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Innovative Culture: A Fifty-year (1972-2023) Analysis and Future Direction

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Abstract

Researchers, organizations, and policymakers have underlined the necessity of innovation for sustained economic growth. Few studies have applied bibliometric analysis to the term innovative culture". This bibliometric study aims to evaluate the global trend in "innovative culture" by analyzing related publications in the Scopus database. The bibliometric map was analyzed utilizing VOS Viewer 1.6.19. The research employed Scopus as the primary database to extract relevant articles. Nevertheless, relevant literature from other databases has not been included. Scopus assessed 1,224 academic articles from 1972 to 2023. The United States and China lead "innovat* culture" research. The co-authorship analysis discovered that the United States had the most international collaboration. The analysis of author's keywords indicated that "developing countries" and "product innovation" were important directions for studying innovative culture. Further studies are recommended to address this potential limitation. This paper offers implications and insights for the related field, guiding future research toward effectively investigating innovative culture.

Keywords: bibliometric analysis, bibliographic map, innovative culture.

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1 Introduction

International organizations and governments have recognized for decades that the challenges faced by various regions and industries globally are continually evolving (Franco *et al.*, 2022; World Health Statistics, 2022). Many individuals and organizations realize that the world is transforming rapidly, particularly in 2023 (Scholz *et al.*, 2023). Industry 4.0, the fourth industrial revolution, employs cyber-physical systems to automate manufacturing, whereas artificial intelligence, such as ChatGPT, is modifying communication methods (Hozdić and Makovec, 2023). In order to remain competitive in the evolving market, individuals and organizations are eager to adopt innovation to survive and prosper by undertaking every possible effort for sustenance (Fiorini *et al.*, 2023; Johnsson, 2023).

The culture or subculture of a group or nation may impact creativity and, consequently, innovation (Glăveanu, 2019), which may immediately impact a group or community's innovation and its potential (Roy and Mohapatra, 2023). Innovation is a crucial aspect that organizations cannot overlook, as it contributes to the rapid expansion and profit margins of businesses (Bukki

et al., 2019). In general, in terms of organizations, innovation resolves business-related issues (Calik *et al.*, 2017). According to Baregheh *et al.* (2009) and Thompson (1965), innovation is defined as the creation, development, and achievement of novel goods, procedures, or services that enhance competency, achievement, or competitive edge. Similarly, innovation also refers to the systematic process of introducing novel concepts and ideas to a company, leading to improved overall performance and outcomes (Rogers and Rogers, 1998).

An innovative culture is essential for organizations to achieve long-term success and competitiveness in today's dynamic business environment (Li *et al.*, 2023; Pfotenhauer *et al.*, 2023). An organization that fosters an innovative culture gains a competitive edge in the marketplace by attracting consumers and investors who value innovation and technological advancements (Gallou *et al.*, 2021; Reine, 2022). A competitive edge is achieved in an organization by continuously innovating and improving its products and services. Besides, innovative culture is a context in which novel perspectives are fostered, discussed, developed, and executed (Ramón *et al.*, 2023) to create an environment of growth and advancement, enabling organizations to remain nimble, efficient, and adaptable, leading to ultimate success (Ryu *et al.*, 2021). Consequently, several corporate leaders have realized that fostering an innovative culture within organizations is the top priority, thus adopting a proactive approach to fostering a creative and innovative atmosphere (Patrucco *et al.*, 2022). In order to create an innovative culture, an organization could adopt a consistent operational and managerial attitude, set of beliefs, methodology, level of dedication, and other techniques, which will help the organization gain a competitive edge in the aspect of innovation (Calik *et al.*,2017).

Additionally, Tian *et al.* (2018) investigated the influence of culture on innovation by undertaking a systematic literature review of peer-reviewed articles. The findings revealed the varied and unique link between culture and innovation. Nevertheless, the systematic literature review method posed challenges in avoiding the omission of certain empirical findings. Besides, Tomasova (2020) utilized the contrastive analysis method to review personnel innovative development. Nevertheless, identifying the intensity of overcoming innovative obstacles does not identify the significant general trend of innovative culture over time and the impact, quality, and relevance of the research. Furthermore, limited research utilized bibliometric analysis to explore the research development of innovative culture (Ferrigno *et al.*, 2023; Peng *et al.*, 2021; Santa *et al.*, 2018). Hence, the current study aims to fill the existing gap by intending to employ bibliometric analysis to evaluate the patterns and trends of scientific publications. The bibliometric analysis can aid in identifying the leading authors, journals, and articles on a certain subject, as well as emerging topics and research needs. The findings offer a comprehensive and impartial review of the state-of-the-art research on "innovative culture" and significant insights and direction for scholars and practitioners interested in the issue. The findings would provide evidence-based insights into the most impactful research and influential contributors (Donthu *et al.*, 2021; Santos, 2015). Additionally, the findings can guide practitioners, policymakers, and scholars in making informed decisions and shaping strategies that align with the current state of knowledge in innovation culture. The subsequent step is to move to the academic platform to collect the metadata of "innovat* culture".

The indexed database of interdisciplinary studies available on Scopus serves as the primary source for data extraction in this investigation (Gavel and Iselid, 2008). Besides a broader extent of coverage, Scopus presents information on citations for over 15,000 ranking papers that have been peer-reviewed. As opposed to Google Scholar, which frequently provides insufficient bibliometric data (Aguillo, 2012), Scopus enables more in-depth investigation (Carey *et al.*, 2023). Scopus has also been used in previous bibliometric studies to produce substantive reviews (Kumar *et al.*, 2021).

The current bibliometric study aims to address the following research questions to assist governments, organizations, stakeholders, and academics by gaining a more profound understanding of the advancements in innovative culture and suggesting new areas for future research:

*Q*1. What is the current trend in publishing and reference for the concept of innovat* culture?

*Q*2. Which authors, institutions, and nations have made the most significant contributions to the development and promotion of innovat* culture?

*Q*3. What are the publications and journals with the highest number of citations in the field of innovat* culture?

*Q*4. What are the contributions of co-authorships in the field of innovat* culture?

*Q*5. What are the dominant themes and subjects that are commonly written in the innovat* culture, and how have they changed over the years?

*Q*6. What are the new areas of research that may be explored in innovat* culture and its potential influences in the future?

The research objectives of this study are listed below:

*RO*1. To review the general development of studies on innovative culture.

*RO*2. To identify the achievement of engaged academics, universities, and nations.

*RO*3. To discuss the concept and terminology and interesting topics.

*RO*4. To provide novel insights for further potential areas of study.

2 Methodology

This study employed bibliometric analysis, a phrase invented by Pritchard (1969), who argued that it could be used in any investigation attempting to measure the outputs of social scientific and scientific research. Bibliometric analysis is a quantitative tool for measuring, tracking, and analyzing scholarly publications (Roemer and Borchardt, 2015). For research purposes, this method can analyze large-scale trends or patterns over a fifty-year period compared to other methods, such as qualitative methods. It can also identify the publications of authors, reputable journals, employed methodology, and conclusions drawn (Sánchez, 2015). Bibliometric analysis is a more feasible and cost-effective method for studying innovative culture over a fifty-year period compared to other methodologies. Given the large volume of scholarly literature available on the topic, this method enables the collection and analysis of rich and diverse data from sources (Donthu *et al.,* 2021). Bibliometric analysis is a scientific computer-assisted review procedure that scrutinizes all the publications associated with a particular subject or field. It can also identify central research or authors and their relationship (Bellis, 2009).

Bibliometrics, a method within the field of information and library sciences, utilizes statistical techniques to analyze the bibliographic data from a selected set of reviews (González-Alcaide, 2021). Available bibliometric software generates a structured summary or visual depiction of the review, illustrating the progression of a particular research area (Varma *et al.*, 2021). Bibliographic analysis is increasingly used in corporate management and social science, with most published studies covering coverage patterns, introspection, and conclusions (Lim *et al.*, 2022). This methodology considers citation data as reliable indications of the expansion of study domains (Donthu *et*

al., 2021), uncovering notable authors and their affiliations, and delineating the structures and interconnections of academic output (Pattnaik *et al.*, 2021).

Bibliometric methods require a considerable amount of bibliographic evidence and have been used to analyze various themes, journals, countries, and others (Blanco *et al.*, 2017). It can provide a wealth of topical and relational information, allowing for a better comprehension of the entire academic grounds (Churruca *et al.*, 2019). Initial bibliometric analysis primarily focused on the writer or reference information, its conceptual development, and its most influential works (Feeley, 2008). Nevertheless, recent bibliometric analysis includes statistical analysis and observational studies based on titles, terms, and data from abstracts (Ellegaard, 2018).

The present study utilizes bibliometric analysis to provide a summary of innovative culture research. This paper aims to provide a more in-depth comprehension of bibliometrics using Scopus data, which includes academic details such as the author, nation, citation record, author affiliation, and other relevant factors. Furthermore, for the bibliometric analysis, several performance indicators were retrieved from Scopus, including Total Papers (TP), which represents the actual quantity of articles from Scopus, Total Citations (TC), which represents the actual amount of citations generated by the publication, and Total Publications per Country (TPC), which represents the total quantity of publications generated by the leading nations.

3 Search Procedure

A data mining exercise was undertaken on January 28, 2023, using Scopus. The procedure focused on the core theme of "innovat* culture" to explore the global research trend. The search conditions are critical since they form and influence the resulting outcomes. The author utilizes the symbol "*" to substitute numerous different types of endings that appear behind the "t." This approach is employed since the current research is fundamental to the field of an innovative culture and thus cannot exclude any expression with similar themes. The author narrowed the search field to "topic" (including searches in "title," "abstract," and "keyword") and established no time constraints to include all relevant papers related to the topic. Only sources written in English were considered.

By beginning with the earliest articles published in 1972 and concluding with the most recent articles published in 2023, all the retrieved article journals were organized by publication date. The query string was configured as per the following: TITLE-ABS-KEY (for "innovat* culture"). A total of 1,224 documents were generated through this query. The 1,224 documents were subsequently reviewed utilizing the following criteria: year, author(s), nation, universities, and others. In addition, the authors compiled a catalog of bibliometric measures, including examples such as the total number of citations, the total number of publications, and the h-index. The search technique depicted in Table 1 contains further information regarding the query strings.

Table 1. The search keyword and the query string values

No	Subject	Search Term	Value of Query String	Result of Publications
1	Central	innovat* culture	TITLE-ABS-KEY ("innovat* culture")	1224

3.1 Bibliometric Map

In the subsequent stage of data analysis, the researcher extracted the bibliographical data from the 1,224 publications using the VOSviewer 1.6.19 software, which is useful for visualizing the details of the bibliometrics. VOSviewer is a software application designed for the creation and visualization of bibliometric networks, such as co-authorship, citation, and others (Van and Waltman, 2010). The software is capable of processing extremely large datasets, including those containing millions of records. Additionally, it offers various complex functionalities, including cluster recognition, display of temporal patterns, and normalization of indicators. Nevertheless, other software options, such as SciMAT and CiteSpace, may not be accessible (Ji *et al.*, 2023). This tool could be utilized to examine and investigate the organization and progression of scientific disciplines, identify significant authors and publications, and uncover developing subjects and patterns (Saenz and Alejandro, 2022). VOSviewer provides a range of visualization choices, including cluster analysis and various layout and labeling techniques (Van and Waltman, 2017). In the present research, this software identified the top nation and the frequency of author keywords for the theme of "innovat* culture". The following sections explain the bibliometric map in detail.

3.2 Co-authorship Analysis

According to the results of the investigation on co-authorship, 118 countries are associated with 1189 authors. The author created a thesaurus file to prevent the unintentional repetition of country names due to distinct acronyms. Similar country names were merged in the thesaurus file. For instance, "UK" and "United Kingdom" were combined into "United Kingdom. "

3.3 Analysis of Keyword Co-occurrence

The co-occurrence analysis of author keywords uncovered 87 keywords from 1,224 publications. Prior to conducting a co-occurrence analysis using the analysis software, the author created a thesaurus to identify repeated keywords. In order to identify repetitions, the author examined each keyword and grouped those with similar meanings. For instance, 'innovation culture' and 'innovative culture' both refer to the culture of innovation. Thus, the keywords were merged and renamed as "innovation culture." In addition, a minimum of five co-occurrences were specified for the analysis result.

4 Analysis of Results

4.1 Development of Research

Since 2020, the academic focus on innovation culture has witnessed significant growth. This information is proved by the publication of 1,224 research articles on this innovation culture in less than three years. The figure below (Figure 1) illustrates the rise of articles within Scopus. A total of 100 journal articles were published on the topic of "innovate* culture" in the year 2020.

Nevertheless, there was a significant increase in 2022, with a reported peak of 141 publications. The figure below was exported at the beginning of 2023, limiting the collection of recent papers. Studies on this term are anticipated to continue to increase as innovation remains a future trend or a hot topic.

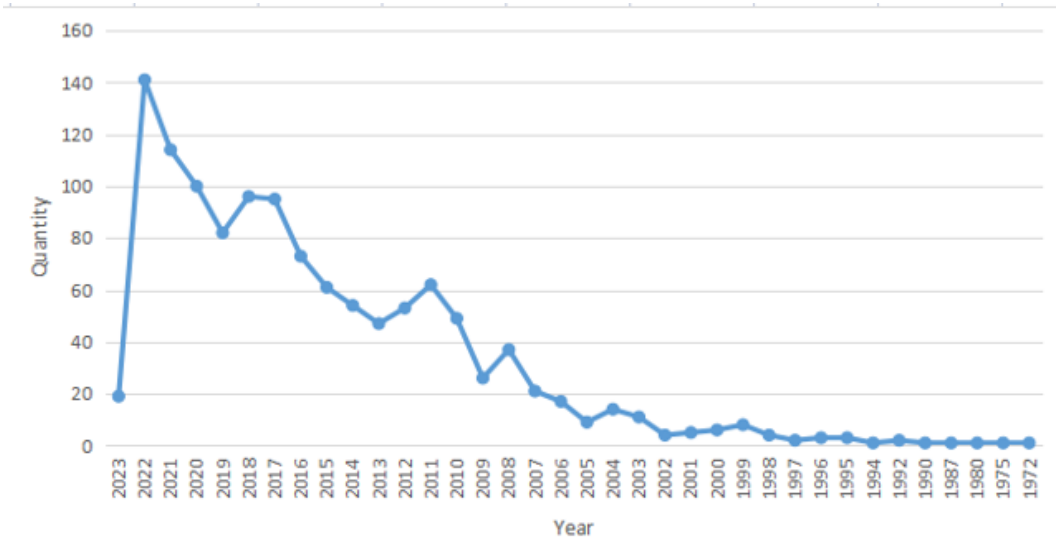

Figure 1. Number of "innovate* culture" articles in the Scopus database (1972–January 2023)

The subject area analysis demonstrates that this topic has captured the interest of both natural science and social science fields. This statement is supported by the top ten Scopus subject areas that contain publications on the topic: Business, Management and Accounting (663 publications), Computer Science (174 publications), Social Sciences (330 publications), Engineering (265 publications), Economics, Econometrics and Finance (190 publications), Decision Sciences (114 articles), Environmental Sciences (70 articles), Medicine (63 articles), Arts and Humanities (48 articles), and Energy (43 articles). These results suggest that, besides articles in traditional disciplines, there is an increasing emphasis on "innovate* culture" in various other fields, demonstrating a greater integration of interdisciplinary works across diverse fields.

4.2 Top-output Journals

Table 2 summarizes the number of articles and citations published in prominent journals related to the present subject. The number of published articles was utilized to rank the leading journals. Table 2 illustrates that leading prominent journals are published by seven different publishers. *Sustainability Switzerland*, *Research Technology Management*, and *Journal of Business Research* are the top three periodicals. *Technological Forecasting and Social Change*, which ranks the fourth periodical, published more journals than the other seven publishers. *European Journal of Innovation Management*, *International Journal of Innovation Management*, *Leadership and Organization Development Journal*, *Strategic Direction*, *Communications in Computer and Information Science,* and *International Journal of Innovation Science* are the remaining periodicals.

Out of a total of ten top journals, most are in Quartile 1 (Q1), two are in Quartile 2 (Q2), and two are in Quartile 4 (Q4). *Sustainability Switzerland* published the most papers on "innovate* culture" (17 publications) and received the highest number of citations (192 citations). It was subsequently followed by *Research Technology Management* and *Journal of Business Research*, with 15 and 11 publications, respectively, and the highest citation counts of 230 and 590, respectively.

Table 2. Leading journals on "innovate* culture" studies (Based on total publications).

Rank	Name of Journal	Quartile	TP (%)	TC	CiteScore (2021)	Most Cited Article	Times cited	Name of Publisher
1	Sustainability Switzerland	Q1	17	192	5	Sustainability condition of open innovation: Dynamic growth of Alibaba from SME to large enterprise	51	Multidisciplinary Digital Publishing Institute (MDPI)
2	Research Technology Management	Q1	15	230	4.7	Building a Radical Innovation Competency	98	Taylor & Francis
3	Journal of Business Research	Q1	11	590	11.2	The mediating role of an innovative culture in the relationship between absorptive capacity and technical and non-technical innovation	127	Elsevier
4	Technological Forecasting and Social Change	Q1	10	569	13.7	The moderating role of innovation culture in the relationship between knowledge assets and product innovation	180	Elsevier
5	European Journal of Innovation Management	Q1	9	570	7	Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis	292	Emerald Publishing
6	International Journal of Innovation Management	Q2	9	55	2.9	Organisational Culture and Leadership as Mediators of Service Innovation and Firm Competitiveness: A Study of an Emerging Economy	22	World Scientific
7	Leadership and Organization Development Journal	Q1	8	286	4.9	Organizational culture and innovation culture: Exploring the relationships between constructs	94	Emerald Publishing
8	Strategic Direction	Q4	8	6	0.1	Crafting a winning innovation strategy	3	Emerald Publishing
9	Communications in Computer and Information Science	Q4	7	9	0.9	Democratizing Innovation in the Digital Era: Empowering Innovation Agents for Driving the Change	4	Springer Nature
10	International Journal of Innovation Science	Q2	7	47	4.2	Innovative work behaviour through high-quality leadership	14	Emerald Publishing

Note: TP = Total publications; TC = Total citations

Technological Forecasting and Social Change held the fourth-highest position, with ten publications and a citation count of 569. *European Journal of Innovation Management* ranked fifth with nine articles and 570 total citations, followed by the *International Journal of Innovation Management* with nine publications and 55 total citations.

Although the *Leadership and Organization Development Journal* is ranked seventh (eight papers), it has a citation count of 286. This journal is followed by *Strategic Direction* with eight publications, and *Communications in Computer and Information Science* with seven publications, with a total citation count of six and nine, respectively. The *International Journal of Innovation Science* is ranked at the bottom, with a total of seven articles published. Despite its bottom position in the rankings, *Social Media & Society* has a higher CiteScore than both *Communications in Computer and Information Science* and *Strategic Direction*.

In terms of CiteScore 2021, four publications scored above 5.0, namely *Technological Forecasting and Social Change*, with a score of 13.7, followed by *Journal of Business Research* at 11.2, *European Journal of Innovation Management* at 7.0, and *Sustainability Switzerland* (5.0). The publications with the lowest score are *Communications in Computer and Information Science* (0.9) and *Strategic Direction* (0.1). According to Maharjan *et al.* (2022), CiteScore is a crucial criterion for selecting the most eligible journals for publication by researchers. In order to enhance the contributions of future researchers, the author has provided an overview of prominent journals (Refer to Table 3) and the corresponding CiteScore and publications.

Table 3. Ten top journals on "innovate* culture" studies

Rank	Name of Journal	CiteScore in 2021	Name of Publisher	Number Of Publications
1	Technological Forecasting and Social Change	13.7	Elsevier	10
2	Journal of Business Research	11.2	Elsevier	11
3	European Journal of Innovation Management	7	Emerald Publishing	9
4	Sustainability Switzerland	5	Multidisciplinary Digital Publishing Institute (MDPI)	17
5	Leadership and Organization Development Journal	4.9	Emerald Publishing	8
6	Research Technology Management	4.7	Taylor & Francis	15
7	International Journal of Innovation Science	4.2	Emerald Publishing	7
8	International Journal of Innovation Management	2.9	World Scientific	9
9	Communications in Computer and Information Science	0.9	Springer Nature	7
10	Strategic Direction	0.1	Emerald Publishing	8

Source: Scopus database

4.3 Leading Countries, Universities and Cooperation

Table 4 summarizes the most prolific nations that have contributed to the global expansion of "innovat* culture" studies based on the total publications of the country (TPC). According to the data, the first-ranked nation is the United States, with 186 papers accounting for 67.2% of publications worldwide and emerging as the leader in "innovat* culture" research. China ranks second with 131 publications (70.99% of SCP), followed by the United Kingdom with 88 publications (55.68% of SCP) and Germany with 73 publications (68.49% of SCP).

Besides the four leading countries stated above, five additional countries (Malaysia, Australia, Spain, Canada, and India) generated 40 to 69 publications. France, the Netherlands, Brazil, Italy, South Korea, and the Russian Federation ranked tenth to fifteenth, with total publications ranging from 27 to 39.

Table 4. Fifteen top countries and universities on "innovat* culture" studies.

Rank	Name of Nation	TPC	SCP	Name of the Leading Academic Institution	TPI
1	United States	186	67.2%	Florida State University	7
2	China	131	70.99%	Zhejiang University	10
3	United Kingdom	88	55.68%	Cranfield University	6
4	Germany	73	68.49%	Universität Bamberg	3
5	Malaysia	69	62.32%	Universiti Sains Malaysia	19
6	Australia	62	66.13%	Queensland University of Technology	5
7	Spain	61	60.66%	Universitat de València	7
8	Canada	41	53.66%	University of Saskatchewan	12
9	India	40	77.5%	University of Delhi	3
10	France	39	43.59%	CNRS Centre National de la Recherche Scientifique	5
11	Netherlands	34	58.82%	Delft University of Technology	6
12	Brazil	31	74.19%	Universidade de São Paulo	5
13	Italy	29	55.17%	Università degli Studi di Torino	3
14	South Korea	28	64.29%	Sungkyunkwan University	4
15	Russian Federation	27	88.89%	HSE University	6

Note: TPI = Total publications of the institute; SCP = Single-country publications; TPC = Total publications of the country

In addition, the results also illustrate that only one country delivered less than 50% of single-country publications (SCP): France (43.59%). The rest of the fourteen countries has been over 50%: United States (67.20%), China (70.99%), United Kingdom (55.68%), Germany (68.49%), Malaysia (62.32%), Australia (66.13%), Spain (60.66%), Canada (53.66%), India (77.50%), Netherlands (58.82%), Brazil (74.19%), Italy (55.17%), South Korea (64.29%), and the Russian Federation (88.89%). Alzard *et al*. (2022) stated that a high percentage of SCP demonstrates

increased cooperation between nations. International cooperation is essential for the dissemination of knowledge and the advancement of publication rankings.

As per the World University Rankings 2023, five of the top universities shown in Table 4 are among the world's top 150 universities (QS World University Rankings, 2023). One university, Zhejiang University, is ranked among the top 50 best world universities, securing the 42nd position. The Delft University of Technology follows closely at 61st, with Sungkyunkwan University at 99th and Universidade de São Paulo at 115th. This finding underscores the growing attention and recognition that "innovat* culture" is garnering among the world's leading academic institutions. Table 5 displays the top 30 countries and institutions in "innovat* culture" research.

Table 5. Fifteen top countries and universities on "innovat* culture" studies.

Rank	Name of Institution	Country	No. of Publications
1	Universiti Sains Malaysia	Malaysia	19
2	University of Saskatchewan	Canada	12
3	Edwards School of Business	Canada	12
4	Zhejiang University	China	10
5	Universiti Utara Malaysia	Malaysia	9
6	City University of Hong Kong	Hong Kong, China	8
7	Universiti Teknologi Malaysia	Malaysia	8
8	Florida State University	United States	7
9	Universitat de València	Spain	7
10	Universidad de Oviedo	Spain	7
11	Universitat Politècnica de València	Spain	7
12	Univerzita Hradec Králové	Czechia	6
13	Universiti Teknologi MARA	Malaysia	6
14	Cranfield University	England	6
15	Delft University of Technology	Netherlands	6
16	Thammasat University	Thailand	6
17	Universidad de Extremadura	Spain	6
18	HSE University	Russia	6
19	Univerza v Ljubljani	Slovenia	6
20	Islamic Azad University	Iran	6
21	McMaster University	Canada	6
22	Middlesex University Business School	England	6
23	Graduate School of Business	Malaysia	6

Rank	Name of Institution	Country	No. of Publications
24	Universidade de São Paulo	Brazil	5
25	CNRS Centre National de la Recherche Scientifique	France	5
26	Queensland University of Technology	Australia	5
27	Radboud Universiteit	Netherlands	5
28	Erasmus Universiteit Rotterdam	Netherlands	5
29	Shanghai Jiao Tong University	China	5
30	Universidad Autónoma de Madrid	Spain	5

Figure 2 presents a representation created by the authors using VOS Viewer, the most popular information visualization application. It illustrates the connections between the countries engaging in cutting-edge research on innovate* culture.

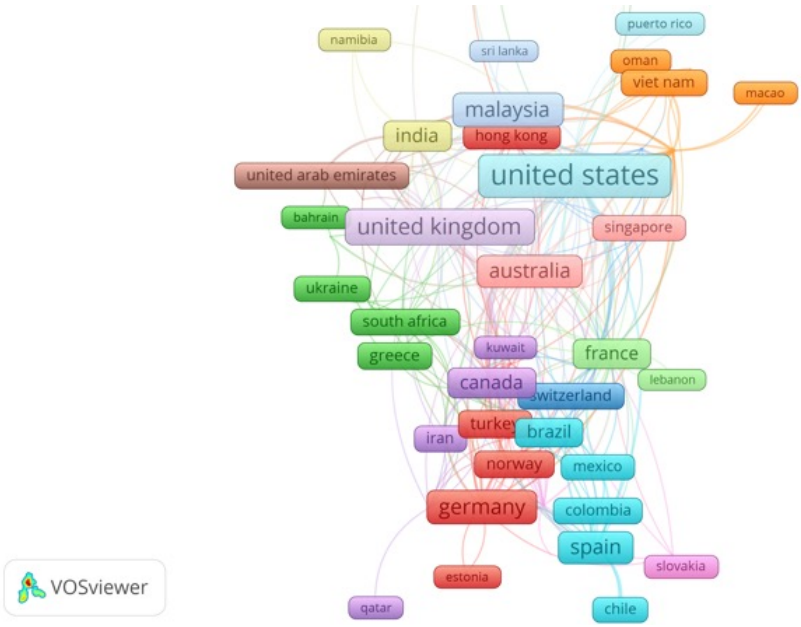

Figure 2. Visualized map of co-authorships extracted from the bibliometric data

The United States has the most affiliations (32 links, 83 co-authorship), followed by the United Kingdom (30 links, 60 co-authorship), Australia (24 links, 39 co-authorship), China (17 links, 50 co-authorship), and the remaining nations. In addition, the analysis reveals that only 35% of the countries had more than 20 international collaborative publications. Furthermore, two countries, Israel and Jordan, published "innovat* culture" papers without affiliation with any other nation. It is proposed that these countries increase the number of international students at their universities and promote a diverse working culture. Additionally, they should increase funding for research and encourage a climate of international collaborative research at public institutions to increase international cooperation.

4.4 Scholars with the Greatest Output and High Citations

Table 6 ranks 15 top authors on the subject of "innovat* culture" with the corresponding number of publications and citations. These authors are from nine different countries, including Malaysia (4), Canada (4), Spain (1), the United States (1), the United Kingdom (1), the Russian Federation (1), the Czech Republic (1), the Netherlands (1), and Thailand (1).

Dobni, C.B. is the most prolific contributor in the Scopus database, with 13 articles (TC = 372) and an h-index of 6, followed by Ahmad, N.H., with seven published articles, a total citation of 112, and a five h-index. They are followed by Klassen, M. (Canada), Halim, H.A (Malaysia), and Hanifah, H. (Malaysia) as the next three most productive authors, with a total of seven, six, and six publications, respectively.

Santos-Vijande, M.L. (ranked sixth, from Spain) obtained the highest total of 407 citations among the other top 15 productive authors. The seventh and eighth writers are Vafaei-Zadeh, A. and Wilson, G.A, each with six articles with a total of 77 and 66 citations, respectively. Meissner, D. (ranked ninth) from the Russian Federation and Abhari, K. (ranked tenth) from the United States have a total of 236 and two citations, respectively, with h-indexes of four and one. Kleinschmidt, E.J. from Canada is the most productive author, ranking 11th with an h-index of four. With four publications, the remaining authors ranked 12th to 15th. Among these authors, Sokolova (ranked 15th) has the most citations (84). Based on the number of Scopus-published papers and the high number of citations, it is possible to conclude that the scholars mentioned above are the most prominent within the field of "innovat* culture."

4.5 Author Keyword Analysis

In order to avoid analyzing similar author keywords, the thesaurus file's keywords were renamed. As a result of analyzing the thesaurus file, 87 author keywords that have occurred at least five times were discovered. From these findings, 28% (25 author keywords) were utilized five times, 11% (ten author keywords) were used six and seven times, respectively, 9% (eight author keywords) were utilized eight times, 8% (seven author keywords) were used nine times, and 31% (27 author keywords) were utilized at least ten times. The visualized map of author keywords is depicted in Figure 3, which will be explored in further detail in the following paragraphs.

5 Discussion

5.1 Concept and Terminology

This section discusses the graphic visual map in Figure 3 by focusing on the subject of "innovat* culture." The result of the keyword mapping analysis serves as the foundation for the co-occurrence mapping of significant or unique terms in a particular article. Mapping is an explanation that enables an individual to perceive the configuration, dynamics, interdependencies, and interactions of knowledge elements (Van and Waltman, 2010). Figure 3 depicts the visualization of the bibliometric map network for publications on the topic of "innovat* culture." This mapping presents several key terms that have frequently appeared in publications on the topic of "innovat* culture" over the past 50 years. These terms are displayed along with their relationships to other key terms within the nine clusters.

Table 6. 15 top authors in "innovat* culture" studies.

Rank	Name of Author	Author ID in Scopus	First Publication Year*	TP	h-index	TC	Current Affiliation	Country
1	Dobni, C.B.	7801360535	2008	13	6	372	Edwards School of Business	Canada
2	Ahmad, N.H.	35777347300	2017	7	5	112	Universiti Sains Malaysia	Malaysia
3	Klassen, M.	50561602600	2015	7	4	53	Edwards School of Business	Canada
4	Halim, H.A.	36172546800	2017	6	3	49	School of Management	Malaysia
5	Hanifah, H.	57195371636	2017	6	3	77	Graduate School of Business	Malaysia
6	Santos-Vijande, M.L.	57194982405	2007	6	5	407	Universidad de Oviedo	Spain
7	Vafaei-Zadeh, A.	57195372582	2017	6	3	77	Graduate School of Business	Malaysia
8	Wilson, G.A.	56112645200	2021	6	2	16	University of Regina	Canada
9	Meissner, D.	55337583500	2013	5	4	236	HSE University	Russian Federation
10	Abhari, K.	56960654500	2020	4	1	2	Fowler College of Business	United States
11	Kleinschmidt, E.J.	7003979811	2007	4	4	335	Université McGill	Canada
12	Mehralian, G.	54889094600	2019	4	3	60	Nottingham Trent University	United Kingdom
13	Nieboer, A.P.	6506518114	2012	4	4	56	Erasmus School of Health Policy & Management	Netherlands
14	Panuwatwanich, Kriengsak	24921934000	2017	4	3	30	Sirindhorn International Institute of Technology	Thailand
15	Sokolova, M.	54788299100	2017	4	4	84	Univerzita Hradec Kralove	Czech Republic

TC = Total citations; TP = Total publications

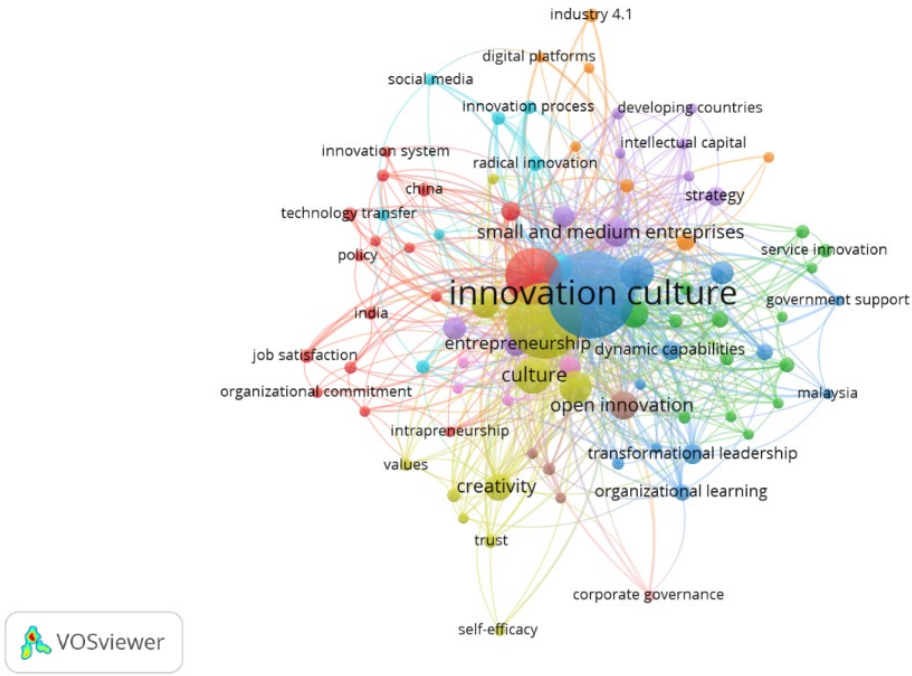

Figure 3. Visualized map of author keywords extracted from the bibliometric data

Cluster 1. Organizational Culture

The first and largest thematic cluster comprises 16 author keywords, including organizational culture (141 occurrences, 59 links), design thinking (16 occurrences, 17 links), China (nine occurrences, eight links), job satisfaction (nine occurrences, seven links), technology transfer (nine occurrences, seven links), human resource management (seven occurrences, nine links), India (seven occurrences, nine links), innovation policy (seven occurrences, ten links), globalization (six occurrences, eight links), intrapreneurship (six occurrences, nine links), policy (six occurrences, six links), innovation system (five occurrences, four links), national innovation system (five occurrences, nine links), organizational commitment (five occurrences, five links), research and development (five occurrences, six links), and teamwork (five occurrences, nine links). Most articles in this cluster demonstrated that to create a thriving innovation system, successful implementation of innovation policies within a national innovation system requires a strong organizational culture that embraces design thinking (Camagni and Capello, 2017), promotes job satisfaction, facilitates technology transfer (Den Hertog & Bilderbeek, 2001), fosters effective human resource management (Azizi *et al.,* 2021), encourages research and development, and adapts to the challenges posed by globalization (Binz and Truffer, 2017). In this cluster, one of the most cited articles is "Organisational Culture and Leadership as Mediators of Service Innovation and Firm Competitiveness: A Study of an Emerging Economy" (TC = 55), authored by Anning (2016).

Cluster 2. Innovation Dynamics

The second thematic cluster comprises 14 author keywords, including firm performance (37 occurrences, 29 links), market orientation (13 occurrences, 13 links), product innovation (11 occurrences, 13 links), social capital (nine occurrences, seven links), Australia (eight occurrences, seven links), competitiveness (eight occurrences, eight links), corporate social responsibility

(eight occurrences, ten links), service innovation (eight occurrences, five links), marketing (seven occurrences, nine links), financial performance (five occurrences, eight links), green innovation (five occurrences, five links), process innovation (five occurrences, 11 links), resource-based view (five occurrences, six links), and social innovation (five occurrences, nine links). Most articles in this cluster presented that the integration of product innovation (Aksoy, 2017), service innovation (Zheng *et al*., 2018), process innovation (Najafi *et al.,* 2018), and social innovation, as well as the cultivation of social capital and the implementation of corporate social responsibility, plays a crucial role in improving firm performance (Xie *et a*l., 2019) by enhancing competitiveness, and fostering sustainable growth (Hermundsdottir and Aspelund, 2021).

Cluster 3. Strategic Innovation

The third thematic cluster comprises 12 author keywords, including innovation culture (328 occurrences, 78 links), innovation performance (49 occurrences, 38 links), innovation strategy (23 occurrences, 19 links), transformational leadership (19 occurrences, 19 links), dynamic capabilities (16 occurrences, 14 links), organizational learning (13 occurrences, 13 links), new product development (12 occurrences, 14 links), absorptive capacity (seven occurrences, 11 links), Malaysia (six occurrences, eight links), organizational structure (six occurrences, 11 links), competitive advantage (five occurrences, ten links), and government support (five occurrences, seven links). Most articles in this cluster revealed that establishing an innovation culture supported by a solid innovation strategy (Aksoy, 2017), dynamic capabilities (Farzaneh *et al.,* 2021), organizational learning, absorptive capacity, and an adaptable organizational structure (Dedahanov *et al.,* 2017), is essential for driving innovation performance and achieving sustainable competitive advantage. In this knowledge cluster, one of the most cited articles is "The Mediating Role of an Innovative Culture in the Relationship Between Absorptive Capacity and Technical and Non-technical Innovation" (TC = 590), authored by Ali and Park (2016).

Cluster 4. Innovative Leadership

This thematic cluster comprises 11 author keywords, including innovation (247 occurrences, 70 links), culture (59 occurrences, 34 links), knowledge management (48 occurrences, 38 links), creativity (33 occurrences, 24 links), leadership (32 occurrences, 20 links), collaboration (eight occurrences, ten links), trust (eight occurrences, nine links), values (seven occurrences, ten links), flexibility (five occurrences, nine links), self-efficacy (five occurrences, four links), and Vietnam (five occurrences, seven links). In this thematic cluster, one of the articles of total publication articles and Quartile 1 (Q1) of the top journals is "Building a Radical Innovation Competency" (TP = 15), authored by O'Connor and Ayers (2015). Most articles in this cluster revealed that a robust culture that emphasizes knowledge management (Abbas and Sağsan, 2019), fosters innovation, encourages cooperation, embraces flexibility, instills self-efficacy (Dessyana and Riyanti, 2017), promotes trust, and upholds shared values is necessary for fostering an innovative leadership.

Cluster 5. Sustainable Entrepreneurship

This thematic cluster comprises ten author keywords, including small and medium enterprises (37 occurrences, 34 links), entrepreneurship (25 occurrences, 20 links), technological innovation (24 occurrences, 11 links), sustainability (21 occurrences, 17 links), strategy (16 occurrences, 13 links), Croatia (seven occurrences, nine links), knowledge economy (six occurrences, ten links), developing countries (five occurrences, six links), intellectual capital (five occurrences, ten links), and regional development (five occurrences, seven links). Most articles in this cluster presented that in the era of the knowledge economy (Popkova, 2019), the strategic promotion

of entrepreneurship and the development of small and medium-sized businesses, with a focus on sustainability and the exploitation of intellectual capital (Jinini *et al.,* 2019), are crucial drivers for regional development. One of the prominent journals from Quartile 1 (Q1) of the top journals in this cluster is "Sustainability Condition of Open Innovation: Dynamic Growth of Alibaba from SME to Large Enterprise" (TP = 17, TC = 192), authored by Yun *et al.* (2020).

Cluster 6. Transformation

This thematic cluster comprises eight author keywords, including innovation management (34 occurrences, 29 links), radical innovation (11 occurrences, ten links), innovation process (nine occurrences, eight links), management (nine occurrences, 11 links), product development (eight occurrences, eight links), case study (seven occurrences, ten links), social media (seven occurrences, five links), and idea generation (five occurrences, eight links). One of the articles included in the total publication count and belonging to Quartile 1 (Q1) of top journals in this thematic cluster is "Building a Radical Innovation Competency" (TP = 15), authored by Connor and Ayers (2015). Most articles in this cluster demonstrated that effective innovation management is essential for fostering radical innovation (Gomes *et al.*, 2019) through efficient product development processes, leveraging the power of social media platforms to improve idea generation (Carlson *et al.*, 2018), and propel transformational breakthroughs.

Cluster 7. Digital Transformation

This thematic cluster comprises seven author keywords, including innovation capability (15 occurrences, 20 links), change management (nine occurrences, nine links), industry 4.1 (eight occurrences, three links), digitalization (six occurrences, nine links), digital platforms (five occurrences, six links), digital transformation (five occurrences, seven links), and national culture (five occurrences, three links). Most articles in this cluster revealed that it is essential to develop innovation capabilities and embrace change management practices (Doppelt, 2017) in order to adapt to the demands of Industry 4.0, where digitalization, digital platforms, and digital transformation (Gerrikagoitia *et al.*, 2019) play crucial roles in driving organizational success.

Cluster 8. Collaborative Innovation

This thematic cluster comprises four author keywords, including open innovation (34 occurrences, 24 links), human capital (seven occurrences, eight links), innovation climate (six occurrences, nine links), and information and communications technology (51 occurrences, six links). In this knowledge cluster, one of the prominent journals from Quartile 1 (Q1) of top journals is "Sustainability Condition of Open Innovation: Dynamic Growth of Alibaba from SME to Large Enterprise" (TP = 17, TC = 192), authored by Yun *et al.* (2020). Most articles in this cluster discovered that the cultivation of an innovation climate supported by open innovation practices, the exploitation of human capital's potential, and the utilization of information and communications technology (Nguyen *et al.*, 2020) enables seamless cooperation.

Cluster 9. Strategy

This thematic cluster comprises five author keywords, including education (20 occurrences, 15 links), innovation orientation (six occurrences, nine links), corporate governance (six occurrences, seven links), entrepreneurial orientation (five occurrences, nine links), and strategic management (five occurrences, nine links).

5.2 Topics of Interest

According to the result of the author-keyword analysis, this section provides summaries for aspiring scholars who are eager to learn more about the term "innovat* culture" and expand their research opportunities. According to the data result, the three most frequently used author keywords are "innovation culture" (328 occurrences, 78 connections), "innovation" (247 occurrences, 70 connections), and "organizational culture" (141 occurrences, 59 connections). Besides, the analysis also presents the "national culture" (five occurrences, three links), which establishes the broader context within which organizational and innovation cultures emerge. These cultures, in turn, contribute to shaping the overall "innovation climate" (six occurrences, nine links) within a country or organization.

In today's constantly changing and highly competitive marketing, a country or organization must have an innovation strategy (23 occurrences, 19 links) to clarify its developing direction, such as innovation orientation, market orientation, or entrepreneurial orientation (five occurrences, nine links) (Masa'deh *et al.*, 2018). In order to achieve sustainability and gain a competitive advantage, a country or organization should embrace creativity (33 occurrences, 24 links), open innovation (34 occurrences, 24 links), and innovation (247 occurrences, 70 links) (Srisathan *et al.*, 2020). The information mentioned above aligns with the findings presented in Table 2, which displays the search outcomes. Notably, one of the most referenced articles is titled "Sustainability Condition of Open Innovation: Dynamic Growth of Alibaba from SME to Large Enterprise" by Yun *et al.* (2020).

Furthermore, regarding the aspect of country or organization, factors such as regional development (five occurrences, seven links) and government support (five occurrences, seven links), including policies, play a significant role, as discussed by Mitra (2019) and Owen *et al.* (2018). For instance, an innovative policy promotes the continuous improvement of small and medium enterprises, encourages the creation of new products, services, and processes, and ultimately drives growth and success (Aksoy, 2017).

In terms of the organization, including small and medium enterprises (37 occurrences, 34 links), innovation often thrives in collaborative environments (such as teamwork (five occurrences, nine links) where diverse perspectives collide (Torfing, 2019). The findings demonstrate the importance of organizational structure or organizational management for innovation, such as knowledge management (48 occurrences, 38 links), innovation management (34 occurrences, 29 links), change management, strategic management (five occurrences, nine links), or human resource management. The organization should be able to clarify and understand which type of management will aid in the design of an innovation culture within the organization (Keles and Battal, 2017).

Management practices not only value the organization but also the employees. It promotes individual learning and development while encouraging employees' problem-solving and flexibility (five occurrences, nine links) (Agarwal and Farndale, 2017). For example, the practice allows the employee to exchange ideas and knowledge from different areas of expertise. It encourages individuals to view challenges as opportunities for innovation, finding new solutions to issues face, adapting to changing circumstances, learning from failures, and continuously improving their dynamic capabilities, innovation capability, or absorptive capacity to increase their competitiveness, gain competitive advantage (five occurrences, ten links), and seek job satisfaction in their respective fields (Barney and Clark, 2007).

The consequences of an "innovate* culture" have been widely debated. The development of a strong innovation culture, influenced by the complex interplay of societal factors and the knowledge economy (Marques and Morgan, 2021), is critical to improving financial performance (five

occurrences, eight links), innovation performance (49 occurrences, 38 links), and firm performance (37 occurrences, 29 links). Companies can develop a sustainable competitive advantage by nurturing and effectively leveraging human capital, which includes the skills, knowledge, and capabilities of individuals within an organization to develop leadership (32 occurrences, 20 links) or transformational leadership. Additionally, fostering relationships, networks, and cooperation among individuals and groups facilitates the development of entrepreneurship (25 occurrences, 20 links) or intrapreneurship. Moreover, tapping into intellectual capital (five occurrences, ten links), which includes an organization's innovation knowledge, expertise, and intellectual property (Hsu and Chen, 2019), further contributes to this advantage.

Furthermore, a comprehensive innovation culture that is successfully implemented involves various forms of innovation, such as technological innovation (24 occurrences, 11 links), service innovation, social innovation (five occurrences, nine links), radical innovation, and product innovation throughout the entire new product development and product development lifecycle (Slater *et al.*, 2014). This process entails utilizing information and communications technology (five occurrences, six links), digital platforms (five occurrences, six links), and social media as enablers that enable seamless cooperation, knowledge sharing, and market insights (Edwards-Schachter, 2018). Furthermore, adopting technology transfer practices and digital transformation principles (five occurrences, seven links) ensures that organizations can adapt to the changing business landscape, capitalize on emerging opportunities, and drive long-term growth in the digital age. This finding corresponds to the search results shown in Table 3, where the first leading journal is "Technological Forecasting And Social Change," with a score of 13.7.

5.3 Future Direction

5.3.1. Economic Development and Support

In a context of uncertainty and a rapidly changing environment that demands constant adaptation, innovation is the deciding factor for differentiation and competitiveness for nations, countries, or regions (Cox and Khan, 2017). Keeping abreast of the shifts is crucial to the continued success of any nation or organization. Nevertheless, very few countries or organizations are ready to adjust to these changes (Dutta *et al.*, 2016). In order to remain competitive with the rest of the world and stay profitable, countries or organizations must prioritize innovation. Consequently, it is important for countries to identify the factors that have a major impact on innovation to ensure that they can more confidently direct their efforts and resources to achieve a competitive advantage (Arsawan *et al.*, 2020). For instance, regional development, government support, and the effects of a national innovation system on modern societies are believed to be key factors contributing to several benefits, including advancements in competitive advantage and financial performance (Al-Khatib *et al.*, 2021; Mohelska and Sokolova, 2018; Nawaz Khan *et al.*, 2019). By taking inspiration from the questions below, future researchers could undertake studies to contribute to the body of knowledge and address the emerging issues:

- How does national culture influence organizational innovation, culture, and practices, and what tactics could be employed to utilize cultural strengths for innovation?
- What are the most effective government support efforts and policies for fostering an innovation culture in various contexts?
- What impact do regional development and the presence of innovation systems have on the establishment and sustainability of an innovation culture?

5.3.2. Innovation and Technology

Technological changes contribute to an increase in national prosperity through innovation (Dutta *et al.*, 2016). Since digital transformation has been growing and evolving on a global scale, businesses must be aware of these changes to survive. For instance, green innovation has influenced green organizational culture (Muisyo and Qin, 2021; Wang, 2019; Zameer *et al.*, 2020), which impacts the development orientation of the organization. Moreover, the economy tends to stagnate when technological innovation is absent. In order to remain competitive in the fiercely competitive market, one of the greatest challenges facing modern businesses is understanding how to foster an innovation culture that thrives in the face of constant technological advancements, such as information and communications technology (Chatterjee *et al.*, 2021; Chou *et al.*, 2019) or innovation system (Chen *et al.*, 2020; Stojčić, 2021). By drawing inspiration from the questions posed below, future researchers could examine the issues to make further contributions to the related literature.

- How can organizations stimulate and facilitate idea generation to foster an innovative culture?
- What are the essential elements and dynamics of innovation systems that facilitate the growth of innovation culture?
- How does the use of information and communications technology affect the innovation culture of businesses?

5.3.3. Entrepreneurship and Organizational Factors

Previous research has investigated the significance of innovative culture as an effective factor or practice in organizational commitment, operational performance, teamwork, and other aspects (Çetin *et al.*, 2017; Iranmanesh *et al.*, 2021; Solís and Mora-Esquivel, 2019). Due to the intense competition among organizations, a clear understanding of the influential factors, such as innovative culture, which influence entrepreneurial orientation or organizational development, is required (Al-Swidi and Mahmood, 2011; Khan *et al.*, 2020). According to growing evidence, an innovative culture is the key driver of innovation development (Lašáková *et al.*, 2017). The questions listed below could serve as an inspiration for future researchers planning to contribute to the related body of literature.

- How does the organizational commitment to innovation influence the development and maintenance of an innovation culture in various types of organizations?
- What are the key factors that drive entrepreneurial orientation in organizations, and how do they contribute to the overall innovation culture?
- How do strategic management practices affect the development and effectiveness of an innovation culture within organizations?

5.3.4. Process and Performance

The innovation process has included two primary steps, namely idea generation and opportunity recognition (O'Connor and Rice, 2001). This process not only focuses on social innovation but also organizational innovation and process innovation, aiming to cultivate a national or organizational strategy and culture (Sensmeier, 2019). On the other hand, innovation has revealed various aspects of flexibility, such as market flexibility (Thomas, 2021), strategic flexibility (Bock *et al.*, 2012), and human resources flexibility (Do *et al.*, 2016). Researchers aiming to make further contributions to the related body of knowledge can refer to the questions and suggestions below as an inspiration.

- How to foster a culture of innovation within an organization, and what are the best methods for introducing and overseeing process innovation?
- How does social innovation affect the innovation culture of businesses as a whole, and how can it be integrated into innovation plans most efficiently?
- How organizations that value process innovation and adaptability while embracing social innovation are better able to cultivate a culture of innovation and make a positive social impact?

6 Implications and Limitations

When contemplating the implications of the present study, it is important for future research to acknowledge some of the constraints present. Firstly, the keyword search strategy in this study restricted the search scope only to include titles and abstracts that contained the term 'innovat* culture'. Consequently, some scholarly works on "innovat* culture" could have been missed. Although the term "innovat* culture" was not specifically used in their research, some academics may have employed concepts that capture the core of this phenomenon. In order to obtain a complete picture, future researchers should compare studies on "innovat* culture" across different databases, such as between Web of Science (WOS) and Scopus. This study has limitations in that it only examines "innovat* culture" in January of 2023 and does not include publications from the rest of the year. While more investigation into "innovat* culture" is needed, the results of the current study can help shape future investigations.

Secondly, the outcomes of this bibliometric study bear noteworthy ramifications for the advancement of the nation and its governance, specifically from an organizational standpoint. Besides, organizations, such as SMEs, now face the necessity of adopting business sustainability practices. For a company to be competitive and survive in the market, prioritizing sustainable innovation is crucial. Nevertheless, SMEs in emerging markets from developing countries continue to lack the resources necessary to become more innovative (Najib *et al.*, 2021), especially under the context of Industry 4.0. Future research should focus on establishing resources to support the innovation development of different nations and areas, individuals, and groups with a background in innovation.

Thirdly, one of the most recent author keywords discovered in this analysis is "product innovation." Many other developing countries are still in the early stages of developing their innovation practices. Industrial development lags in developing countries due to a lack of and immaturity in technology and product innovation culture (Liang *et al.*, 2022). Future research may consider highlighting the fundamental issues of innovation culture from both internal and external perspectives. This approach will provide valuable preliminary insights into the innovation culture confronting developing countries.

Subsequently, managers should cultivate an innovative culture in their organizations to improve their innovative performance and competitive advantage. Future research may consider highlighting the importance of synchronizing human resource management strategies with innovation objectives, such as offering sufficient training and incentives to encourage their employees' involvement in innovative endeavors (Al-Khatib *et al.*, 2021; Jotabá *et al.*, 2022).

Lastly, policymakers should utilize bibliometric analysis to discern pivotal domains of innovation and allocate research and development money accordingly. This approach can facilitate the advancement of research in domains with the potential for significant influence. In addition, policymakers should utilize the recognized skills and knowledge areas in innovation culture to

formulate education and training policies that guarantee the workforce possesses the essential talents for promoting innovation.

7 Conclusion

The bibliometric study provided a comprehensive understanding of the research trajectory pertaining to the concept of "innovat* culture" by examining a total of 1,224 journal articles sourced from the Scopus database. The scholarly discourse on this subject has exhibited a consistent upward trend since the beginning of 2005. The analysis discovered that the United States and China are the leading countries in the study of "innovat* culture." According to the co-authorship analysis, the United States has the most cooperation with other countries. Other countries, such as Israel and Jordan, are encouraged to broaden their research tracks on "innovat* culture." The study topic was identified as an ongoing subject of investigation within the fields of business and social sciences. Furthermore, "developing countries" and "product innovation" could be future research topics to understand better "innovat* culture."

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