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OPEN INNOVATION MAPPING BASED ON PUBLISHER RESEARCH THROUGH BIBLIOMETRIC ANALYSIS

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ABSTRACT

Research on open innovation (OI) has increased in recent years, demonstrating its potential in various fields of knowledge. Its linkages with SMEs have attracted the attention of academics. This analysis was conducted from 2018 to 2022. This article aims to evaluate the intellectual structure of open innovation scientific studies, and their relation to various scientific fields, through bibliometric analysis using the Scopus database, publish or perish, the lens, and the VOSviewer software application. The methodology consists of a selective systematic and transparent process divided into four phases: (i) establishing search criteria for research fields, through literature review, (ii) database selection, (iii) application of inclusion and exclusion criteria to the selected documents and explanation of their uses software; and (iv) analysis of results through a scientific output performance approach and bibliometric mapping. The results show an increasing trend of open innovation publications quite a lot, especially in the United Kingdom and the United States, but only a few studies discussing open innovation in SMEs for researchers in Indonesia totaling 121 articles discussing marketing, economics, management and social sciences. So there are many opportunities for researchers in Indonesia. This study contributes to the field by providing an overview of open innovation in the context of MSMEs.

Keywords: Open Innovation, Bibliometric, The Lens, VOSviewer

INTRODUCTION

Open innovation (OI) has become a topic of interest to business and academics in various disciplines, such as management, economics, and social sciences, in addition, open innovation has become a new paradigm in organizations. (Bogers et al., 2018). (Bogers et al., 2018; H. Chesbrough & Crowther, 2006; H. W. Chesbrough, 2003) elaborated on this theory in developing a conceptual framework to describe the transformation that some companies experience in the way innovation is managed; that is, the transition from, in terms of, a closed to an open approach. This type of innovation is seen as a paradigm shift, as an organization can gain an inflow and outflow of knowledge to enhance its innovation efforts. Several researchers have refined this idea, bearing in mind that the exchange of information and knowledge flows through three modes: (i) outside-in, related to acquiring external knowledge to create internal innovation; (ii) combined, linked by co-creation; and (iii) outside (inside-out), characterized by knowledge transfer (Sabando-Vera et al., 2022). Open innovation encourages companies to find identity and participate in the innovation process. This business model allows companies to be more effective in creating and capturing value, gain collective intelligence and save costs, time, and new revenue opportunities. This type of innovation study has various approaches, such as the triple helix model of university-industry-government collaborative relations, governance theory, and absorptive capacity. In addition, other authors have asked about the effect on engagement level requirements and strategies, practices, and routines for managing open innovation, risks, and barriers, (Sabando-Vera et al., 2022).

The dynamics of open innovation customer-driven open innovation platforms can be set up by the government, especially for new industries. With advances in technology, e-commerce, and information systems, the shared economy has become a new business model. Uber, Airbnb, and bike-sharing systems are just a few examples that demonstrate the exchange of products and services between citizens and businesses. Social media, as a tool to facilitate R&D and commercialization, is used by the industry to capture consumer value and generate interactive communications. It can also include users for brand image commercialization and promotion. Several case studies, exploring the dynamics of social media across the innovation funnel, show that social media is becoming more integrated in innovation systems. While open innovation is easier to implement in large companies, resource-constrained MSMEs may find it difficult to exchange external technologies. Although alliances, partnerships, and networks are

common phenomena in SMEs, they are considered to have access to downstream markets rather than upstream technology development. Through investigating the success of open innovation in South Korea, it was found that intermediaries such as service providers can help MSMEs build trust between network members and reduce innovation barriers. Policy support can facilitate MSME innovation capabilities. In particular, developing country governments can link large companies and MSMEs. MSMEs play an active role globally, by providing competitive advantages in specialized knowledge and intellectual property.

MSMEs play an important role in the context of the global economy by representing around 90% of business and 40% of GDP in developing countries, and generate two-thirds of the world's jobs (Sun et al., 2020). Despite its importance, this type of company faces limitations compared to large companies, such as limited funds, difficulty in hiring employees, lack of leadership (Zhou et al., 2021), lower absorption capacity and lack of capturing value. However, its size can offer several advantages, such as focusing on a niche market to increase expertise, flexibility, and speed in implementation and decision-making (Petrou et al., 2020). The open innovation implemented in SMEs is attractive because it allows them to generate alliances with large companies due to their high profitability and high specialization capacity; this collaboration in the creation process allows them to have intellectual protection. In addition, this type of company can achieve improvements in innovation quality, performance, and access to low-cost resources through the adoption of open innovation practices, such as networking, co-development, external sourcing, and commercialization, among others. In addition, it makes it possible to build business models, innovation systems, and knowledge management practices. Taken together, the activities mentioned above have become the fundamental pillars of the effect of implementing OI on companies.

Companies work to adopt open innovations to improve company performance (Singh et al., 2021). Previous studies provide arguments about the importance of open innovation studies (Anshari, M.; Almunawar, 2021). Antecedent factors such as technology, technological innovation (Naqshbandi & Tabche, 2018), Human Resources (Engelsberger et al., 2022), and knowledge management (Grimsdottir & Edvardsson, 2018) have a significant effect on open innovation. A previous study has highlighted the importance of human capital for innovation performance. Several studies have demonstrated the positive effect of human capital on innovation (Latifah et al., 2022). Culture is something that members have in an organization based on shared values and norms. Therefore, culture influences open innovation on organizational performance (Galiulina & Touate, 2022). Several authors have considered studying open innovation in SMEs globally through a literature review and empirical studies at the national level on its application. Other researchers are considering studying its scientific structure using the Web of Science database between 2018 and 2022. Despite these scientific contributions, knowledge about the composition and evolution of open innovation in SMEs is scarce, (Sabando-Vera et al., 2022). Therefore, conducting a bibliometric analysis would allow a global review of the publications that structure it and complement previous studies.

The bibliometric analysis allows for exploring the intellectual structure of a field of study, determining its characteristics and research areas through a quantitative evaluation of the existing academic literature. In addition, it allows the identification of emerging research areas and collaboration between institutions and researchers. This research adopts a bibliometric analysis approach. Bibliometrics is a scientific field that studies quantitatively the scientific production of an academic discipline or research topic through mathematical and statistical methods. These studies facilitate understanding of cognitive structures by analyzing their performance (author, country, institutions) and visualization through bibliometric mapping. Hence, they indicate relevant information that complements the literature review. This approach belongs to the three most important methods of literature review: systematic literature review, meta-analysis, and bibliometric analysis. This bibliometric study has contributed to various disciplines, such as economic management and education. Furthermore, bibliometrics has attracted the attention of scholars in recent years because of its usefulness in understanding a broad range of research fields. The bibliometric analysis consists of two approaches: an (a) analysis of scientific structure performance by publication, year of publication, number of papers produced, country, author, and affiliation; (b) bibliometric mapping, which allows the representation of relationships between fields and sub-fields of knowledge. Use of VOSviewer is open-access software developed by the Center for Science and Technology Studies, University of Leiden (Netherlands). This software

enables the construction of two-dimensional bibliometric networks.

This network shows the cognitive structure of the field of study which is called a bibliometric map or science map. These maps allow the close structural analysis of its nuclear (keyword co-occurrence), meso (author citation cited), and peripheral (author citation cited citation) parts. Various disciplines implement this software to analyze the cognition structure Use of VOSviewer is open-access software developed by the Center for Science and Technology Studies, University of Leiden (Netherlands). This software enables the construction of two-dimensional bibliometric networks. This network shows the cognitive structure of the field of study which is called a bibliometric map or science map. These maps allow a close structural analysis of its nuclear (keyword co-occurrence), meso (author citation cited), and peripheral (author citation cited citation) parts. Various disciplines implement this software to analyze the cognition structure Use of VOSviewer is open-access software developed by the Center for Science and Technology Studies, University of Leiden (Netherlands). This software enables the construction of two-dimensional bibliometric networks. This network shows the cognitive structure of the field of study which is called a bibliometric map or science map. These maps allow a close structural analysis of its nuclear (keyword co-occurrence), meso (author citation cited), and peripheral (author citation cited citation) parts. Various disciplines implement this software to analyze cognition structure This study aims to evaluate the intellectual structure of open innovation in SMEs through bibliometric analysis using the Scopus database to determine its performance, evolution, and pattern. This research has two approaches: (i) performance analysis, which involves knowing the authors, countries, journals, and outstanding publications, and (ii) science mapping, which involves visualizing the cognitive structure of the field of study through co-occurrence and cooccurrence, citation analysis. Because of that, through bibliometric analysis, researchers can find updates regarding the trend of open innovation publications in SMEs.

RESEARCH METHODS

This study adopts a bibliometric analysis approach. Bibliometrics is a scientific field that studies quantitatively the scientific production of an academic discipline or research topic through Pitchard's mathematical and statistical methods (Sabando-Vera et al., 2022). These studies facilitate the understanding of cognitive structures by analyzing their performance (author, country, institution) and visualization through bibliometric mapping. Hence, they indicate relevant information that complements the literature review. This bibliometric study has contributed to various fields of science, such as management, economics, and education. Furthermore, bibliometrics has attracted the attention of researchers in recent years because of its usefulness in understanding a broad range of research fields. This work followed a methodological process consisting of four phases: (i) search for research area criteria, (ii) database search and document extraction, (iii) inclusion and exclusion criteria for documents and software used, and (iv) results and analysis.

According to Subiyantoro (2023) Bibliometric analysis is a quantitative approach used to analyze and measure characteristics, patterns, and trends in scientific literature. This method involves using bibliometric indicators, such as number of publications, citations, and author collaborations, to identify and understand structure and influence within a particular area of research. In contrast to Meta Analysis, Meta analysis is a statistical method used to systematically combine and analyze research results from several similar independent studies. In meta-analyses, data from various studies are collected, synthesized, and statistically analyzed to come to more robust conclusions than each individual study can provide. Both have different, but complementary goals and approaches in compiling, analyzing, and interpreting information in the scientific literature. Both types of analysis are important tools in scientific research. Meta-analysis provides a stronger understanding through combining data from similar studies, while bibliometric analysis provides insight into characteristics and developments within the research field. Proper use of these three analyses can make a valuable contribution to the development of knowledge and understanding in various fields of science.

This study aims to analyze the structure of the open innovation academic field as an important factor in micro, small, and medium enterprises. The terms selected as search criteria are "open innovation" and "Micro, Small, and Medium Enterprises" (including "MSMEs" and other related expressions). This option allows for building a database. Bibliometric studies require information from reliable, high-quality, and wide-reaching databases. Bibliometric analysis was performed using VOSviewre. The data used in Scopus-indexed article data in the form of research citations in the form of RIS. Tracking data used

from 2018 to 2022 via Publish or Perish software. However, in this study Scopus was chosen for several reasons as follows: (i) provides broad coverage of scholarly results across multiple fields of knowledge by indexing 66% more journals than WoS; (ii) has better coverage (in terms of time) compared to other databases; (iii) have scientific output quality indicators, such as Citescore or Scimago Journal Rank (SJR); (iv) ease of access to bibliographical sources; and (v) availability of institutional access. Tracking results are stored in the form of a RIS File and can be added manually to Scopus publisher websites such as ScienceDirect emerald insight, and so on. After all the citations obtained are sufficient and sufficient, the RIS file will be inputted using VOSviewer. The approach used is a Bibliometrics-based map, besides that the Lens tool is used to add other important information.

RESULTS AND DISCUSSION

One important aspect that has emerged recently is open innovation (Latifah et al., 2022). Companies work to adopt open innovations to improve company performance (Singh et al., 2021). Open innovation has become a new paradigm in organizing innovation (Bogers et al., 2018). In companies characterized by competitiveness and the ability to adapt quickly to environmental changes, linking human resource policies with various forms of open innovation (OI) seems inevitable. The open innovation implemented in SMEs is attractive because it allows them to generate alliances with large companies due to their high profitability and high specialization capacity; this collaboration in the creation process allows them to have intellectual protection (Sabando-Vera et al., 2022). Several authors have considered studying open innovation in SMEs globally through a literature review and empirical studies at the national level on its application. Previous studies provide arguments about the importance of open innovation studies (Latifah et al., 2022). Antecedent factors such as technological innovation, human resources, and knowledge management influence open innovation.

Studies on this topic are still rare, where based on the results of the mapping that has been done through the Lens software, it is known that discussions related to open innovation in MSMEs have been written in 3,281 articles around the world in the period 2018 to 2022. From the results of the mapping it is known that the ranking classification of universities in the world that discuss research on open innovation in SMEs is shown in the following table:

Table 1
Top 10 Universities in the World With Articles About Innovation in SMEs From 2018 - 2022

No	University Name	Country	Quantity
1	Cardiff University	English	27
2	Aston University	English	26
3	University of Sheffield	English	22
4	London School of Economics and Political Science	English	17
5	University of Nottingham	English	16
6	University of Edinburgh	Scotland	15
7	Erasmus University Rotterdam	Dutch	14
8	Swansea University	English	14
9	Northumbrian University	English	12
10	Nottingham Trent University	English	11

Source: The Lens Software

In Table 1 above, it can be seen that many articles discussing open innovation in MSMEs are carried out in England, where the campus with the most written works is Cardiff University, with 27 articles, followed by Aston University with 26 articles, and the University of Sheffield with 22 articles. Of the 10 leading universities in the world that have research related to open innovation in MSMEs, none are located in the Asian region, especially Indonesia. The results of the mapping carried out through Lens, the description of the results can be seen in the following table:

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Table 2
Top 10 Universities in Indonesia That Have Writing Papers Open Innovation in MSMEs from 2018-2022

No	University Name	Country	Quantity
1	Bogor Agricultural University	Indonesia	10
2	Islamic University of Indonesia	Indonesia	7
3	Gadjah Mada University	Indonesia	6
4	University of Indonesia	Indonesia	6
5	Airlangga University	Indonesia	5
6	Bandung Institute of Technology	Indonesia	5
7	Binus University	Indonesia	5
8	Andalas University	Indonesia	4
9	General Soedirman University	Indonesia	4
10	Mercu Buana University	Indonesia	4

Source: The Lens Software

Overall in Indonesia, 119 articles discuss open innovation in MSMEs, where Bogor Agricultural University is the biggest contribution, namely 10 articles, followed by Gajah Mada University, the Islamic University of Indonesia, and the University of Indonesia with 6 articles. The ranking was followed by Airlangga University, Bandung Institute of Technology, and Binus University with 5 articles, as well as several other leading public and private universities in Indonesia. Thus there are still many opportunities open for researchers from campuses in Indonesia to conduct research that discusses open innovation in Micro, Small, and Medium Enterprises. To find out the development of research that discusses open innovation in MSMEs,

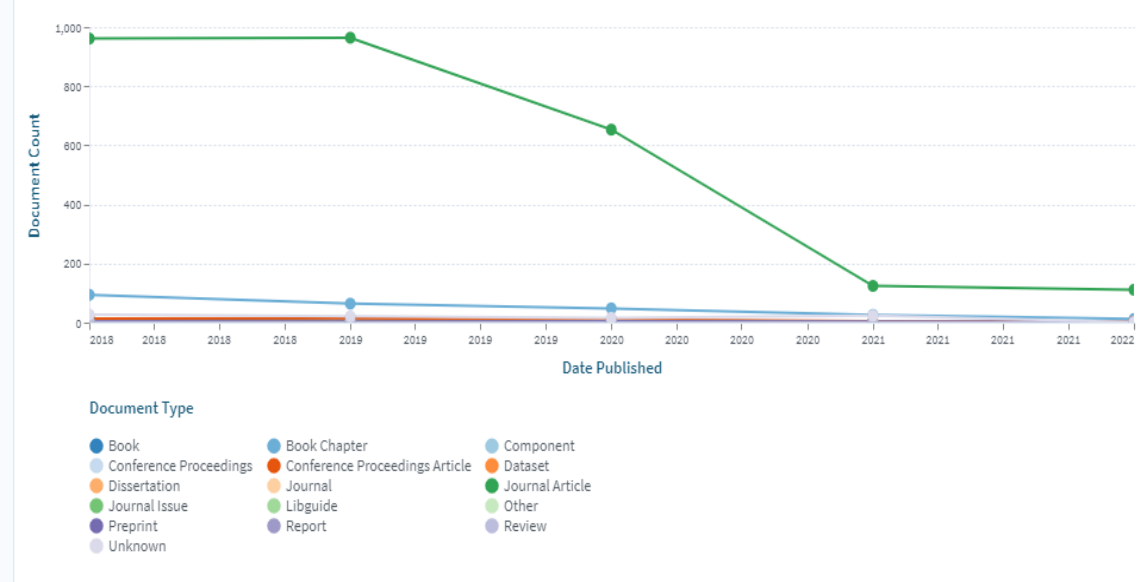

Figure 1 Research Development Map for 2018 – 2022
Source: The Lens Software

In Figure 1 above, this mapping shows that research issues related to open innovation in MSMEs are popular from 2018 to 2019, and from 2020 to 2022 these issues will decrease. Even though MSMEs make a very large contribution to the economy of a country. In 2021 and 2022, research on open innovation will decrease, even though it is very important to research open innovation in MSMEs, to help MSMEs identify the driving factors for innovation and organizational readiness to implement open innovation in terms of human resources, organizational systems, organizational policies, and management strategies implemented by the organization. Therefore, MSMEs require the involvement of various parties or stakeholders by considering various aspects. For example integrated policies for all parties involved in the implementation of open innovation, the technology intensity of companies cited as the main drivers driving involvement in open

innovation practices, internal availability of information, measurement, and adjustment of compensation or additional incentives. Throughout 2018 to 2022 research topics discussing open innovation in MSMEs have also been published through several reputable Scopus-indexed publishers as illustrated in Figure 3 below:

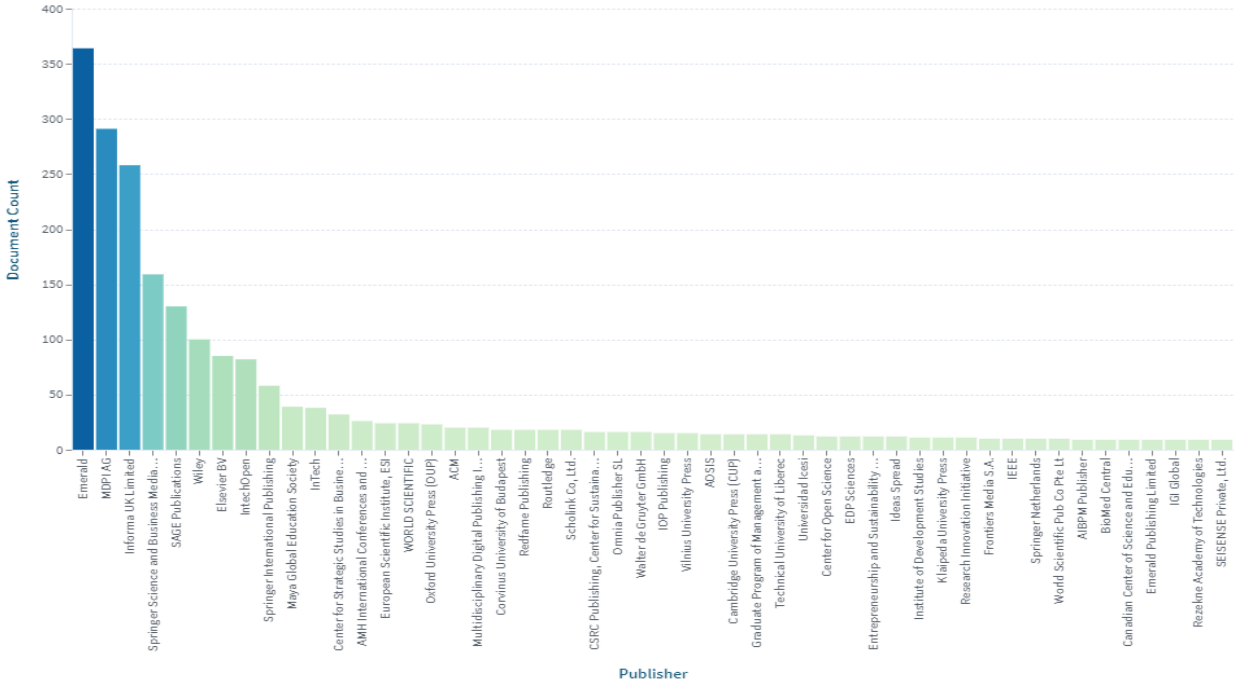

Figure 2 Open Innovation Research Mapping on MSMEs in Reputable Publishers Indexed Scopus 2018 – 2022
Source: The Lens Software

In Figure 3 above, it can be seen that the most publications in the form of articles with Scopus-indexed reputations were made through Emerald Publishers with more than 350 publications, followed by MDPI AG with 291 publications, then Informa UK Limited As with 258 publications. The order of four and five is followed by Springer Science and Business Media with 159 publications and SAGE Publication with 130 publications. In addition, the following is the number of scientific works over time for the top authors based on the total number of scientific works in the result set shown in the image below:

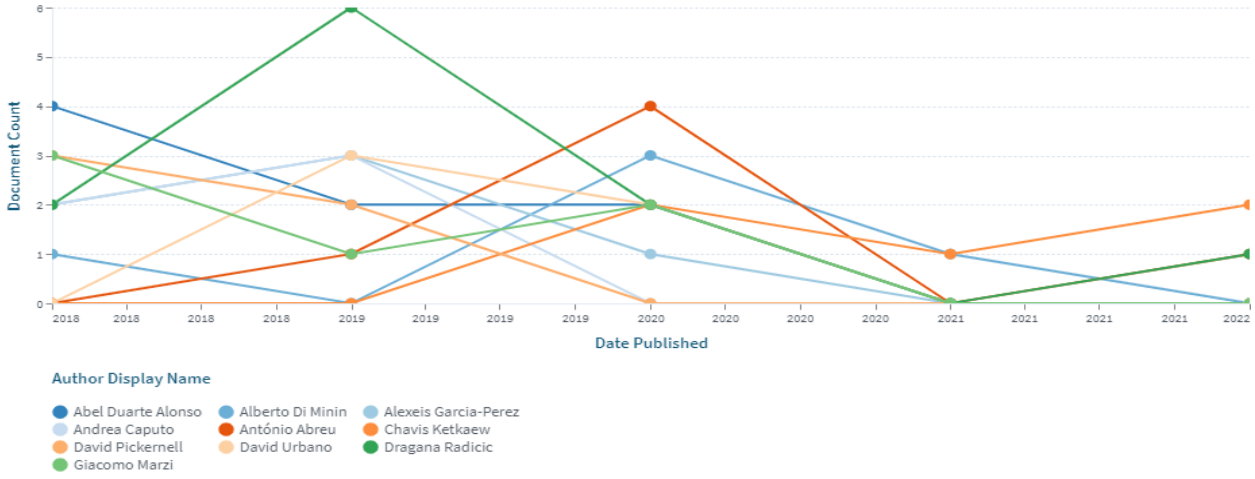

Figure 3. Top 10 most productive authors
Source: The Lens Software

Figure 3 above shows the number of scientific works from time to time for the top 10 authors based on the total number of scientific works from year to year. Dragana Radici contributes on topics that include the Relative effectiveness of open innovation strategies in single and complex MSME innovators, Cooperation for Innovation and Its Impact on Technological and Non-Technological Innovations: Empirical Evidence for European MSMEs in Traditional Manufacturing Industries, and others of a general nature in the same subject. Co-author Abel Duarte Alonso discusses Micro-enterprise, Self-Efficacy, and Knowledge Acquisition: Evidence from Greece and Spain and Strength, innovation and Opportunity in emerging industries: an exploratory study. Alexis Garcia Perez discusses the topic Potential links between enterprise innovation and enterprise competitiveness: evidence from an IT company in the UK. Other researchers namely: Antonio Abreu, Giacomo Marzi, Alberto Di Minin, Andrea Caputo, Chavis Ketkaew, David Pickernell, and David Urbano discussed issues similar to studies on external knowledge acquisition and challenges in MSME management, about OI practices, stakeholders, trends and engagement, big data for OI, knowledge dynamics, innovation practices and innovation strategies, sustainable growth, R&D investment, OI adoption, and entrepreneurship at OI.

Contribution to the journal. This analysis provides an overview of the various disciplines that make up the intellectual capital of open innovation in MSMEs (Pico-Saltos et al., 2021). The following is a table of the top 10 journals with the highest number of publications:

Table 3
Top 10 journals with the highest number of publications

No	Journals	Article	H-Index	SJR	To quote
1	Sustainability	117	109	0.66	3394
2	Accounting, Auditing & Accountability Journal	17	105	1.47	1006
3	Small Business Economics	17	142	2.63	1113
4	Education Policy Analysis Archives	16	50	0.47	122
5	Journal of Knowledge Management	14	124	1.74	428
6	Journal of Intellectual Capital	13	97	1.16	238
7	Journal of Open Innovation: Technology,	11	28	0.34	96
8	Markets, and Complexity BMJ open	9	121	0.98	82
9	Information Technology & People	8	64	1.07	209
10	Journal of Management	8	241	7,12	286

Source: The Lens Software

The table above displays the top 10 journals with the most number of publications, where the Sustainability Journal totals 117 articles ranked in the Q1 quartile, H-Index 109, SJR 0.66, and citing 3394. The article discusses more intellectual capital in the relationship between the openness of a company's search strategy and innovation performance. Modeling the relationship between external search strategies of open innovation and proposing how intellectual capital is important for open innovation strategies in service industries. In addition, this article intends to broaden the field of open innovation by exploring the mediating effects of intellectual capital. This paper fulfills an identified need to study how intellectual capital can be enabled in the service industry's open innovation. Empirical insights allow us to have a better understanding in terms of how service companies learn from external sources of knowledge. This paper shows that the impact of an openness strategy on innovation performance becomes indirect through a partial mediator of intellectual capital so that innovation performance in the service industry benefits from simultaneously combining intellectual capital with an efficient openness strategy.

Finally, this paper includes implications for more insight into how service firms enhance their innovative activities with external search strategies and practices in terms of intellectual capital. This paper shows that the impact of an openness strategy on innovation performance becomes indirect through a partial mediator of intellectual capital so that innovation performance in the service industry benefits from simultaneously combining intellectual capital with an efficient openness strategy. Finally, this paper

includes implications for more insight into how service firms enhance their innovative activities with external search strategies and practices in terms of intellectual capital. This paper shows that the impact of an openness strategy on innovation performance becomes indirect through a partial mediator of intellectual capital so that innovation performance in the service industry benefits from simultaneously combining intellectual capital with an efficient openness strategy. Finally, this paper includes implications for more insight into how service firms enhance their innovative activities with external search strategies and practices in terms of intellectual capital, (Lo et al., 2020). Ranks two and three had the most articles, namely the Accounting, Auditing & Accountability Journal and the Small Business Economics Journal with 17 articles. Discussion on understanding the process of translating ideas across disciplines by focusing on how the notion that people are company assets is translated between accounting and human resources (HRM) disciplines (Ejiogu & Ejiogu, 2018). In addition, discussing small and medium enterprises (MSMEs) and recognizing the need for MSMEs to postulate strategies to compete and succeed in the global market in the current ultra-competitive business environment, MSMEs face several internal and external challenges. There are 10 journals that discuss open innovation in MSMEs in Indonesia. Can be seen in the table below:

Table 4.
Top 10 Journals Discussing Open Innovation in Indonesia

No	Journals	Article	Quote
1	Journal of Innovation and Entrepreneurship	2	14
2	Springer eBooks	2	0
3	Archives of Business Research	1	0
4	Asia Pacific Journal of Marketing and Logistics	1	9
5	Dinamisia : Jurnal Pengabdian Kepada Masyarakat	1	0
6	EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi dan Bisnis	1	0
7	Electronic Commerce Research	1	1
8	Environment-Behaviour Proceedings Journal	1	1
9	European Journal of Business and Management Research	1	0
10	IEEE Transactions on Engineering Management	1	0

Source: The Lens Software

In the table above, you can see the top 10 journals that discuss open innovation in Indonesia. The first position, in the Journal of Innovation and Entrepreneurship amounted to 2 articles. Research Discusses micro, small and medium enterprises (MSMEs) play an important role in a country's economy, so managers must try to run their businesses in accordance with the current green economy (GE) concept. In addition to GE, an element that is no less important related to MSMEs is business digitalization (Pangarso et al., 2022). In the era of society 5.0, MSMEs are increasingly affected by digital technology in running their business (Riyanti et al., 2022). In second place, articles in the journal Springer eBooks totaled two articles. The first article discussing Ambidexterity is still a concern for many researchers, especially in the field of SMEs because of its influence on innovation performance (Pranaditya et al., 2022). The second article discusses that innovation initiatives have become a fairer arena for small and medium-sized enterprises (SMEs), the attention to open innovation research in this context is growing. Previous research on small and medium-sized enterprises and innovation has underscored the important role of corporate marketing initiatives to drive enterprise-level innovation amid limited resources (Nasution et al., 2022). While the third position and so on only have one article.

Globally, research on open innovation is rising even higher. In this decade, research focused on SMEs' commitment to implementing open innovation in business (Papa et al., 2018), use of business models and business practices, absorption capacity, technological capabilities, dynamic capabilities and sustainability (Lee et al., 2022; Priyono et al., 2020; Taghizadeh, 2020; Tran et al., 2022; Wang et al., 2017). Meanwhile, in Indonesia, Of the 121 articles outlined, many discuss about more about the main factors to achieve sustainability, environmental dynamism and environmental competitiveness (Rumanti, 2021, 2022). Market orientation and company performance, there is still little research on SMEs in Indonesia with innovation mediation (D'souza et al., 2021), Business strategy, innovation performance, digital business (Abu Hasan et al.,

2022; Alfarobi &; Hartono, 2022; Astuti et al., 2021)

Bibliometric Mapping Analysis. VOSviewer is used to perform the bibliometric mapping. This software uses a technique created by its developers called VOSviewers. This technique visualizes bibliometric maps better than other software by using multidimensional scaling (Sabando-Vera et al., 2022). The visualization of the study area characterizes this analysis through a semantic visual map that allows observation of intellectual structures, developments, and relevant topics (Nobanee et al., 2021). Bibliometrics processed through VOSviewers software as attached in Figure 4 below:

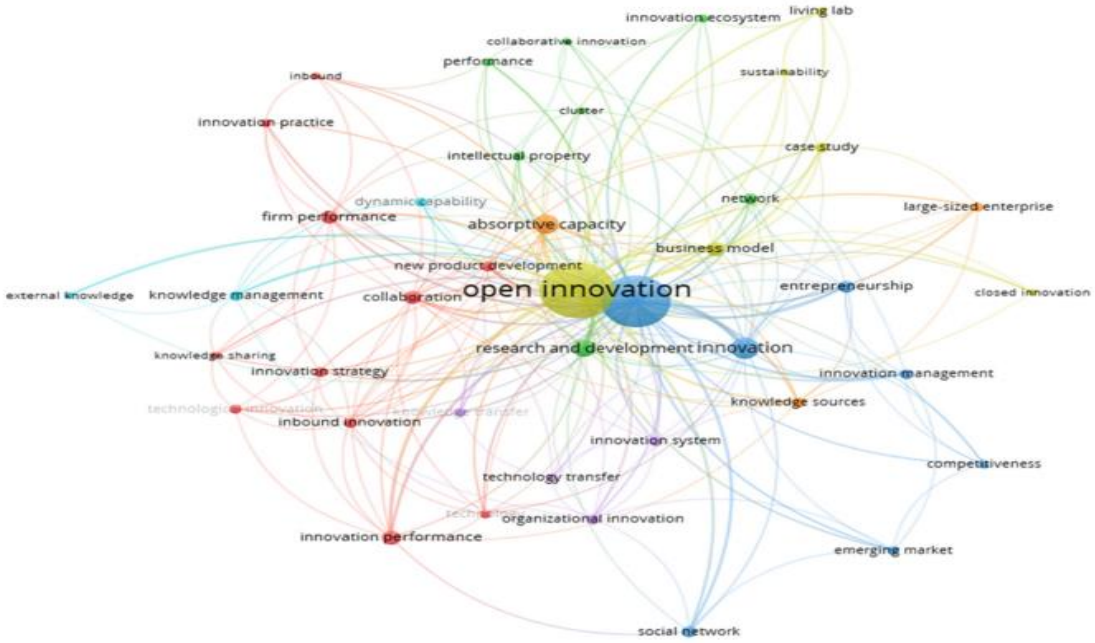

Figure 4. Network Visualization
Source: VOSviewers Software

In the picture above, the red color presents relevant information about the performance of open innovation and MSMEs. The green color examines involvement in research and development (R&D) of external knowledge networks implementing an open innovation strategy. The blue color is the third research area with the topic that stands out is micro, small, and medium enterprises (MSMEs). The yellow color highlights the terms open innovation and business models that focus on business model innovation as an alternative to improve company performance and transform digital technology models and network operations. The sky blue color highlights studies on the knowledge management capacity of MSMEs, using absorptive capacities and dynamic capabilities. The orange-blue color indicates that this is a capacity developed in this business context, Co-citation analysis, this analysis is most widely used in bibliometric studies, as it allows us to explore the relationships that exist between reference documents (knowledge base). Furthermore, the aim is to understand the fundamental themes of the field of study, uncovering schools of thought or paradigm shifts. The following Figure 5 visualization of the author's co-citation network (Sabando-Vera et al., 2022):

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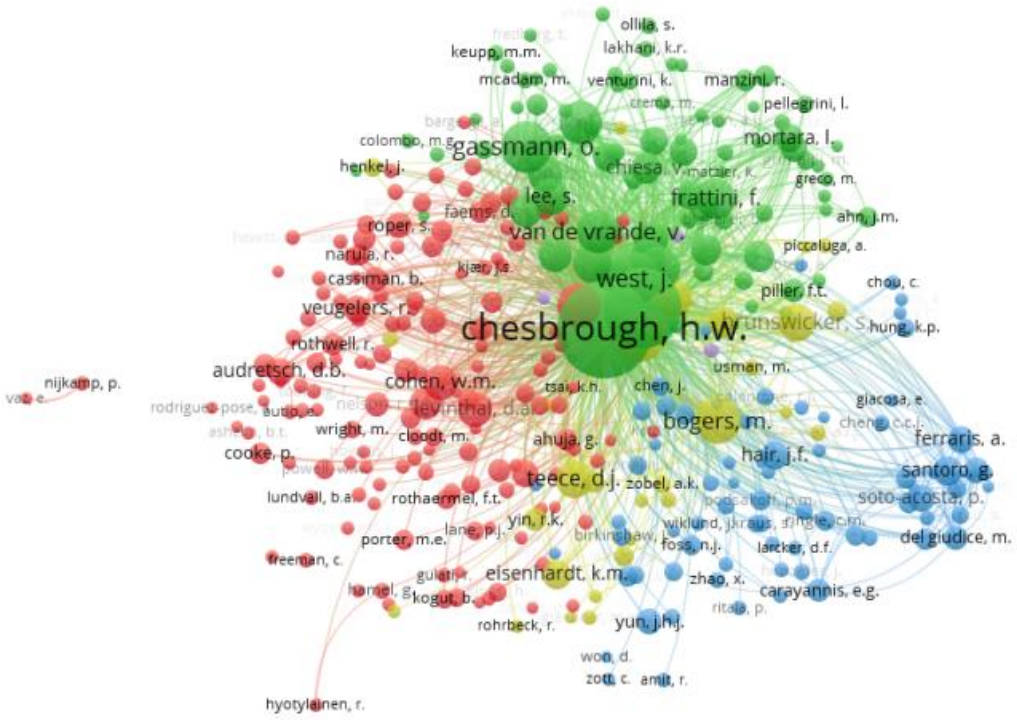

Figure 5. Visualization of author co-citation network
Source: VOSviewers Software

The analysis in the figure above explores which authors have been cited together and which form the knowledge base (reference document) of the studied intellectual structure showing the author co-citation network, built with VOSviewer software, grouping reference authors using a visualization similarity mapping technique. The nodes represent authors, who together (in one group) can represent topics, specialties, or schools of thought. A uniform structure is made up of four groups and 334 authors (nodes), elements that form a knowledge base and have more than 20 shared citations. The red color covers relevant topics about factors influencing the use of external knowledge during the innovation and development process. Within the green group, the author Henry Chesbrough is the originator of the concept of open innovation and who in his later work has deepened the theory with individual contributions, working with Wim Vanhaverbeke, Joel West, Oliver Gassmann, and Ellen Enkel. Other scholars continued the same line of OI development, such as Ulrich Lichtenthaler, Vareska Van de Vrande, Jeroen PJ De Jong, Maurice De Rochemont, and Eelko KRE Huizingh. The blue color authors who consider implementing open innovation activities are Gabriele Santoro, Pedro Soto-Acosta, and Alberto Ferraris. These authors work in areas that include knowledge management and knowledge exchange and sharing. The yellow color focuses on utilizing innovation which can be a guide to generating a competitive advantage. Ammon Salter. Jin Chen's purple color, In the Journal Co-Citation Analysis, this analysis considers the similarity of journals in terms of the received citation patterns, where two journals are cited together by several related documents. This analysis allows us to understand the structure of academic specialization. This is presented in Figure 6 below (Sabando-Vera et al., 2022):

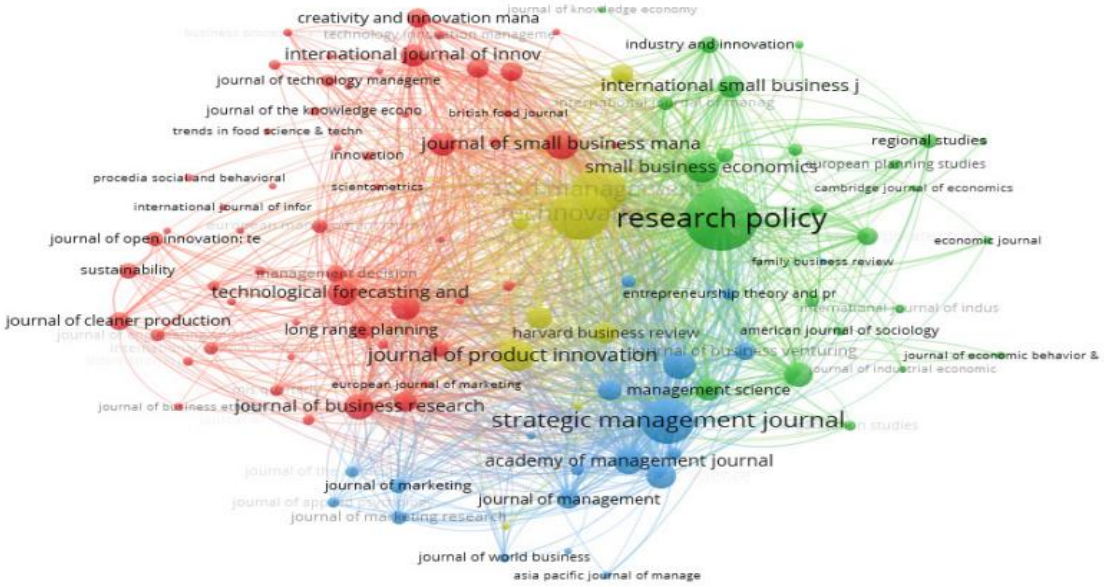

Figure 6. Visualization of journal co-citation network
Source: VOSviewers Software

The red color in the image above shows "Business, Knowledge and Technology" representing 55 journals with 4587 citations. Consists of the Journal of Small Business Management, Journal of Business Research, Technological Forecasting and Social Change, Journal of Knowledge Management, and European Journal of Innovation Management. The green color "Policies and SMEs Management", represents 24 journals with 3994 citations. Consists of Research Policy, Small Business Economics, Administrative Science Quarterly, and International Small Business Journal. In blue, "Business Research" represents 20 journals with 3096 citations. Consists of Strategic Management Journal, Academy of Management Review, Academy of Management Journal, and Organization Science. The yellow color "Management", represents 9 journals with 3357. Consists of Technovation, R&Dmanagement.

In line with the results of research conducted by (Sabando-Vera et al., 2022), where this research reveals scientific output with positive growth trends as reflected in the collaboration of 65 countries, 947 authors, and 182 journals. This fact implies high performance in the field of study. The most prolific contributors are (i) the authors, Alberto Di Minin and Gabriele Santoro, (ii) the country, UK, and Italy and (iii) the journal, The Open Innovation Journal: Technology, Markets, and Complexity And Sustainability. The contributors (based on the number of citations) are (i) the author, Wim Vanhaverbeke, (ii) the country, England, and (iii) the journal, Technology. Furthermore, the most influential article (by several citations) is “Open Innovation in SMEs: Management Trends, motives, and Challenges” by van de Vrande and colleagues. On the other hand, the bibliometric mapping analysis provides insight into the various fields and networks of researchers that form the intellectual structure of open innovation studies in SMEs. Co-author keyword analysis reveals seven themes related to this intellectual structure: enterprise performance, R&D networks, business management, business models, capacity, and knowledge transfer. The knowledge base lies (author co-citation) with researchers, such as H. Chesbrough, W. Vanhaverbeke, J. West, A. Salter, and O. Gassmann, and for other fields with authors, such as Wesley M. Cohen and Daniel A. Levinthal (absorptive capacity), David J. Teece and Kathleen M. Eisenhardt (dynamic capability). Research activities rely on (journal co-citation) journals related to management, technology, and business management. This study is a contribution to the academic world by exploring the intellectual structure of OI in UKM due to: (i) easy access to scientific knowledge by obtaining author's information on various topics and related subjects; (ii) the possibility of forming a collaborative network by knowing the various researchers involved; and (iii) to serve as a guide for novice researchers to study this intellectual structure extensively. In addition, this is in line with previous research gaps which provide recommendations to several studies regarding open innovation that take more into account the

perspective of young entrepreneurs. Where progress in this field in the last five years (2017-2021) has reached 64% of scientific results, so further studies are needed. In addition, research that discusses its intellectual structure is still scarce, so it is necessary to expand its scope.

Studies in developing countries regarding open innovation are still lacking, most of the research on open innovation is in developed countries. In studies on the relationship between managers/business actors in the implementation of open innovation, most of the research does not consider gender, age, education, experience, culture, and ethnicity. Therefore, it is necessary to study and further discuss these characteristics with a holistic approach from business actors and a relationship with open innovation. The basic theory used in this study is the Resource-Based View (RBV) Theory and Social Network Theory.

CONCLUSION

This study aims to evaluate the structure of the field of open innovation in micro, small, and medium enterprises (MSMEs) through bibliometric analysis using the Scopus database, Publis or perish, the lens, and VOSviewer software. This research reveals scientific output with a positive growth trend as reflected from 2018 to 2022, namely 3287 studies. This fact implies high performance in the field of study. On the other hand, the bibliometric mapping analysis provides insight into various fields and research networks that form the intellectual structure of open innovation studies in SMEs. Co-author keyword analysis reveals seven themes related to this intellectual structure: enterprise performance, R&D networks, business management, business models, capacity, and knowledge transfer. The intellectual structure shows seven themes related to company performance, R&D networks, business management, business models, capabilities, and knowledge transfer. This study contributes to the field by providing an overview of IO in the SME context. It also provides policymakers with in-depth information to develop policies for strong economic growth. The knowledge base lies (author co-citation) with researchers, such as H. Chesbrough, W. Vanhaverbeke, J. West, A. Salter, and O. Gassmann, and for other fields with authors, such as Wesley M. Cohen and Daniel A. Levinthal (absorptive capacity), David J. Teece and Kathleen M. Eisenhardt (dynamic capability). Research activities rely on (journal co-citation) journals related to management, technology, and business management. This study is a contribution to the academic world by exploring the intellectual structure of open innovation in SMEs because of the ease of access to scientific knowledge by obtaining the author's information on various topics and related subjects, forming a collaborative network by knowing the various researchers involved. In the future, many empirical studies are needed with different studies on open innovation, for example on human capital, employee personality, commitment and involvement in activities, also considering gender, age, education, culture. So that it can enrich the scope of open innovation both theoretically and empirically

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