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Scientific Mapping of Intellectual Property Rights: Bibliometric analysis

Dr Asha Chaudhary
Assistant Professor, Maharaja Surajmal Institute, Delhi

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ABSTRACT

Intellectual Property Rights (IPR) have attracted considerable scholarly attention across disciplines; however, limited efforts have been made to systematically map the scientific landscape of this domain. This study addresses this gap by conducting a bibliometric analysis of IPR research using 1,098 documents retrieved from the Scopus database covering the period from 2018 to 9 August 2024. The analysis was performed using the Bibliometrix package and its web-based interface, Biblioshiny, implemented in R. The study employed both descriptive and network analysis techniques to examine publication trends, influential sources, authors, collaborations, and emerging research themes. The findings reveal a dynamic growth trajectory in IPR research, characterized by periods of expansion, disruption during the COVID-19 pandemic, and subsequent recovery. The analysis identifies leading journals, prominent contributors, and evolving thematic areas, indicating the broadening scope and increasing significance of IPR-related research. By consolidating fragmented literature and providing a comprehensive scientific mapping of the field, the study offers valuable insights for researchers, practitioners, and policymakers. Although the analysis is limited to the Scopus database and the capabilities of Biblioshiny, the findings contribute to a deeper understanding of the intellectual structure of the IPR domain and highlight potential directions for future research, collaboration, and policy development.

Keywords Intellectual Property Rights, Intellectual Property, Bibliometric analysis, Science Mapping

1.INTRODUCTION

In the era of Globalisation, a country can progress and move forward only when information and knowledge-based environment is created. It may restrict free flow of technology but it is mandatory for sustainable development (Samriti, 2023). IP is very crucial for the growth of business as it helps in expansion of market, supports fair competition, and economy at large. Thus, it is crucial to stay ahead in the path of innovation and creativeness in order to compete in the era of tough technology and trade competitions. Lack of awareness regarding IPR resulted in the death of creativeness and inventions resulting into economic loss and declining era of intellectual in the country (Chudasama, 2021). Due to establishment of dedicated and powerful global IP institutions, major developments witnessed in IPR (Chang, 2001).

Every human is distinctively gifted (Firdous & Mir, 2016), blessed with a substantial attributes of intelligence which helps in creating or developing new ideas in various domains like literature, science, technology and many more(Keshava & Gupta, 2023). The term intellectual property began to use not until 19th century though many legal principles evolved over centuries which intellectual property rights. Intellectual property which is intangible in nature means intellectual creativeness of creator. Management of IP and IPR requires various actions and strategies which are required to be in coordination of national laws and international treaties and practices (Saha & Bhattacharya, 2011)

Managing intellectual property and IPR is multidimensional task. Different types of IPR calls in different action, management, planning and approaches and engagement of persons with different field of knowledge such as science, finance, marketing medicines. The legal rights enjoyed by the creator or inventor is for safeguarding their work for a certain time period are referred as Intellectual Property Rights. The establishment of WIPO and the ratification in TRIPs article in 1995 within WTO has resulted in establishment of strong IP regimes across the members of WTO. WIPO main objective is to promote protection to the intellectual property across globe. Between 16-18th centuries, firms started to think to safeguard their products and machines from being copied, gave the emergence of IP notion (Peukert, 2017). Through IPR inventor or creator enjoys exclusive rights so that they can reap commercial benefits from their innovative or creative efforts. Every industry should develop its own polices related to IPR management style, strategies etc. according to its area/ domain of speciality (Saha and Bhattacharya, 2011). Intellectual property rights are important for progressive development of a nation (Jajpura et al., 2017). It plays significant role in the promotion of innovation, creativity and hence in economic growth (Kaushik et al., 2023).

Over the years, it is witnessed that bibliometric research is contributing significantly in academic studies. The concept of bibliometric was invented by Pitchard in 1969 (Pritchard,1969). Bibliometric analysis (like (Davarpanah & Aslekia, 2008). (Garg et al., 2015), (Gnanasekaran & Balamurugan, 2016) (Chauhan & Singh,

2023) (Zhu et al., 2023) (Amentae et al., 2024)) helped in evaluating and displaying the complete picture of periodical literatures in a respective domain subject

1.2. **Research Objectives**

1. Identify the most prominent Journals in the IPR domain.
2. To study the Intellectual Structure in the IPR domain.
3. To Identify the Collaborative Networks in the IPR domain

2. RESEARCH METHODOLOGY

Analysis of the undertaken research begins with the database identification, followed by the collection of the data based on the scientific search strategy (Figure 2).

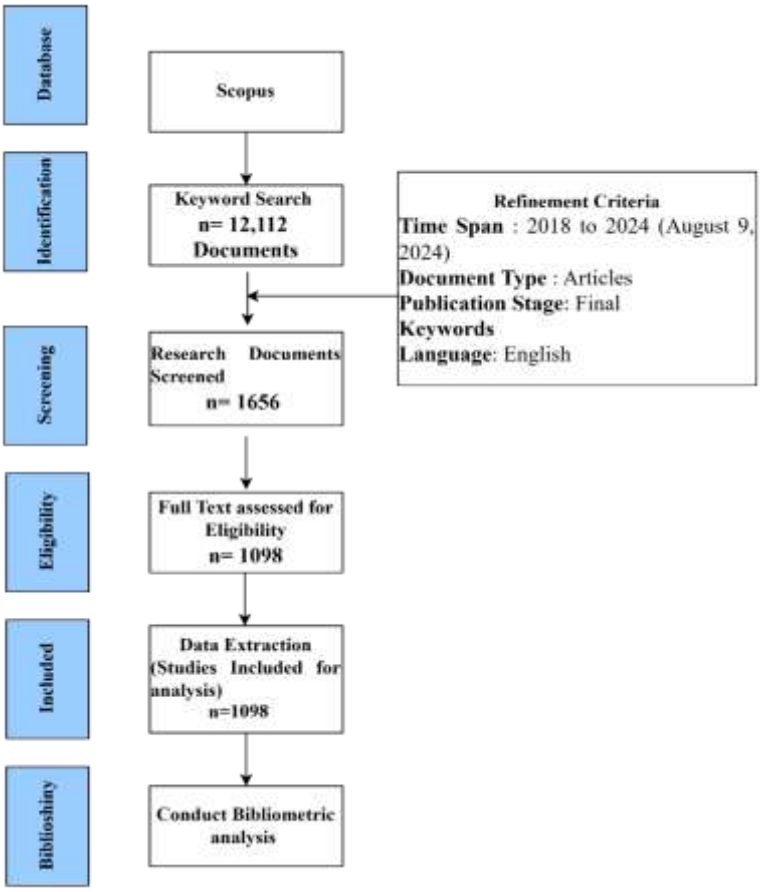

Figure 2: Flowchart for selection of Documents

The Scopus database was used as it provides broader coverage. Data for the undertaken research followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) flowchart (Moher et al., 2009). PRISMA flowchart represents screening process which is used for systematic review (refer to Figure 2). Search started with a keyword in Scopus using the string: "Intellectual Property Rights", search retrieved 12,112 documents. After screening of documents through different filters like time span (2018 to 2024 (9th August 2024), defining the document type (Articles), publication stage (Final), keywords (like Intellectual Property Rights, Intellectual Property, Innovation, WIPO, Trade Secrets, Trademarks so on), lastly defined the language (English) left with 1656 documents. The retrieved data was examined whether it is focusing on the research undertaken, this left with 1098 documents for Bibliometric analysis. Once the database is set, it is analysed through Bibliometric software, Biblioshiny (interactive web application) which is an R- Tool used for doing comprehensive science mapping analysis. It is an age-old method for conducting research. Various software like Publish or Perish, Bib Excel, were used for bibliometric studies in the past. Bibliometrix R-package, an open-source software, enables comprehensive scientific analysis which incorporates analysis of data along with data visualisation. It is user friendly and becomes highly significant in bibliometric analysis. For analysing data, it is structured under two heads two heads: Descriptive analysis which focus on analysing bibliometric data in terms of Sources, Documents and Authors whereas Network analysis focus on analysing through Conceptual, Intellectual and Social structures.

3. DATA ANALYSIS AND FINDINGS

3.1 **Descriptive Analysis**

3.1.1 **Data Set**: Table 1 gives the view of bibliometric data of 1098 documents on Intellectual Property Rights over the past years ranging from 2018 to 2024(9th Aug 2024) which were extracted through a search query on Scopus database. These extracted documents were published in 639 different sources with average citation score of 7.148 which is moderate and indicates a fair impact of publications on the researcher's community. Collaboration co-author index of 2.81 per document and international co-authorship index of 23.13 % of the documents indicates collaborative research trend as well as a significant level of global collaboration. The annual growth rate observed as -3.9% which indicates decline in the publication of documents each year either because of saturation in the IPR research field or external factors which are influencing the publication productivity. From the data set, it is observed that documents extracted have variety of keywords and large number of references which indicates that IPR field is broad and has substantial engagement with existing literature.

Table 1 Summary of Data Set

Description	Results
Timespan	2018:2024
Sources (Journals, Books, etc)	639
Documents	1098
Annual Growth Rate %	-3.9
Document Average Age	2.93
Average citations per doc	7.148
References	50259
DOCUMENT CONTENTS	
Keywords Plus (ID)	3764
Author's Keywords (DE)	3239
AUTHORS	
Authors	2578
Authors of single-authored docs	263
AUTHORS COLLABORATION	
Single-authored docs	287
Co-Authors per Doc	2.81
International co-authorships %	23.13
DOCUMENT TYPES	
Article	1098

3.1.2 **Production Output**: Table 2 shows number of published documents from 2018 to 2024 (till 9th August 2024). The table indicates upward trend with little fluctuations. In the time span from 2018 to 2020 indicates steady growth in publication, witnessed sharp increase in 2020 whereas disruption in the publication in 2021. Disruption could be due to the pandemic event (COVID 19) which might have delayed research publication processes or the research work. Table 2 indicates strong recovery in the year 2022 and 2023. The partial date of 2024 (till 9th August 2024) suggests possible slowdown but expecting might end up with a respectable number of production (104 articles in approximately 7.5 months). The scientific productivity figure 4 reflects a dynamic research trend with growth, disruption may be due to COVID 19 and recovery phase.

3.1.3 **Three Field Plot** : Figure 5 represents the relationship between three fields in a dataset using Sankey Plots. It provides a summary of the relationships between authors, keywords and publication sources in a research field. On the left side of the Figure 5 is Authors, on the middle row are the keywords and on the right side are the sources selected for the analysis. Sankey Plot helps in identifying the main topics of the research with key contributors and the journals most commonly publishing thus research, thus helps in identifying trends along with the key (dominant) players in the field. Figure 5 helps in identifying that Lee k is most associated with Intellectual Property right, patents and trademarks specific topic suggesting that author has a strong focus in this area and Journal of IPRs and Journal of world Intellectual Property frequently publish documents on IPR and Trips. It is also observed that Journal of IPRs also frequently publishing documents on Patent.

Table 2 : **Annual Scientific production**

Year	Articles
2018	132
2019	141
2020	182
2021	141
2022	176
2023	222
2024(9-8-2024)	104

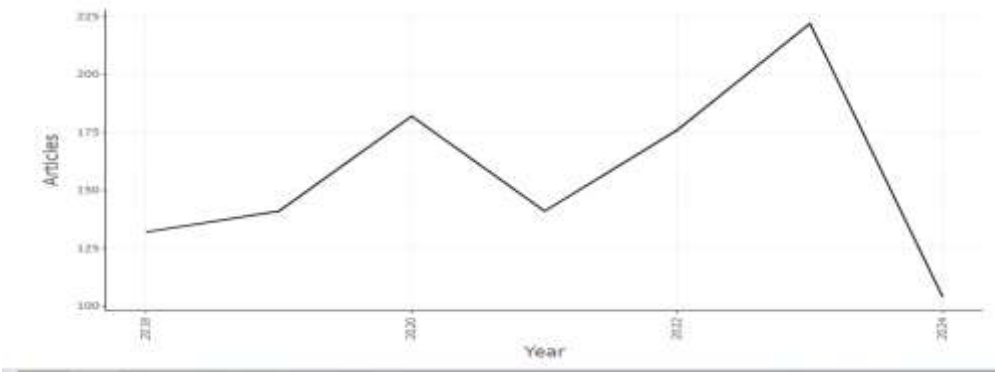

Figure 4: Annual Scientific production

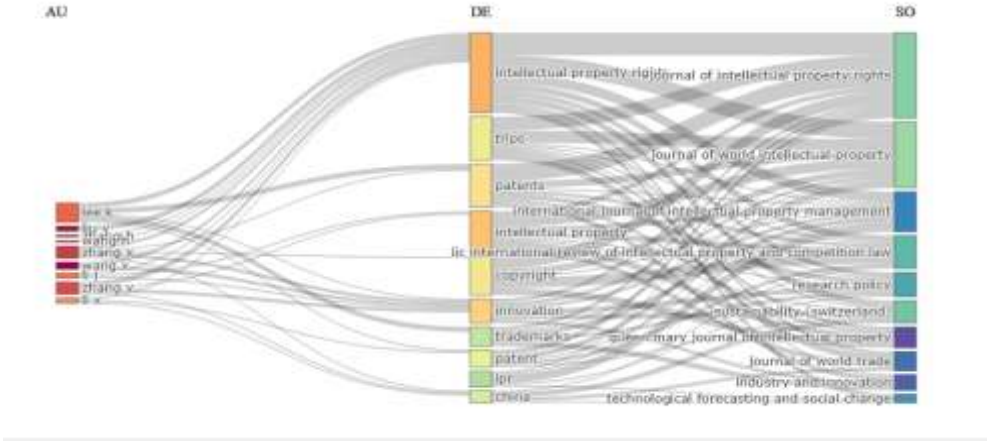

Figure 5 :Three Field Plot

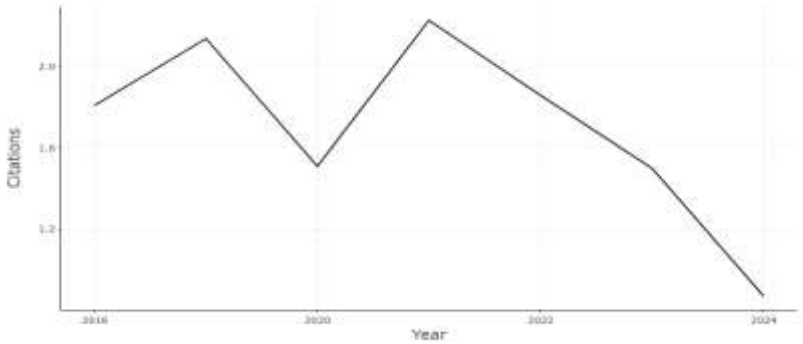

Figure 6 : Average Article Citation per year

In Table 3, Means TC per year indicates the average number of citations which the articles receive per year in a particular year. It is observed that articles published in the year 2018 had a Mean TC per year 1.81 which means that each article published in 2018 received 1.81 citations per year where as in 2023 it is 1.50 and 2024 (till 9th August 2024) is 0.87 citations per year. From Figure 6, it is observed that Mean TC per year for years between 2018 to 2021 is relatively stable on the other side declining trend is observed in 2023 and 2024. Overall, figure 6, shows a decreasing trend which indicates a saturation or shift in research focus.

Table 3: Average Article Citation per year

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2018	12.66	132.00	1.81	7
2019	12.82	141.00	2.14	6
2020	7.55	182.00	1.51	5
2021	8.91	141.00	2.23	4
2022	5.59	176.00	1.86	3
2023	3	222.00	1.50	2
2024	0.87	104.00	0.87	1

In Biblioshiny, the relevant sources (often shown in bar plots or tables) provide information about the journals or sources that publish the most documents in a particular dataset or field. It indicates the leading journals by the number of published articles.

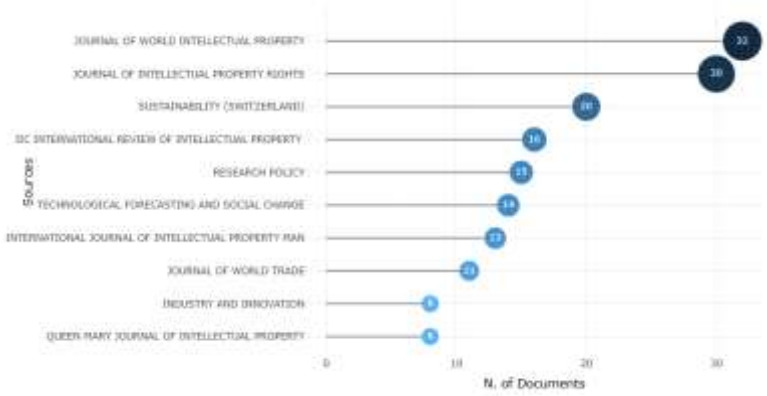

Figure 7 : Most Relevant Sources

Figure 7, showing the academic journals that have the maximum number of articles related to IPR in the database which has been extracted. Journal of world Intellectual Property is the prolific journal publishing maximum articles (32 articles) related to research domain IPR, followed by journal of Intellectual Property rights with 30 articles then by Sustainability (Switzerland) with 20 articles. Most relevant sources displayed in figure 7 shows the observation which would be helpful for the researchers in identifying the potential outlets (prolific journals) related to IPR research domain.

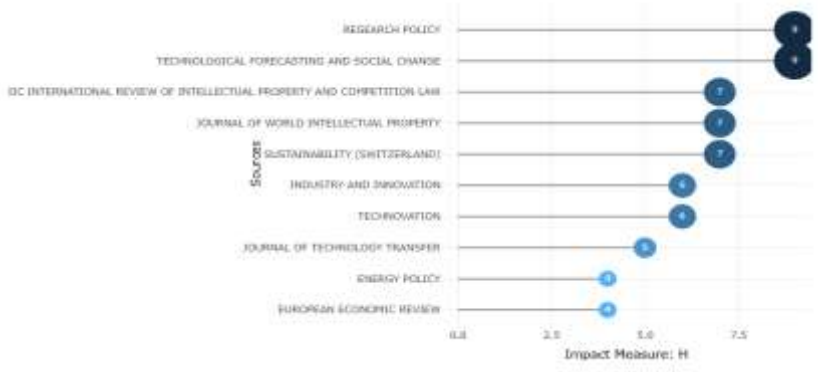

Figure 8 : Source Local Impact

Source Local Impact analysis indicates the influence of a specific source within the dataset. The impact based on the citations within the dataset is measured by the h-index metric. Higher value of h-index indicates a stronger impact .Figure 8 shows that both , Research Policy and Technological Forecasting and Social Change have h-index of 9 which suggests impactful sources, followed by IIC International Review of Intellectual Property and Competition Law, Journal of World Intellectual Property, and Sustainability (Switzerland) with h-index of 4 suggesting moderate impact then European Economic Review and Energy Policy with lowest h -metric of 4 suggesting less impactful sources . Figure 8 suggest that journals with high h-index metric are influential and impactful journals in terms of citations and recognition.

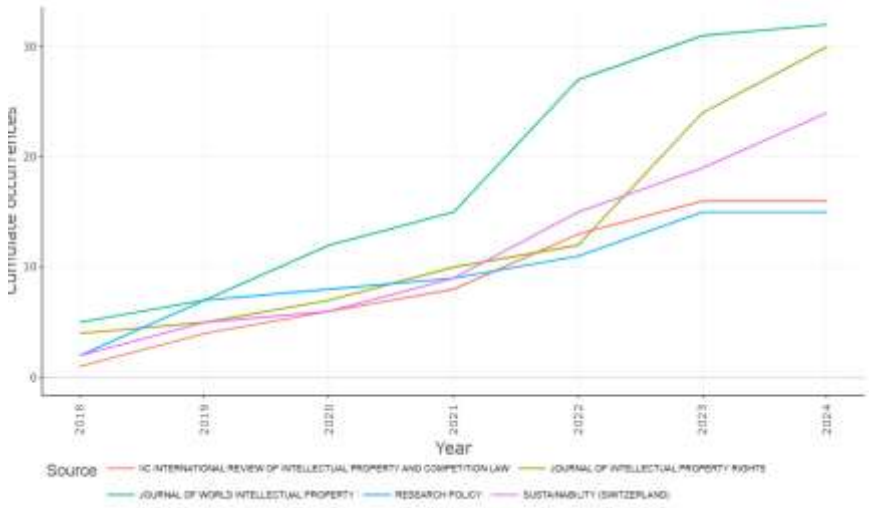

Figure 9: Source Dynamics

Figure 9 shows the number of publications across top five academic journals ranging from 2018 to 2024. The analysis shows that Journal of World Intellectual Property indicates fluctuating pattern but 2022 is witnessed with notable publication (12) followed by Sustainability (Switzerland) with 6 in the same year. Journal of Intellectual Property Rights shows notable publication in 2023 which suggests it is a prominent journal in that year, followed by Journal of World Intellectual Property, Research Policy and Sustainability (Switzerland) with 4 publications that year. In 2024 Journal of Intellectual Property Rights and Sustainability shows moderate growth with 6 publication and 5 publications, Research Policy shows no publication in 2024. Source Growth network helps in identifying which journals are becoming prominent in reach field of IPR and also shows shift in interest over t9ime which helps in understanding where to focus for future research.

3.2 Intellectual Structure: Intellectual Structure helps in displaying the network of relationship between most influential authors.

3.2.1 Co-citation anlysis: Figure10 shows that co-citation analysis indicating authors who have been cited together. Nodes are representing Authors and lines represent co-citations. Colour of the nodes are different clusters of authors who have been co-cited together indicating either their work relatedness or same area of research. Green colour nodes are more dense than Blue and suggest connection between the clusters indicating interdisciplinary research. The red cluster seems isolated and suggest separate subfield or emerging area, gaining traction.

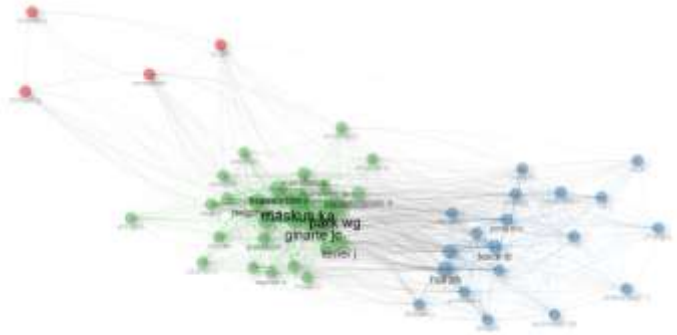

Figure 10: Co-citation anlysis

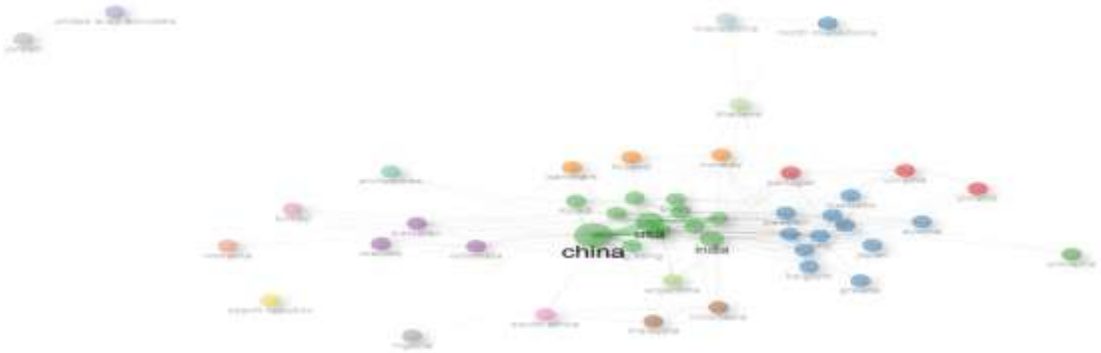

Figure 11

3.3 Social Network Analysis: Figure 11 shows the collaborative relationships between countries in the research domain of IPR. Each node depicts different country, size of node indicates volume of joint publications, edges shows collaboration between countries with thicker or many lines which indicates stronger or frequent collaboration. Figure 11 analysis shows that China, USA and India appears to be the central node. This analysis suggest potential collaborations in order to increase output and innovation in the research field of IPR.

CONCLUSIONS

The undertaken study underlines the evolution of Intellectual Property Rights domain over a time span of 2018 to 2024(9th August 2024). The present study presents the comprehensive evaluation Intellectual Property Rights through Biblioshiny application. The undertaken study makes a significant contribution in this domain as it consolidates the fragmented literature work in the domain of IPR by focusing on the significant authors, sources and documents. Data was analysed through Bibliometric software, Biblioshiny, which is a interactive, flexible and user friendly web-based application. Data set for the undertaken research work was generated from the Scopus database due as it provides quality research sources and also compatible with the application. The data set exhibits that 1098 documents have been published in 639 different sources with moderate citation score (7.148) which indicate that IPR field is broad and has substantial engagement with existing literature and have a fair influence on research community. Data set shows dynamic research trend with growth, disruption may be due to COVID 19 and recovery phase (Figure 4). Prolific journals publishing maximum articles in the area are Journal of world Intellectual Property followed by journal of Intellectual Property rights then by Sustainability (Switzerland). In Figure 10 , the red cluster seems isolated and suggest separate subfield or emerging area, gaining traction. Figure 11 analysis shows that China, USA and India appears to be the central node. This analysis suggest potential collaborations in order to increase output and innovation in the research field of IPR. Thus, this research work has made an attempt to build a roadmap for research community and policymakers. Policymakers shape and regulate environment and encourage innovation, thus foster research and development environment.

This paper has made an attempt to build knowledge base and identifying unexplored areas in IPRs, thus would help in giving direction to future researches in this area.

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