



Patent Analysis in India: A Bibliometric Study

Mohammad Zameer^a and Somipam R. Shimray^b

^aResearch Scholar, Department of Library and Information Science, Babasaheb Bhimrao Ambedkar University, Lucknow, Pin-226025, India.

Email: idofzameer@gmail.com

^bAssistant Professor, Department of Library and Information Science, Babasaheb Bhimrao Ambedkar University, Lucknow, Pin-226025, India.

Email: srshimray@yahoo.com

Received: 29 November 2024; Accepted: 04 April 2025

This paper aims to conduct a bibliometric analysis of the literature on patent analysis published by Indian researchers using the Scopus database from 2005 to 2024. Data is extracted from the Scopus database for the bibliometric study. Biblioshiny and VOSviewer are used as software to analyze the performance of the literature on patent analysis in India. There is a fluctuation in the yearwise publication outputs and citations of the articles. Monika Gupta, R K Sastry, and A K Tiwari were the prominent author. The institution “Jaypee Institute of Information Technology” in Delhi and the journal “Journal of Intellectual Property Rights” are identified as the pivotal places of origin of the articles. The article “Phycobiliproteins as a Commodity: Trends in Applied Research, patents and Commercialization” by Sekar Soundarapandian is the most cited article, published in 2008. The conceptual structure of the literature on patent analysis is analyzed and visualized using keywords co-occurrence to identify the emerging themes of the aforementioned topic. These findings assist practitioners, policymakers, and editors in further development.

Keywords: Patent Analysis, Patent Analytics, Bibliometric Analysis, India, Biblioshiny, VOSviewer

Introduction

Creating and innovating things is what differentiates humans from other creatures. It works as an evolution in society. However, as time passes, it becomes difficult to understand what was created by whom, as many started showing ownership of other works. To solve this problem, patents have come into the picture. A patent is an agreement between the person who created it and the government that protects the creator from infringement. Filippo Brunelleschi, an architect and engineer, was granted the first recorded patent in 1421 for a three-year monopoly on manufacturing a barge with a hoisting mechanism for transporting marble¹. As time passes, many patents are given to different inventors from different countries. These Patents have to be analyzed to provide evidence-based information that assists organizations in making better decisions for further research and development of innovation policies, IP commercialization and licensing, research collaboration, and many others. For this reason, there is a need for Patent analysis. However, in this study, the publications related to patent analysis are going to be analyzed through bibliometric analysis. As innovation plays a significant

part in the development of a country, India is used as the country in which the publications are going to be measured. This study helps readers understand India's current worth and future potential in innovation. As far as we know, no such studies exist that conduct a thorough bibliometric analysis on “Patent Analysis” for this country, i.e., India. To fill this gap and find some unanswered questions, this study conducted a bibliometric study of the publications of patent analysis in India from 2005 to 2024.

Literature Review

According to the World Intellectual Property Organization (IPO), a patent is an exclusive right granted for an invention. Aithal & Aithal² explained in their article that a patent is a right granted to the inventor that prevents others from making, using, selling, or importing the invention without his/her permission. From the above, it can be concluded that a legal document granted by the government to the inventor for an invention of a product, process, new model, improved system, improved process, or new technical solution for a problem is called a Patent. It is of three types as described by the USPTO:

1. Utility Patents: These patents are for inventing a new or enhanced and useful procedure, machine, article of manufacture, or composition of matter.
2. Design Patents: These patents are for inventing a new, original, and ornamental design for an article of manufacture.
3. Plant Patents: These patents are for inventing or discovering and asexually reproducing any distinct and new variety of plants.

Analyzing or measuring these types of patents reveals insights into innovation in institutions and countries. For this reason, patent analysis is important. Patent analysis uses patent data to highlight innovation insights and trends in certain technological sectors. According to the World Intellectual Property Organization, Patent Analytics provides data-driven insights for strategic resolutions in research and development, innovation policies, intellectual property commercialization, and other areas and it emerged in 1990³. Analysis is the breaking down of an issue into smaller parts called elements or components to gain insights from them². Likewise, every element or component of the patent is used in analysis to gain insights. There are several common patent-based measures like technological novelty, technological impact of the patent, and innovation activity⁴. To capture the newness of the technology, the researchers use citations, technical keywords, and claim structures of the patents. To measure the technological impact, the researchers will use the forward citations to measure the impact and relevance of the patents. Innovation activities of the patents are to track the output from the creations of human minds and the shift in a particular area by tracking patents, patent applications, or inventor activity. There are also various techniques, with a broad toolset and algorithms targeted at extracting relevant insights from patent data. Several researchers, such as⁵, employed text mining to analyze vast amounts of unstructured text data to identify concepts, patterns, subjects, keywords, and other aspects from patent data⁵. Text mining techniques assist with text segmentation, summary extraction, attribute selection, term association, cluster construction, subject identification, and information mapping for patent analysis⁶. To structure the patent data, the self-organizing map (SOM) and Louvain algorithm⁷ act as clustering techniques, assisting in knowledge representation and creating clusters inside the cluster of the patent data⁸, and the Association Rule Mining technique is used to find hidden relationship

variables in vast datasets of patents. It is also used to find the correlation and co-occurrence between data sets, such as Ampornphan & Tongngam⁹ in 2020. Furthermore, another technique, i.e., Word Embedding, is used to illustrate patent text for other downstream tasks, for instance, patent classification, patent recommendation, finding related patents, knowledge mining, etc¹⁰. However, K-Means Clustering and Latent Dirichlet Allocation (LDA) are the two techniques that are widely employed to get insight through patent analysis⁴. In this technique, K-Means Clustering is used to solve the clustering problem¹¹, whereas LDA is a topic modeling technique used to uncover the central topics and their distribution across the set of documents.¹²

A close review of patent analytics approaches and algorithms reveals a dynamic ecosystem with significant practical ramifications. By traversing this difficult terrain, Patent Analytics has the potential to be a transformative tool for innovation, intellectual property strategy, and informed decision-making in a continuously transforming mechanism in a technology context. However, in this study, a bibliometric analysis of all the literature on patent analysis yielded in India is conducted, which demonstrates the current and future scope of patent analysis in India. In 1969, the term “Bibliometrics” was coined by (1969), who defined it as the “statistical distributions of the processes relating to establishing a theory for the structural aspects of a library.” Previous studies have proven the importance of these studies. For example, Girgin Kalp¹³ conducted a bibliometric and co-citation network analysis on 129 publications from 1981 to 2021, revealing a gradual increase in scholarly production on patent valuation over the last two decades. They collected data using Scopus, an abstract and citation database and mined it using Python. Likewise, Jürgens & Herrero-Solana¹⁴ conducted a study on technical watches to extract insights from patents by carefully analyzing technical information. The above study discusses the similarities and dissimilarities between patent bibliometrics and classic bibliometrics. The four categories named “performance”, “technology”, “patent value”, and “collaboration indicators” are explored to find out the technology watch activities.

In the Indian context, some research has been undertaken to analyze the patent database. Abraham & Moitra¹⁵ undertook a study to analyze Indian patent data provided by the Indian Patent Office on the

subject of Electric Communication Techniques over a five-year period to obtain thorough information on technical innovation in India. The study also discussed the working and non-working papers in inPASS. They also compared the data to patents granted by the United States Patent and Trademark Office. This highlights the relevance of patent analysis in identifying technical forecasts and trends and assisting public and private institutions in developing new useful products and processes for the country. Similarly, Mukherjee¹⁶ conducted a study titled “Re-evaluating India’s Third Mission through Top Ranked Universities & Technological Institutes”. In this study, Mukherjee¹⁶ performed an analysis of the patenting activities of faculty members at the top 20 Indian academic and technical institutes from 2011 to 2020 using data from the inPASS database. According to his study, IIT Madras academicians invented 167 patents within this period, and IIT Mumbai is in second position with 156 patents. It shows that inventors prefer collaboration with their colleagues in the same institutions. Also, Padma Shri Prof. Thalappil Pradeep was granted 19 Indian patents from 2011 to 2020, and he is currently working at IIT Madras. Similarly, some more researchers in India have undertaken studies on patent analysis, such as Nandagopal¹⁷, Sharma & Jain¹⁸, Singh & Chakraborty¹⁹, Ravi & Janodia²⁰ and so on. Since the day when patents came into existence, there have been a large number of patents. It’s necessary to analyze those patents to understand the current innovations and future trends and create an awareness of collaborations between the patentee, countries, and institutions. To answer these questions, a comprehensive bibliometric study was conducted from 2001 to 2024 to analyze the publication of patent analysis, which belongs to India, using the Scopus database. No such study has been conducted to fill the gap in the existing body of knowledge.

Objectives: The objectives below guided this study.

1. To identify the yearwise growth rate of articles of Patent Analysis.
2. To identify the prolific authors in the field of Patent Analysis.
3. To examine the prominent institutions working in the field of Patent Analysis.
4. To examine the prominent sources that are producing the literature on the topic of Patent Analysis.
5. To identify the most influential article on the topic of Patent Analysis.
6. To examine the future trends on the topic of Patent Analysis.
7. To visualize the relation with the top 10 productive authors and sources.

Research Methodology

This section of the study comprises three stages. The first is to collect the data from the Scopus database. The second is the selection of software for analysis. The third stage is to analyze the extracted data and find the objectives of our study.

Search Strategy for Data Collection

This study used the Scopus database to conduct the study as it provides a broader range of curated high-quality data of abstracts and citations from a large number of peer-reviewed publications. The search string used to extract the data includes the topic name, i.e., “Patent Analysis” or “Patent Analytics” in the publications' title, abstract, or keywords. Furthermore, the search is limited to the articles whose country type is “India”, and the date of publication is from 2001 to 2024. Hence, the search is performed using the following formula: “TITLE-ABS-KEY (“Patent Analysis” OR “Patent Analytics”) AND PUBYEAR > 2000 AND PUBYEAR < 2025 AND (LIMIT-TO (AFFILCOUNTRY, “India”))”. This gives 111 resultant documents associated with the above formula. Notably, this data is extracted on the 11th of September 2024.

Data Analysis tools

Various tools are used to conduct a bibliometric analysis of publications. However, this study used MS Excel for cleaning and formatting the data, Bibliometrix-Biblioshiny, which is a package of R widely used for bibliometric analysis²¹, and VOSviewer version 1.6.20 for visualization of co-authorship and keyword analysis.

Data Analysis and Interpretation

As mentioned above, this study used the Biblioshiny, a R package for bibliometrics analysis.²¹ On loading the data in the web app of bibliophily, it analyzed the data and generated the following results. This study accumulated 111 documents of Patent Analysis from

the timespan of 2001 to 2024. The extracted documents are from 80 sources. The annual growth rate of the documents is 7.25%, with a document average age of 6.28. Furthermore, it reveals that the total number of authors is 343, of which 8 documents are single-authored documents. Also, out of 343 authors, 18.92% have international co-authorship.

1 Publication Trends

This section of the study presents the articles published per year on the topic of Patent Analysis. It assists the researcher in predicting future publications on the aforementioned topic.

1.1 Analysis of Publication Outputs (number of articles published per year)

Figure 1 illustrates the growth of the publications published per year. The graph shows that the document of patent analysis fluctuated during the marking period (2001- 2024). Also, from 2001 to 2014, it shows fluctuation, but in 2015, it shows a

sudden rise with 11 documents. The lowest growth rates were observed in 2002 and 2003, with no publications recorded, which can be attributed to the limited awareness of the topic during those years. From 2019 onwards, there was a dramatic increase in literature, driven by the significant shift of the field towards new areas of research, which captured the interest of researchers, scholars, and scientists. However, 2023 is the year with the highest number of documents, with 15 published documents. Following that 2022 is with 14 documents and 2015 with 11 documents published. However, till 11 September. In 2024, only ten documents were published. The Annual growth rate of the document published on the topic of Patent Analysis from 2001 to 2024 is 7.25%.

1.2 Analysis of Publications Outputs (total number of citations given per year)

Figure 2 illustrates the publication's output with the help of the citations. This line chart assists in knowing the accumulation and maturity of the research.

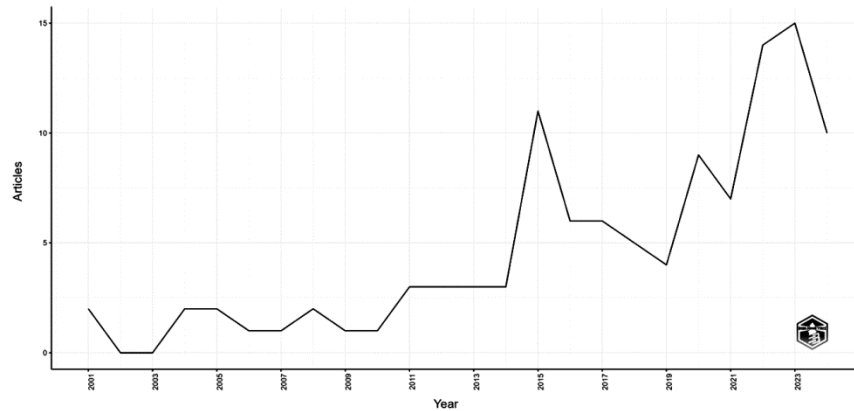


Fig. 1 — Annual Scientific Publication

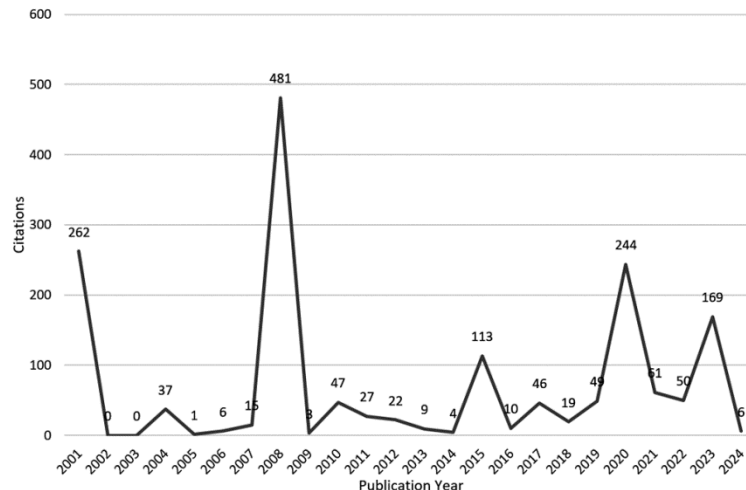


Fig. 2 — line graph of the year wise distributions of citations

However, the citation count of the documents of the literature on patent analysis in India is in oscillating trends, i.e., frequent ups and downs. The highest citation accumulated in 2008 with 481 citations, perhaps due to the publication of a review or increased media attention within the scientific community. Following that, 2001 has 262 citations, while 2020 has 244 citations.

2 Authors

Authors are the ones who are responsible for the production of knowledge through their publications. A comprehensive analysis of the authors helps the budding researcher collaborate according to their study interest (Figure 3). The findings reveal that the total number of authors was 343. Monika Gupta, Sastry RK, and Tiwari AK were the most prominent authors, with 5 publications. Monika Gupta worked in ICAR Hyderabad, and Sastry RK is working at the National Academic of

Agricultural Research Management in Hyderabad. Tiwari AK is working on Symbiosis International Pune India (deemed University). Sharma SK was the minimum contributor with 3 publications, working in the Department of Biotechnology JK Institute of Information Technology, Noida. The productively shows the author's interest in the literature increased in this field; the result shows that Monika Gupta, Sastry RK, and Tiwari AK have always updated themselves in the current field, and their research is authentic and relevant for readers.

3 Institutions

Analysis of institutions supports the investigation and evaluation of institutions' productivity, identifying their interest and determining which one is making the best use of the investments for the given projects. It assists in funding distribution, policy formation, and best for scholarly collaboration. Table 1 shows the top 10 institutions whose

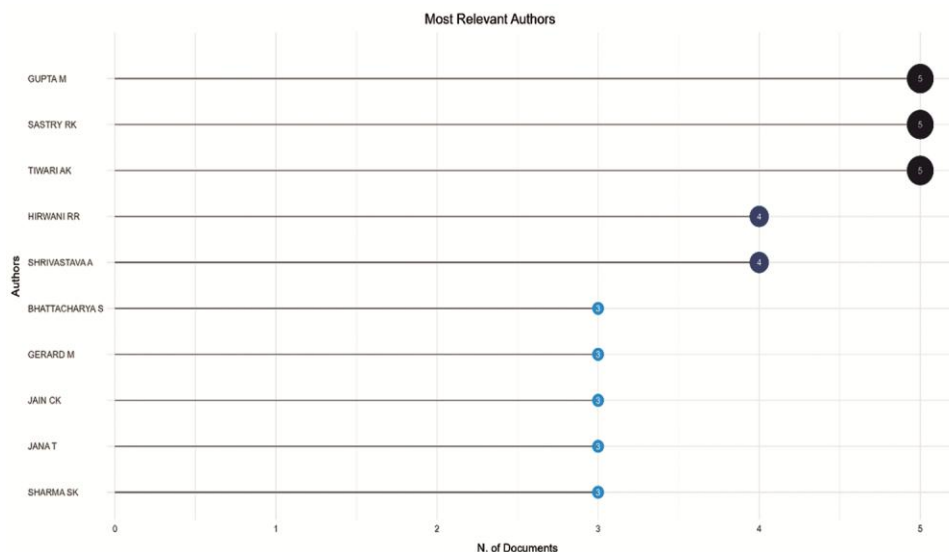


Fig. 3 — Top 10 influential authors

Table 1 — Top 10 influential institutions

S. No.	Affiliation	Authors Affiliated
1.	JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY	18
2.	NATIONAL ACADEMY OF AGRICULTURAL RESEARCH MANAGEMENT	11
3.	CSIR-NATIONAL INSTITUTE OF SCIENCE COMMUNICATION AND INFORMATION RESOURCES	9
4.	SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY) (SIU)	8
5.	CHAOYANG UNIVERSITY OF TECHNOLOGY	7
6.	RAJIV GANDHI SCHOOL OF INTELLECTUAL PROPERTY LAW	6
7.	MEDICAL UNIVERSITY OF VIENNA	6
8.	JSS COLLEGE OF PHARMACY	6
9.	CSIR- CENTRAL BUILDING RESEARCH INSTITUTE	5
10.	CSIR-UNIT FOR RESEARCH AND DEVELOPMENT OF INFORMATION PRODUCTS	5
	Grand Total	81

researchers are producing the literature on the topic of patent analysis. Notably, Jaypee Institute of Information Technology, a private university in Noida, Uttar Pradesh, has 18 researchers affiliated with this institution. On the other hand, the National Academy of Agricultural Research Management, formed by the Indian Council of Agricultural Research and based in Hyderabad, Telangana, has 11 authors, whereas the National Institute of Science Communication and Information Resources, which is in New Delhi, has 9 authors publishing the literature on the topic of patent analysis.

4 Relevant Sources

In Academics, journals are the source of all scholarly communication for a particular discipline or some broad topics. Information regarding sources becomes necessary as it provides insights to the editorial board for refinement of the scope of their sources, for readers to assist as a source of information regarding their topic, and for authors to specify the best-fit sources for publishing their studies.²² Analysis of the journals helps the user identify which are of high-quality sources and best fit for his/her use. Figure 4 shows that the Journal of Intellectual Property Rights is the most relevant source, with 9 publications on the topic of “patent analysis” in India. Following that, Current Science is ranked second with 4 publications, and Desidoc Journal of Library and Information Technology is in third place with 3 publications. Subsequently, the International Journal of Biological Macromolecules, International Journal of Intellectual Property Management, Recent Patents on Engineering, and World Patent Information are 3 publications, Environmental Science and Pollution Research, International Journal of Hydrogen Energy, and International Journal of Innovation and Technology are 2 publications.

World Patent Information are 3 publications on the topic of “patent analysis” from India. In addition to that, Environmental Science and Pollution Research, International Journal of Hydrogen Energy, and International Journal of Innovation & Technology are 2 publications.

5 Articles/documents

The knowledge of impactful articles helps the researcher understand the demand for and the direction in which the literature on patent analysis is going. Table 2 gives information on the top 10 most cited articles of Patent Analysis from 2001 to 2024 in the Scopus database in India, with 16.75 average citations per document. The most influential article of patent analysis with the highest citations, 478 is “Phycobiliproteins as a Commodity: Trends in Applied Research, patents, and Commercialization,” published in “The Journal of Applied Psychology” in 2008. The article, which is in the second position, is “Innovation Assessment through Patent Analysis” in the Journal “Technovation,” published in 2001 with 253 citations. Afterward, the article “Advances in passively driven microfluidics and lab-on-chip devices: A comprehensive literature review and patent analysis” is in the third position, as shown in Table 2. The article mentioned above is published in the journal named “RSC Advances” with 124 citations.

6 Future Trend

Examining the distribution of keywords given by authors assists the researcher in identifying the conceptual structure of a research domain and showing the popular topics and trends in that research

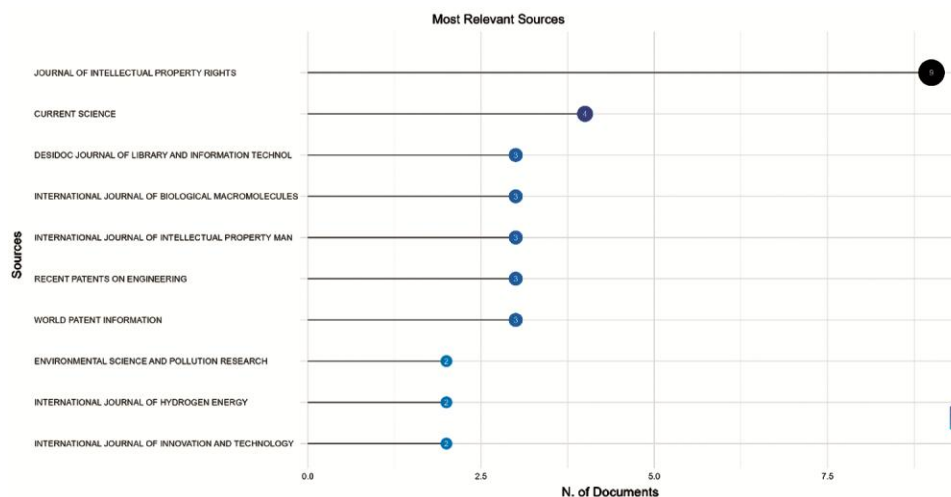


Fig. 4 — Most relevant source.

Table 2 — Top 10 influential articles.

Rank	Articles	Authors	Journals	Publication Year	Impact Factor	Citations	Doi
1	Phycobiliproteins as a commodity: Trends in applied research, patents and commercialization	Sekar Soundarapandian	Journal of Applied Phycology	2008	3.3	478	10.1007/s10811-007-9188-1
2	Innovation assessment through Patent Analysis	Biju Paul Abraham	Technovation	2001	12.5	253	10.1016/S0166-4972(00)00040-7
3	Advances in passively driven microfluidic and lab-on-chip devices: A comprehensive literature review and patent analysis	Vigneswaran Narayanmurthy	RSC Advances	2020	3.9	124	10.1039/d0ra00263a
4	A review on CO ₂ capture and sequestration in the construction in the industry: Emerging approaches and commercialised technologies	Mohd. Hanifa	Journal of CO ₂ utilization	2023	7.7	102	10.1016/j.jcou.2022.102292
5	Therapeutic and cosmetic applications of Evodramine and its derivatives- A patent review	Kirti Gavaraskar	Fitoterapia	2015	3.4	67	10.1016/j.fitote.2015.07.019
6	Prospection of recent chitosan biomedical trends: Evidence from patent analysis (2009-2020)	Malesh Kurak	International Journal of Biological Macromolecules	2020	8.2	55	10.1016/j.ijbiomac.2020.10.043
7	Annotated chemical patent corpus: A gold standard for test mining	Saber A. Akhandi	PLoS One	2014	3.7	54	10.1371/journal.pone.0107477
8	Nanotechnology patents as R&D indicators for disease management strategies in agriculture	Sastry R. Kalpana	Journal of Intellectual Property Rights	2010		47	
9	Prospection of chitosan and its derivatives in wound healing: Proof of patent analysis (2010-2020)	Pradeep Shiva Kumar	International journal of biological macromolecules	2021	8.2	40	10.1016/j.ijbiomac.2021.06.086
10	Jeffrey Dankwa Ampah	Investigating the evolutionary trends and key enablers of hydrogen production energy technologies: A patent life cycle and econometric analysis	International journal of hydrogen energy	2023	7.2	40	10.1016/j.ijhydene.2022.07.258

domain. In this study, VOSviewer software was used to generate a keyword co-occurrence clustering view in the field of Patent Analysis literature in India. Moreover, the unit of analysis is author keywords. There are 463 keywords out of which 338 are connected. The visualization map shows 38 clusters of keywords with 1211 links between them and the total link strength is 1252, as shown in Figure 5.

In Figure 5, the node and font size represent the keyword occurrence in all 111 documents, whereas the lines between the nodes represent the link strength between those two keywords. Figure 5 deduces that the keyword “Patent Analysis” has the highest occurrence. It appeared 43 times in the extracted documents and the total link strength is 196. However, it is linked with 174 other keywords like bibliometric analysis,

technology assessment, ISRO, econometric analysis, and cloud computing but there is a weak link strength between them. Following that, “patents” is the second highest with 8 times occurrence and a total link strength of 43, and “patent” is the third highest with 9 times occurrence and 41 key words.

However, Figure 6 shows the overlay visualization of the authors' keywords, which shows the development of the topics over time on the base map. This helps the researchers to understand the maturity of the topic, and this helps them to analyze the overall trend of the topic. In this study, “innovation” has the highest average publication year of 2022.40, suggesting that the aforementioned keyword is up to date and has the potential for further development in the field of Patent Analysis, as shown in Table 3.

Likewise, “patents” and “chitosan,” with recent

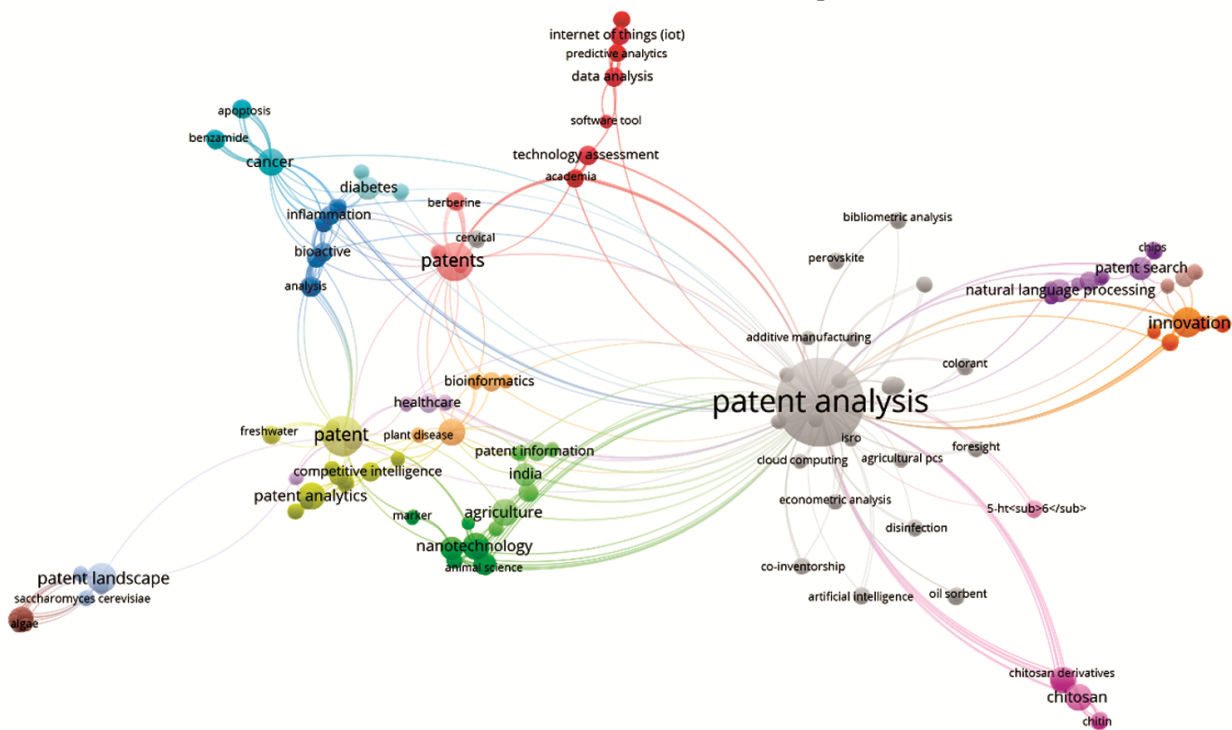


Fig. 5 — Network visualization of author keywords

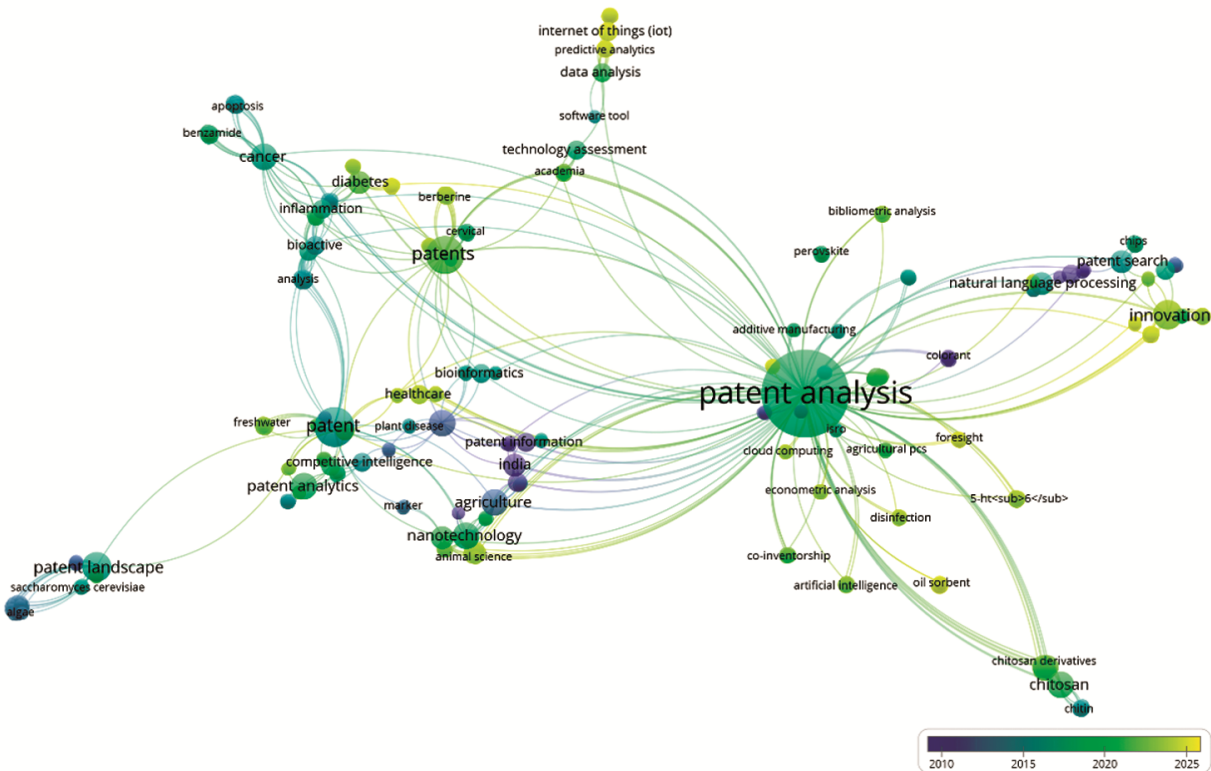


Fig. 6 — Overlay visualization of author keywords

Table 3 — keywords with the highest total link strength.

Rank	Keyword	Occurrence	Total Link Strength	Average publication Year
1	Patent Analysis	43	196	2018.42
2	Patents	8	43	2020.50
3	Patent	9	41	2015.78
4	Cancer	4	31	2016.75
5	Patent Landscape	5	30	2016.60
6	Nanotechnology	4	25	2018.50
7	Chitosan	4	22	2019.50
8	Innovation	5	22	2022.40
9	Diagnosis	3	20	2019.33
10	Bioactive	2	18	2015.00

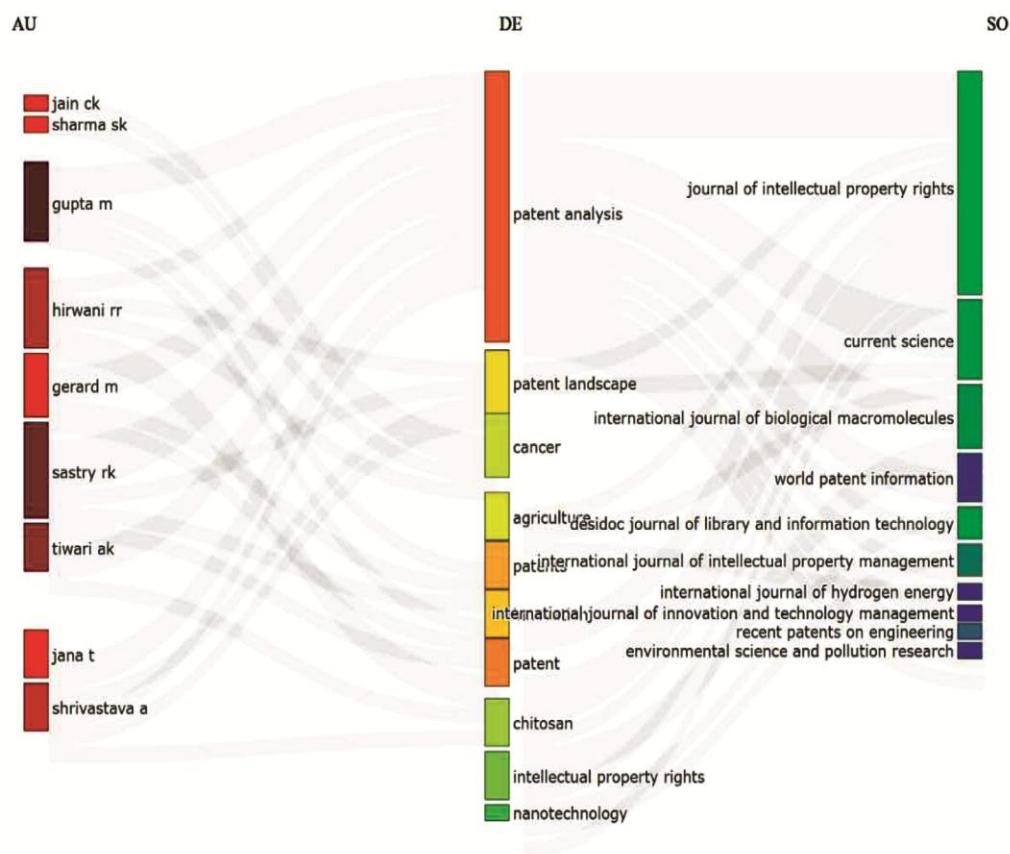


Fig. 7 — Three field plot for sources-keywords-authors.

average publication years of 2020.50 and 2019.50, respectively, suggest the potential for future developments. On the other hand, the Average publication year of the “bioactive” is 2015.00 as shown in Table 3. This suggests that the topic of “bioactive” has reached maturity.

7 Relation between top 10 productive authors and sources

The above keywords were further examined using Biblioshiny’s three-field plot functions based on a Sankey diagram to understand further and display

their relationship with the top ten productive authors and sources. This plot depicts the comprehensive relationship between the many aspects under consideration, as shown in Figure 7. The left column is a representation of authors, the middle column is a representation of the most used keywords by these authors, and the right column is a representation of the journals. The boxes' height and thickness of the connecting lines highlight the connection between the authors, keywords, and the journals from which they were sourced.

As mentioned above, the most prominent authors

are Gupta M, Sastry RK, and Tiwari AK. Gupta M has a strong linkage with “Patent Analysis”, “Cancer” and “Innovation”. Sastry RK has a linkage with “Patent Analysis”, “Patent Landscape” and “Innovation”. Tiwari AK has a strong linkage with “Patent Analysis” and “Patents”, as shown in Figure 7.

In the middle side (Keywords), “Patent Analysis” is the keyword that has a strong link with almost all authors. Also, it is linked to all the top sources of documents related to patent analysis. “Cancer”, “Chitosan,” and “Patent Landscape” are well connected to multiple authors and are published widely across various journals. Thus, these are highlighting it as a hot topic of research.

On the right side, the Journal of Intellectual Property Rights is widely connected with all keywords except the keyword “cancer,” suggesting it is a primary outlet for research on these topics.

Discussion

This study conducts a bibliometric analysis to extrapolate the trends of the topic of Patent Analysis. The key findings extracted from the above research objectives are discussed in this section. In the publication output, both publication and citation count graphs of the articles published in India on the aforementioned topic have seen ups and downs, which are shown in Figures 1 and 2. This highlights that the highest number of articles was published in 2023, whereas the highest citation count was generated in 2008. However, Karataş et al.³ also conducted a bibliometric study on the literature of patent analysis using Web of Science as a database, where the publication output is increasing. And the year 2021 shows the highest publication output. This interprets that there is still a need for support to assist the researchers of India who are coming into this field. In the authors' section, 13.51% of articles (i.e., 15/111) are published by the top 3 authors on the topic of Patent Analysis published in India. This might be pointing out that many researchers are stepping into this field. Monika Gupta from ICAR, Hyderabad; R K Sastry from the National Academic of Agricultural Research Management, Hyderabad; and A K Tiwari from Symbiosis International, Pune are the above-mentioned top three authors, in order. In the study of Karataş et al.³ article, Janghyeok Yoon, from South Korea, has 23 publications the highest number of literature published on the topic of

patent analysis with a total of 958 citations. This outlines that a country like India needs to publish quality research in the field of the aforementioned topic. On analyzing Institutions using the number of publications count, we deduce the National Academy of Agricultural Research Management is the top publishing institution as it produces the highest number of articles, which is approximately 0.1% of the total published articles, i.e., 11 in India. However, in Karataş et al.³ works, Korea University, located in South Korea, is the top publishing institution, with 33 articles with 282 citations. This infers that the government needs to create a policy that assists the institutions in producing works related to patent analysis. Furthermore, the number of published articles in a journal reveals the relevancy of a source journal. The Journal of Intellectual Property Rights is the most relevant source, with nine articles, which is 0.08% of the total articles published in India. However, according to Karataş et al.³, the journal “Technological Forecasting and Social Change” is the top publishing journal with 83 articles and 3932 total citations of the literature related to Patent Analysis. Moreover, in the influential article, much attention has been drawn to the article which has the highest citation in Journals of Applied Phycology (IF = 3.3), the article titled “Phycobiliproteins as a commodity: Trends in applied research, patents, and commercialization,” authored by Sekar Soundarapandian with 478 citations. Sekar Soundarapandian is working on the subject of biotechnology at Bharathidasan University, Tiruchirappalli. However, in Karataş et al.³ article, Hao²³ authored an article titled “Patent citation network analysis” in 2020, which is the most cited article with 677 citations. On examining the future trends through the keyword analysis of this topic, “Patent analysis” is the most occurred keyword and highest linked strength i.e., 43 times and 196 links respectively, whereas according to Karataş et al.³, “Technology”, “Patent”, and “Analysis” are the most frequent keywords. This suggests that authors are using patent analysis as the keyword most. This is also represented in the section of the relation between the top 10 productive authors and their sourced journals, where “patent analysis” is connected by all 10 sourced journals and 8 authors. However, “cancer”, “patent landscape”, “nanotechnology”, “chitosan”, “innovation”, “diagnosis” and “biotechnology” are the other keywords connected

with the topic of patent analysis. This indicates how the patent analysis topic is associated with other topics. Moreover, in the average publication year, “innovation” (APY = 2022.40) is the keyword used by the researcher approximately from 2022, which shows that it might be used in the future too. The relations between the authors, keywords, and journals assist in understanding the types of keywords used by the authors and journals who accept those papers.

Conclusion

The current study demonstrated a bibliometric analysis of the literature on Patent Analysis published in India. In this study, 111 published articles from 2005 to 2024 were identified and extracted from the Scopus database. Citation analysis and keyword analysis are used to examine the aforementioned aims of the study, with the help of Biblioshiny, VOSviewer, and MS Excel as Software. The above findings can assist the new researcher who is stepping into this discipline, which will create familiarity with the topic and show the path for further development in the knowledge base of Patent Analysis. Furthermore, this study also guides practitioners, policymakers, and editorial boards in this emerging research topic for further investigation.

Implication

The bibliometric study of Patent Analysis demonstrated this topic's current trends and status in India, which is illustrated in the above results. The study's findings provide valuable information to the different stakeholders of India to get an in-depth understanding of this topic. This study assists in making judgments by policymakers, institutions, and the government to offer important necessities to researchers who will create impactful research in the coming years. The list of key authors and institutions assists the young researchers in collaboration. The illustrated figures of keywords and journals allow them to reach a larger audience and reveal their valuable findings in front of the world. Visualizing the basic structure assists in identifying and focusing on further exploration and developing the topic mentioned above.

Limitation

Some limitations of the current investigation should be noted. First and foremost, the scope of this study was limited to peer-reviewed articles published by Indian authors and indexed in the Scopus database.

Second, this paper is purely based on a bibliometric study in which our interpreted results are collected from papers using their title, abstracts, and keywords rather than the core contents. Thirdly, Biblioshiny and VOSviewer software are used for analysis; the results may vary slightly when the researcher uses different parameters and databases for analysis. Furthermore, this work might be extended in the future by conducting in-depth content analysis on publications from various databases.

References

- 1 Fisher W W, Patent. Encyclopedia Britannica. Available at <https://www.britannica.com/topic/patent> (Accessed on 4 November 2024).
- 2 Aithal P S, and Aithal S, Patent Analysis as a New Scholarly Research Method, *International Journal of Case Studies in Business, IT, and Education*, 2 (2) (2018) 33–47. <https://zenodo.org/record/1404184>
- 3 Karataş A R, Kazak H, Akcan A T, Akkaş E, and Arık M, A bibliometric mapping analysis of the literature on patent analysis, *World Patent Information*, 77 (2024): 102266. <https://doi.org/10.1016/j.wpi.2024.102266>
- 4 Chuprat S, Novianto E H D, Matsuura Y, Mahdzir A M, and Harun A N, A closer look on patent analytics through systematic literature review, *Management Review Quarterly*, (2024). <https://doi.org/10.1007/s11301-024-00452-x>
- 5 Liu Y, Alias A H B, Haron N A, Bakar N A, and Wang H, Technology status tracing and trends in construction robotics: A patent analysis, *World Patent Information*, 76 (2024) 102259. <https://doi.org/10.1016/j.wpi.2023.102259>
- 6 Tseng Y -H, Lin C J, and Lin Y I, Text mining techniques for patent analysis, *Information Processing & Management*, 43 (5) (2007) 1216–1247. <https://doi.org/10.1016/j.ipm.2006.11.011>
- 7 Bogomolova A, Ryazanova M, and Balk I, Cluster approach to analysis of publication titles, *Journal of Physics: Conference Series*, 1727 (1) (2021) 012016. <https://iopscience.iop.org/article/10.1088/1742-6596/1727/1/012016>
- 8 Segev A, and Kantola J, Identification of trends from patents using self-organizing maps, *Expert Systems with Applications*, 39 (18) (2012) 13235–13242. <https://doi.org/10.1016/j.eswa.2012.05.078>
- 9 Ampornphan P, and Tongngam S, Exploring Technology Influencers from Patent Data Using Association Rule Mining and Social Network Analysis, *Information*, 11 (6) (2020) 333. <https://doi.org/10.3390/info11060333>
- 10 Roudsari A H, Afshar J, Lee S, and Lee W, Comparison and Analysis of Embedding Methods for Patent Documents, *2021 IEEE International Conference on Big Data and Smart Computing (BigComp)* (2021) 152–155. <https://ieeexplore.ieee.org/document/9373099>
- 11 Chao M H, Trappey A J C, and Wu C -T, Emerging Technologies of Natural Language-Enabled Chatbots: A Review and Trend Forecast Using Intelligent Ontology Extraction and Patent Analytics, *Complexity*, 2021 (1) (2021) 5511866. <https://doi.org/10.1155/2021/5511866>

- 12 Zhang H, Daim T, and Zhang Y (Peggy), Integrating patent analysis into technology roadmapping: A latent dirichlet allocation based technology assessment and roadmapping in the field of Blockchain, *Technological Forecasting and Social Change*, 167 (2021) 120729. <https://doi.org/10.1016/j.techfore.2021.120729>
- 13 Girgin Kalip N, Erzurumlu Y Ö, and Gün N A, Qualitative and quantitative patent valuation methods: A systematic literature review, *World Patent Information*, 69 (2022) 102111. <https://doi.org/10.1016/j.wpi.2022.102111>
- 14 Jürgens B, and Herrero-Solana V, Patent bibliometrics and its use for technology watch, *Journal of Intelligence Studies in Business*, 7 (2) (2017). <https://doi.org/10.37380/jisib.v7i2.236>
- 15 Abraham B P, and Moitra S D, Innovation assessment through patent analysis, *Technovation*, 21(4) (2001) 245–252. [https://doi.org/10.1016/S0166-4972\(00\)00040-7](https://doi.org/10.1016/S0166-4972(00)00040-7)
- 16 Mukherjee B, Re-evaluating India's Third Mission through Top Ranked Universities & Technological Institutes, *DESIDOC Journal of Library & Information Technology*, 42 (5) (2022) 277–287. <https://doi.org/10.14429/djlit.42.5.18079>
- 17 Nandagopal M, Commercializing technologies from universities and research institutes in India: Some insights from the US experience, *Current Science*, JSTOR, 104 (2) (2013) 183–189. <http://www.jstor.org/stable/24089383>
- 18 Sharma R, and Jain A, Research and patenting in Indian universities and technical institutes: An exploratory study, *World Patent Information*, 38 (2014) 62–66. <https://doi.org/10.1016/j.wpi.2014.04.002>
- 19 Singh V, and Chakraborty K, Transfer of innovations, *Current Science*, JSTOR, 117 (6) (2019) 1032–1044. <https://www.jstor.org/stable/27138384>
- 20 Ravi R, and Janodia M D, University-Industry Technology Transfer in India: A Plausible Model Based on Success Stories from the USA, Japan, and Israel, *Journal of the Knowledge Economy*, 13 (2) (2022) 1692–1713. <https://doi.org/10.1007/s13132-022-00908-z>
- 21 Aria M, and Cuccurullo C, Bibliometrix: An R-tool for comprehensive science mapping analysis, *Journal of Informetrics*, 11 (4) (2017) 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- 22 Adel K, Elhakeem A, and Marzouk M, Blockchain and Artificial Intelligence: Scientometric Analysis and Visualization, *IEEE Access*, 11 (2023) 137911–137928. <https://doi.org/10.1109/ACCESS.2023.3339752>
- 23 Hao L, Patent Citation Network Analysis, *SSRN Electronic Journal*, (2020) <https://doi.org/10.2139/ssrn.3697433>