Towards Understanding the Crossroad between Sustainability and Open Innovation: A Systematic Bibliometric Analysis

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Abstract

This study presents a bibliometric analysis of academic literature at the intersection of sustainability and open innovation, covering a dataset of 248 publications indexed in the Web of Science between 2007 and 2025. The objective was to identify the intellectual structure of the field, key contributors, and thematic trajectories by applying the PRISMA framework and utilising the Bibliometrix tools. The results reveal a growing scholarly interest in how open innovation – through external collaboration, knowledge sharing, and stakeholder participation –can support sustainable development. The study identifies four main research themes: performance, quality, alliances, and participation. Performance and quality clusters emerge as central to understanding how open innovation impacts economic and sustainable outcomes. The alliances cluster highlights the strategic role of interorganisational collaboration in advancing sustainability practices, while the participation theme underscores the importance of stakeholder engagement and inclusivity in innovation processes. These findings suggest that open innovation acts as a key enabler of sustainability-orientated innovation by enhancing knowledge flows and expanding organisational learning capacities. The paper contributes to a more structured understanding of the field of sustainability and open innovation and provides a foundation for future research aimed at exploring underdeveloped areas such as digital transformation, innovation driven by social networks, and regional comparative studies.

Keywords

Sustainability, open innovation, bibliometric analysis, stakeholder engagement.

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Introduction

The growing complexity of global sustainability challenges has accelerated the convergence of open innovation and sustainability as complementary strategies for organisational transformation. Open innovation - through the integration of external knowledge, stakeholder collaboration and knowledge co-creation—enables firms to address environmental and social imperatives while maintaining competitive advantage (Bigliardi and Filippelli, 2022).

Recent studies highlight that sustainability-orientated innovation is increasingly based on open innovation practices such as digitalisation, external stakeholder engagement, and value chain collaboration, which support the development of sustainable products, services, and business models (Kennedy, Whiteman and van den Ende, 2017; Camilleri et al., 2023). This integration reflects a shift from incremental innovation toward more systemic, radical, and collaborative approaches aimed at achieving long-term sustainable development goals.

The aim of this study is to conduct a systematic review of the existing literature at the intersection of sustainability and open innovation employing bibliometric analysis as the main methodological approach. This

method enables the identification of the dominant trends, influential contributors, and thematic clusters that characterise the intellectual structure of the field. Considering the increasing relevance of sustainability as a driver for accelerating open innovation, the study is guided by the following research questions.

- **RQ1:** What is the current state of academic research addressing the relationship between sustainability and open innovation?
- **RQ2:** What future research directions can be derived from the bibliometric insights obtained?
- **RQ3:** What bibliometric patterns and developments can be observed in the scholarly discourse on sustainability and open innovation over the past decade?

To this end, the remainder of the paper was organised as follows. Firstly, a short literature review is presented regarding the relationship between sustainability and open innovation, then the materials and methods are clearly introduced. Second, the descriptive results are presented, complemented by the literature clustering and by in-depth cluster analysis. The final section examines the conclusion of the systematic literature review and proposed further research trajectories.

1. Review of the literature

Sustainability is understood as an integrative approach that aims at the balance between economic performance, environmental protection, and social responsibility, known as the triple bottom line (Schaltegger, Beckmann and Hansen, 2013; Bigliardi and Filippelli, 2022). It implies, at the organisational level, the ability of firms to meet the current needs of stakeholders without compromising the ability of future generations to meet their own needs (Dyllick and Hockerts, 2002). Corporate sustainability is thus linked to the creation of value not only for shareholders, but also for society and the environment. Open innovation is defined as a deliberate process of managing knowledge flows across organisational boundaries to accelerate internal innovation and expand its external use (Chesbrough and Appleyard, 2007). This involves cooperation with external stakeholders – customers, universities, NGOs, startups – to co-create innovative products, services, or business models (Camilleri et al., 2023).

Sustainability and open innovation are increasingly closely interconnected, as the integration of sustainability objectives requires access to knowledge, technologies, and capabilities from outside the organisation (Bigliardi and Filippelli, 2022). Open innovation is considered an essential catalyst for sustainable innovation (SOI), facilitating both the development of radical solutions to social and environmental problems (Kennedy, Whiteman and van den Ende, 2017) and the building of competitive advantages. At the same time, digitalisation and organizational transformation are identified as factors supporting this process of interdependence (Imran et al, 2021). The relationship between sustainability and open innovation is complementary and increasingly interdependent. Open innovation is considered a strategic catalyst for achieving sustainable goals, allowing firms to integrate external resources, respond more effectively to global challenges and create value for all stakeholders (Smart et al., 2019; Akbari et al., 2020). Srisathan, Ketkaew and Naruetharadhol (2020) demonstrate that sustainability acts as a key mediator in transforming innovation-orientated organisational culture into concrete performance within open innovation processes.

Recent research highlights the increasingly strategic role of open innovation as a catalyst for embedding sustainability in organizational practices, processes, and value creation mechanisms. Open innovation enables firms to transcend organisational boundaries by integrating external knowledge and fostering stakeholder collaboration, both of which are essential for addressing complex sustainability challenges (do Prado, Carius and Godoy, 2025). In this context, sustainability is no longer seen as a peripheral concern, but as a central driver of innovation, particularly when combined with open innovation dynamics that encourage ecoefficiency, circularity, and shared value creation. Moreover, Du, Leten and Vanhaverbeke (2016) demonstrate that sustainability orientation significantly enhances the performance of new product development, and this relationship is strengthened through open innovation (SMOI). Such platforms allow firms to co-create with external actors, integrate environmental and social concerns into product development, and respond more effectively to stakeholder expectations. Similarly, Pichlak and Szromek (2021) show that organisations adopting open innovation strategies are more likely to generate radical ecoinnovations, particularly when these strategies are supported by knowledge inflows from supply chain partners and market-driven intelligence.

Lopes et al. (2017) further emphasise that open innovation, when aligned with effective knowledge management, contributes not only to the development of sustainable innovations, but also to a broader transformation of organisational culture. This synergy fosters a more adaptive, learning-orientated environment in which sustainability goals can be pursued systematically and strategically. Thus, the integration of open

innovation with sustainability practices represents a shift from reactive environmental compliance to pro-active, innovation-led sustainability.

2. Research methodology

This study aims to conduct a comprehensive systematic review of the scholarly literature investigating the nexus between sustainability and open innovation. To ensure methodological rigour and transparency in the identification and selection of relevant studies, a bibliometric analysis was performed according to the PRISMA guidelines (Figure no. 1). The data underpinning this analysis were extracted from the Web of Science database, a leading repository of peer-reviewed academic research.

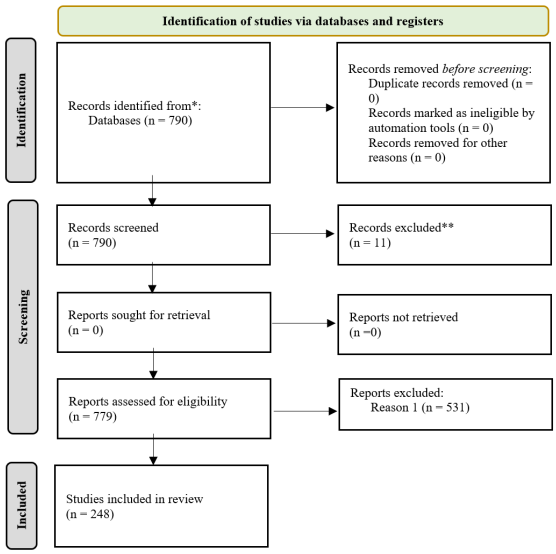

Figure no. 1. Systematic literature review procedure according to the PRISMA guidelines

To effectively manage the initial dataset, a comprehensive search was conducted using the keywords *"sustainable"* and "open innovation", which yielded a total of 790 documents. In the first screening phase, articles not written in English were excluded, resulting in the removal of 11 documents and reducing the dataset to 779 articles. Subsequently, to refine the relevance of the corpus in alignment with the research focus, a disciplinary filter was applied based on the Web of Science Categories, restricting the selection to publications categorised under Business, Management, Economics or Business Finance. This step further narrowed the dataset to 248 documents, which constituted the final set used for bibliometric analysis.

Table no. 1. General information about the extracted records

Description	Results
Timespan	2007:2025
Sources (Journals, Books, etc)	118
Documents	248
Authors	696
Single-authored docs	25
Article	185
Proceedings paper	35
Others	28

The bibliometric analysis encompasses various dimensions, including citation counts, geographic dispersion of contributing authors and institutions, institutional productivity, publication venues, and keywords assigned by authors. This approach enables a comprehensive investigation of the existing literature, offering a detailed assessment of relevant bibliographic indicators (Vătămenescu et al., 2024; Becheș and Anghel, 2025). Table 1 offers a detailed bibliometric profile spanning the period 2007–2025. The dataset comprises

248 scholarly contributions published across 118 distinct sources, encompassing peer-reviewed journals, books, and other academic outlets indexed in the Web of Science. The corpus reflects the scholarly activity of 696 individual authors, with 25 documents being single-authored, indicating a strong prevalence of collaborative research practices. In terms of publication typology, journal articles constitute the predominant category (185), followed by proceedings papers (35), while the remaining 28 publications are distributed across diverse formats, including book chapters, editorials, early access items, and hybrid contributions. This heterogeneity in dissemination channels highlights both the intellectual depth and the interdisciplinary breadth of the field, particularly within the thematic intersections of sustainability and open innovation.

3. Results and discussion

3.1. The impact of the papers on sustainability and open innovation

The data presented in Figure no. 2 indicate a progressively increasing academic interest in the intersection of sustainability and open innovation during the period 2007–2025. Following a period of limited scholarly output between 2007 and 2011, a gradual upward trend in publications emerged in 2012. In 2018, a significant increase was observed with 30 publications, marking the onset of a more dynamic phase in the research field. This trajectory continued to strengthen, culminating in 2024 with 41 articles, the highest annual output recorded. Although a slight decline is observed in 2025, with 18 publications, it is important to note that data for this year were collected in early April. In general, the trend reflects a consistent and intensifying scholarly engagement with the topic.

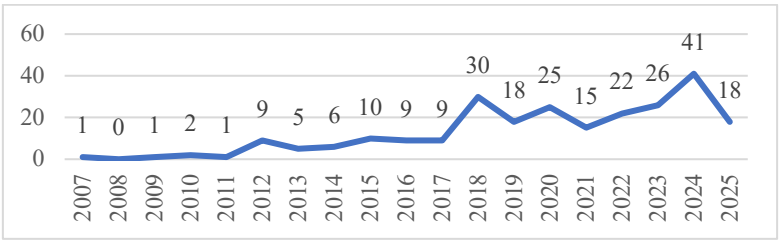

Figure no. 2. Quantifying articles on sustainability and open innovation topics

Table no. 2. Top sources on the topic of sustainability and open innovation

Sources	Articles	Type of publication
Open Innovation 2.0	18	Book
Business Strategy and the Environment	11	Journal
European Journal of Innovation Management	10	Journal
IEEE Transactions on Engineering Management	10	Journal
Technological Forecasting and Social Change	9	Journal
Business Ethics the Environment & Responsibility	7	Journal
RISUS-Journal on Innovation and Sustainability	7	Journal
Entrepreneurship and Sustainability Issues	6	Journal

Table no. 2 offers a comprehensive view of the key sources contributing to the field of sustainability and open innovation, illustrating the varied types of publications involved. In particular, Open Innovation 2.0 is the leading source with 18 articles, primarily in the form of a book, signifying its significant influence in this area. Among the journals, Business Strategy and the Environment stands out with 11 articles, followed closely by the European Journal of Innovation Management and IEEE Transactions on Engineering Management, both with 10 articles. Other journals, such as Technological Forecasting and Social Change, Business Ethics, the Environment & Responsibility, RISUS-Journal on Innovation and Sustainability, and Entrepreneurship and Sustainability Issues, also contribute valuable insights, although with fewer articles (ranging from 6 to 9). This distribution highlights the importance of academic journals in advancing research on sustainability and open innovation, with certain publications playing a particularly prominent role in shaping the discourse. Furthermore, the combination of article types, including both books and journals, indicates the multifaceted nature of the research landscape, reflecting the broad scope of scholarship in this domain.

Table no. 3. Most cited articles on sustainability and open innovation topics

Paper	Total Citations	Average citation per Year
Hesbrough and Appleyard (2007) in California Management Review	681	35,84
Lee et al. (2014) in Technological Forecasting and Social Change, 89, 80-99.	491	40,92
Raute et al. (2019) in the Journal of Innovation & Knowledge	234	33,43
Watson et al. (2018) in the Journal of Product Innovation Management	215	26,88
Markham and Lee (2013), in Journal of product innovation management	158	12,15

An analysis of citation data reveals the significant academic influence of key papers in the field of innovation and knowledge and is presented in Table no. 3. The most widely cited work is Hesbrough and Appleyard (2007) in California Management Review, which has accumulated 681 citations, yielding an average of 35.84 citations per year. Following closely, Lee et al. (2014) in Technological Forecasting and Social Change garnered 491 citations, with an average of 40.92 citations per year. Other notable studies include Raute et al. (2019) in the Journal of Innovation & Knowledge (234 citations, 33.43 per year), Watson et al. (2018) in the Journal of Product Innovation Management (215 citations, 26.88 per year), and Markham and Lee (2013) in the Journal of Product Innovation Management (158 citations, 12.15 per year). These data highlight the sustained academic relevance and impact of these works within the scholarly community.

3.2. A comprehensive examination of clustering in the academic literature on the topic of sustainability and open innovation

The relationship between sustainability and open innovation can be interpreted through the prism of the "grand challenges", "alliances" and "impact" clusters, which highlight the essential dimensions of this interaction and are presented in Table no. 4. Within the "grand challenges" cluster, sustainability is positioned as a strategic response to complex global problems, which require innovative and collaborative solutions. The "alliances" group suggests that open innovation functions as an operational mechanism through which organisations develop partnerships to integrate sustainable practices into their processes. The results of these efforts are reflected in the "impact" cluster, where tangible effects on economic, social and environmental performance are analysed.

Table no. 4. Papers on topics of interest

Cluster	Centrality	Density	Centrality level	Density Level	Theme frequency	Main theme
Performance	20.491	55.64	10	4	736	Basic
Quality	1.717	68.981	8	10	28	Motor
Social media	0.25	67.361	4	8	10	Niche
Market orientation	0	62.5	1,5	6	4	Niche
Impact	11.677	54.551	9	3	332	Basic
Participation	1.083	68.364	7	9	22	Motor
Logic	0	50	1,5	1,5	2	Emerging
Grand challenges	0.292	59.375	5	5	10	Emerging
Human-resource management	0.111	50	3	1,5	5	Emerging
Alliances	0.361	63.889	6	7	7	Motor

Based on the centrality and density analysis in Table no. 4 and Figure no. 3, the identified themes are classified according to their strategic positioning in the conceptual network between sustainability and open innovation. The clusters "Performance" and "Impact" are classified as Basic themes, with high centrality and frequency, which gives them a central role in understanding the relationship between innovation, management and increasing organizational performance. They reflect the dominant concerns of organisations in terms of efficiency, innovation and sustainability, being essential for consolidating competitive advantage. In contrast, clusters such as "Quality", "Participation" and "Alliances" are classified as motor themes, with high density, indicating advanced internal development and the potential to guide future research directions, especially in terms of strategic collaborations (alliances) in the context of open innovation. The "Social Media" and "Market Orientation" clusters appear as niche topics, relevant in

specific domains and well defined internally, but with low connectivity to the central themes. Finally, the "Grand Challenges", "Human Resource Management" and "Logic" clusters are identified as emerging or declining themes, with low centrality and density, suggesting development potential or declining interest within the analysed literature. Thus, the analysis highlights how the key dimensions of sustainability and open innovation are reflected differently through these clusters, depending on their maturity, relevance, and connectivity in the network.

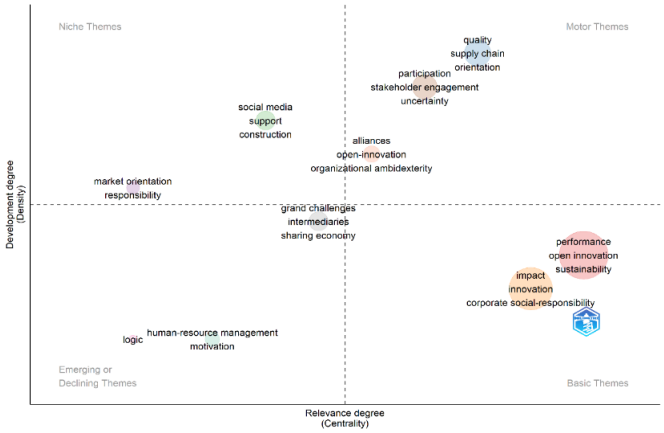

Figure no. 3. Thematic evolution on sustainability and open innovation topics

To examine the impact of sustainability on open innovation, the clusters identified as motor themes: quality, participation, and alliances—have been integrated into a unified thematic framework. This consolidation reflects their collective contribution to advancing sustainable innovation through high levels of internal development, organisational involvement, and inter-organizational collaboration, all of which are essential components in the dynamics of open innovation. In Table no. 5 are presented the main papers which illustrate this relationship.

Table no. 5. Most relevant studies from motor theme

Authors	Type of work	Assigned cluster	Research method
Srisathan, Ketkaew and Naruetharadhol (2020)	Article	Quality	Survey
Smart et al. (2019)	Article	Participation	Systematic review
Akbari et al. (2020)	Article	Quality	Bibliometric analysis
Diriker, Porter and Tuertscher (2023)	Article	Participation	Inductive and deductive analysis

Recent literature highlights the multifaceted nature of open innovation and its interplay with sustainability, organisational dynamics, and socio-political contexts. Srisathan, Ketkaew and Naruetharadhol (2020) demonstrate that organisational culture alone does not directly enhance open innovation performance in SMEs; instead, sustainability frameworks mediate this relationship, acting as strategic enablers of innovation outcomes. In a broader societal context, Smart et al. (2019) argue that the convergence of Open Science and Open Innovation - anchored in Mertonian scientific norms - can drive inclusive and socially responsible innovation, yet remains vulnerable to exploitation in the absence of ethical constraints, especially in the post-truth era. Although Akbari et al. (2020) do not explicitly address open innovation, their bibliometric analysis reveals a growing academic focus on sustainable technology, knowledge collaboration, and innovation systems, aligned with open innovation principles. Diriker, Porter and Tuertscher (2023) contribute a process model based on 'punctuated openness', illustrating how alternating phases of openness and closure enhance co-creation and adaptability in complex, multi-actor innovation initiatives.

The studies in Table no. 6 reflect diverse methods for exploring the link between sustainability and open innovation: Rauter et al. (2019) and Watson et al. (2018) use empirical approaches, while Lee et al. (2014) and Schaltegger, Beckmann and Hansen (2013) offer conceptual insights—together providing a balanced view of how open innovation supports sustainability in theory and practice.

Table no. 6. Most relevant studies from the Basic theme

Authors	Type of work	Assigned cluster	Research method
Rauter et al. (2019)	Article	Impact	Cross-sectional quantitative study
Lee et al. (2014)	Article	Performance	Systematic review
Watson et al. (2018)	Article	Impact	Comparative case studies

Rauter et al. (2018) empirically demonstrate that engaging a broader spectrum of external stakeholders, including NGOs and intermediaries, in open innovation processes significantly improves both economic and sustainability innovation performance, challenging the assumption of an inherent trade-off between these objectives. Complementing this, Watson et al. (2018) develop a hierarchical capability-based framework that emphasizes the role of dynamic capabilities, such as value framing and systematized learning, in enabling effective stakeholder engagement for environmental innovation within open innovation settings. Lee et al. (2014), through comparative case studies of Seoul and San Francisco, further illustrate how successful smart city initiatives rely on adaptive public–private collaborations and open innovation platforms shaped by cultural and institutional contexts.

Conclusions

Open innovation can support sustainability and social impact, but its effectiveness depends on organizational culture, ethical values, and adaptive, collaborative strategies. When aligned with sustainability frameworks and inclusive stakeholder engagement, it becomes a key tool for addressing complex challenges. This study contributes to the literature by mapping the intersection of sustainability and open innovation through a bibliometric analysis of 248 Web of Science articles (2007–2025), following PRISMA guidelines. It identifies major research trends, key contributors, and four main thematic clusters—grand challenges, alliances, impact, and participation—offering a clearer understanding of how these concepts evolve together in academic and practical contexts.

Although this study provides a comprehensive overview of the literature on sustainability and open innovation, certain limitations open avenues for further research. The analysis is restricted to English-language publications indexed in Web of Science, potentially omitting relevant studies from other databases or languages. Including additional sources such as Scopus or Google Scholar could improve the scope and generalisability of findings. Additionally, the roles of digital transformation, social media, and stakeholder involvement in sustainable open innovation remain underexplored. Comparative empirical research across industries or regions may offer deeper insights into how open innovation can effectively support sustainability goals.

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