Areas highlighted in bright yellow represent keywords that appear most frequently and are strongly connected to other topics in the research field. The most prominent terms include "ecosystems," "startup," "entrepreneurship," and "innovation," indicating that these concepts form the central focus of academic discussions on startup ecosystems. Their high density suggests that the majority of studies examine how entrepreneurial activities, startup development, and innovation processes interact within ecosystem environments to support economic growth and technological advancement.

Surrounding these core themes are moderately dense areas represented by green tones, which include keywords such as venture capital, investments, fintech, blockchain, information systems, business

models, and artificial intelligence. These topics represent important supporting dimensions of startup ecosystem research, reflecting increasing interest in digital technologies, financial mechanisms, and organizational strategies that facilitate startup development. The visualization also shows additional related topics such as accelerators, incubators, sustainability, and digital transformation, indicating that contemporary research increasingly integrates technological innovation, funding systems, and sustainability considerations in understanding how startup ecosystems evolve and function.

Discussion

The findings of this bibliometric study reveal that research on startup ecosystems has grown substantially during the period 2010–2024, reflecting the increasing importance of entrepreneurial ecosystems in both academic and policy discussions. The publication trend indicates a steady expansion of scholarly interest, particularly after the mid-2010s when startup ecosystems began to be widely recognized as drivers of innovation, regional competitiveness, and economic development. This growth aligns with the global rise of technology startups and the increasing involvement of governments, universities, and private investors in building innovation-oriented ecosystems. As a result, the academic literature has evolved from conceptual discussions toward more empirical and interdisciplinary investigations that integrate perspectives from entrepreneurship, innovation management, economic geography, and digital transformation.

The co-authorship analysis demonstrates that startup ecosystem research is characterized by several collaborative clusters, with certain scholars acting as key connectors within the research network. Authors such as Wang Xiaofeng and Nguyen Duc Anh appear to play bridging roles that link different research groups. The presence of these connectors suggests that knowledge development in this field depends on collaborative networks that facilitate the exchange of ideas across institutions and geographic regions. However, the network structure also indicates that many research clusters remain relatively small and loosely connected, suggesting opportunities for broader international collaboration. Strengthening cross-regional partnerships could contribute to a more integrated understanding of startup ecosystems, especially in contexts where entrepreneurial environments differ significantly across countries.

The country collaboration analysis highlights the strong dominance of a few leading countries in producing startup ecosystem research. The United States emerges as a central hub within the global collaboration network, reflecting its long-standing leadership in entrepreneurship research and its highly developed startup ecosystems, particularly in innovation hubs such as Silicon Valley and Boston. India also appears as a major contributor, indicating the growing importance of emerging economies in shaping the global discourse on startup ecosystems. European countries such as Germany, the United Kingdom, Italy, and France form another prominent cluster characterized by strong regional collaboration. Meanwhile, countries such as China and Brazil are increasingly visible within the network, suggesting the expanding geographic scope of ecosystem research and the growing interest in startup development in Asia and Latin America.

The keyword co-occurrence analysis provides insight into the thematic structure of the field. The most central keywords—entrepreneurship, startup, ecosystems, and innovation—form the conceptual core of the literature. These themes emphasize the role of ecosystems in supporting entrepreneurial activity and innovation-driven growth. Supporting topics such as incubators, accelerators, venture capital, and entrepreneurial ecosystems indicate that scholars are increasingly examining the institutional and organizational mechanisms that enable startups to access resources, knowledge, and networks. This reflects the ecosystem perspective that entrepreneurship

does not occur in isolation but within interconnected systems of actors and institutions that collectively shape entrepreneurial outcomes. The overlay visualization further reveals how research themes have evolved over time. Earlier studies focused primarily on structural aspects of entrepreneurial ecosystems, including business models, information systems, and technological infrastructure. Over time, however, the field has expanded to incorporate emerging digital technologies and financial innovations. Recent keywords such as artificial intelligence, machine learning, blockchain, fintech, and crowdfunding suggest that contemporary startup ecosystems are increasingly influenced by digital transformation and new forms of financing. These developments indicate a shift toward understanding how digital platforms and advanced technologies reshape the dynamics of entrepreneurial ecosystems and create new opportunities for startup development.

The density visualization reinforces these findings by highlighting the areas of highest research concentration. The strongest thematic density appears around entrepreneurship, startup, innovation, and ecosystems, confirming their role as the central pillars of the field. Surrounding these core themes are related topics such as venture capital, investments, business models, and information systems, which represent important supporting dimensions of ecosystem research. The presence of sustainability-related keywords also suggests that researchers are increasingly exploring how startup ecosystems contribute to sustainable development and environmentally responsible innovation.

These findings suggest that startup ecosystem research is evolving toward a more interdisciplinary and technologically oriented field. While early research emphasized institutional structures and entrepreneurial networks, recent studies increasingly explore the interaction between digital technologies, financial innovation, and ecosystem dynamics. Nevertheless, several research gaps remain. First, much of the literature still concentrates on developed economies, while startup ecosystems in developing countries remain underexplored. Second, there is a need for more comparative studies that examine how different institutional environments shape ecosystem development. Third, future research could further investigate how emerging technologies such as artificial intelligence and blockchain influence entrepreneurial ecosystems, particularly in relation to financing, governance, and knowledge exchange. Addressing these gaps would contribute to a more comprehensive understanding of startup ecosystems and their role in shaping the future of innovation-driven economies.

4. CONCLUSION

This study provides a comprehensive overview of the development of startup ecosystem research through a bibliometric analysis of publications from 2010 to 2024. The findings show a significant increase in scholarly interest in this field, reflecting the growing recognition of startup ecosystems as key drivers of innovation and economic development. The analysis identifies several influential authors, countries, and collaborative networks that contribute to the advancement of the field, with the United States, India, and several European countries emerging as major research hubs. The thematic mapping further reveals that entrepreneurship, startups, innovation, and ecosystems form the core concepts of the literature, while emerging topics such as artificial intelligence, blockchain, fintech, and crowdfunding indicate a shift toward digitally driven entrepreneurial ecosystems. The results highlight the increasingly interdisciplinary nature of startup ecosystem research and emphasize the need for future studies to explore underrepresented regions, strengthen international collaboration, and examine the impact of emerging technologies on the evolution of entrepreneurial ecosystems.

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