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## Intellectual Property Rights in India: A Bibliometric Study

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### Abstract

The study presents the trends in authorship pattern and author's collaborative research in IPR In India with a sample of 382 articles collect from Web of Science database during 2019- 2023.The multi- authorship articles are higher and predominant on single authorship. The study found that the researches in this topic are keep toward team research or group research rather than solo research. Overall per capita authorship is 0.31. Inthis study examines different trends on authorships such as Collaborative Index, Collaborative Coefficient, and Collaborative - Authorship Index. Examine research performance national as well as Global contexts. The paper is based on Bibliometric analysis of total 382 research articles contributed by the authors. It was seen that researchers use latest documents. The study reveals the conclusion about the three Laws of Bibliometrics i.e. Lotka's law (No. of authors) The findings must reveal various aspects of the characteristics and patterns of contributions of the study. In addition to this scientographical mapping of data is presented through graphs using the VOSviewer software mapping technique.

**Keyword** Bibliometrics, IPR, Authorship Pattern, Pareto 80/20 Principle, Bibliometric Laws.

### Introduction

The objective of the present study is to highlight the concept of Bibliometrics, Scientometric, and Laws of Bibliometrics, to specify objective, hypothesis, limitations, methodology and conspectus of the study. 'Alan Pritchard' in 1969<sup>1</sup> has coined the term bibliometrics. To denote a new discipline where quantitative methods were employed to prove scientific communication

process by measuring and analyzing various aspects of written documents. Pritchard (1968) "Application of mathematical methods to books and other media of communication." Bibliometrics is a fast developing area in information science, which is defined as a discipline that investigates the properties and behaviour of information. Bibliometrics Constitutes one of the major thrust of research in the field of library and information science. It utilizes quantitative analysis and statistics to describe patterns of publications within a given field or body of literature. Knowledge is dynamic and multidimensional in nature. The new researches and the thirst for knowledge have led to the generation of new work.

### **Definitional Analysis**

**Hulme (1923)**<sup>2</sup> "The purpose of statistical bibliography is to shed light on the process of written communication and to the nature and course of development of a discipline by means of counting and analysis its various facets of written communication.

**Intellectual Property (IP)** is any creations of human mind. Like tangible property, their creation has a value and, as with all property, it needs to be protected.

**Intellectual Property Rights (IPR)** gives them this protection, as well as helping them exploit and control their IP, 'The exclusive right granted by state, to prevent others from using, manufacturing, distributing-inventions, processes, applications, new and original designs, trademarks, new plant varieties, data based and artiste and literary works', Such a person is known as 'rights owner' or rights holder'. (<https://www.slideshare.net/slideshow/intellectual-property-rights-ipr46327495/46327495>)<sup>3</sup>

### **Web of Science**

Web of Science (WoS) is the world's oldest, most widely used and authoritative database of research publications and citations. Web of Science, previously known as Web of Knowledge, is a database of bibliographic citations of multidisciplinary areas that covers the various journals of medical, scientific, and social sciences including humanities. Based on the Science Citation Index, founded by Eugene Garfield in 1964, it has expanded its selective, balanced, and complete coverage of the world's leading research to cover around 34,000 journals today. A wide range of use cases are supported by WoS from daily search and discovery by researchers worldwide through to the supply of analytical datasets and the provision of specialized access to raw data for bibliometric partners. A long- and well-established network of such partners enables the Institute for Scientific Information (ISI) to continue to work closely with bibliometric groups around the world to the benefit of both the community and the services that the company provides to researchers and analysts

## Methodology

Methodology means study of method or a system of methods and rule applicable to research or work. It is connected basically with what principles and technique to be follow for collecting data information and material for a given research project. (Kothari, 1990)<sup>4</sup>. For the present study quantitative research method is used. It is also used as a way to research in different aspects of education.

## Literature Review

**Padme, S L & Vaishali, K (2016).** Bibliometric Analysis of Indian Journal of Chemistry Section A. International Journal of Information Dissemination and Technology, 6(2), 103-106. Bibliometric Analysis has been undertaken for the period of five years (2010 to 2014). In the present study, an attempt has been made to analyze the year-wise distribution of articles, find out the issue- wise distribution of articles, authorship pattern of Journal articles, year- wise degree of collaboration, institute-wise distribution of papers, and geographical distribution of articles authors also ranking of leading contributors in the articles.

**Kharat, P.P & Dr. Khaparde, S.Vaishali (2018)** Scientometric Profile of Presbyopia in Medline Database. International Journal of Library and Information Studies,8(2),Scientometric Analysis has been undertaken for period of five years (2010 to 2014). The present study is based on 3356references appended to 123 articles contributed on Medline Database. The findings revealed various aspects of the characteristics and patterns of contributions of the study.

**Khaparde Vaishali and Fawaz Abdullah Alhamdi (2015)** made a study in the Electronic Library Journal: A Bibliometric Study (2010 to 2014). Research focused on the number of articles published per volume in each specific year, and authorship patterns. The study found that DC value is more than 0.5; it is evident that multiple authored articles occupy the prominent position indicating the supremacy of solo research in the "The Electronic Library".

## Objectives of the Study

According to the specific field Like Year, Authorship, Journal wise Distribute on etc. objectives of the study categorized are as follows:

- To estimate the Annual growth rate (AGR)of publications
  - To study Authorship distributions of Publications
  - To study the Co –Authorship Pattern of Publication
  - To Estimate the Pareto's 80/20Principle
  - To study Authorship Pattern Distribution-Lotka's law
  - To estimate the Collaborative Index of publication
  - To estimate the Collaborative Coefficient of publication

- To estimate Collaborative Authorship Index of Publication
- To distributing Authorship Per capita Productivity
- To find out country-wise distribution of publication
- **Scope and Limitation of the Study:** The present study is based on Bibliometric study. The scope of the present study is limited to the 382 articles covered on 'Intellectual property rights in India' on Web of Science Database during the total ten years i.e. (2019-2023).
- **Data Collection:** The list of Articles on Intellectual property rights in India with adequate details such as applied Bibliometrics Laws i.e. Lotka's law, ZIPP's law and also Estimate Collaborative Index, Collaborative coefficient etc. various other tables are made on basis upon data collected. These have been classified grouped and analyzed to find the various dimensions of the study.
- **Data Analysis:** The analysis will be done as per the parameters laid down in the objectives of the study. The data collection & analysis is done for Intellectual property rights in India: A Bibliometric study of total 382 articles was collected & was analyzed as per the objective laid down as well as by using various statistical tools.

According to the objective of the study, analysis & findings of the study are outline below

### Annual Growth Rate (AGR) wise distribution

The growth rate is a measurement which is essential in any field. In meaning the growth of the number of publications in a particular discipline. This is often a measure of the annual increase or decrease. Here, the AGR has been determined as per the formula given below:- $AGR = \frac{\text{End value} - \text{First value}}{\text{First Value}} \times 100$

**Table 1: Annual Growth Rate Wise Distribution**

Sr. No.	Year	Frequency	Annual Growth Rate
1	2019	68	
2	2020	64	-5.88
3	2021	101	57.81
4	2022	80	-20.79
5	2023	69	-13.75

In this Table 1. Followed by so on Highest AGR in the year 2021 with 57.81& Lowest AGR in The Year 2020 with -5.88.

## To Study Authorship distributions of Publications

**Table 2.1: Co - Authorship Pattern of contribution**

Year	Author Nature	Frequency	Total	Percentage	Cumulative
2019	Single Author	15		23.81	23.81
	Co-Authors	48	63	76.19	100
2020	Single Author	17		26.98	26.98
	Co-Authors	46	63	73.02	100
2021	Single Author	17		18.89	18.89
	Co-Authors	73	90	81.11	100
2022	Single Author	20		23.53	23.53
	Co-Authors	65	85	76.47	100
2023	Single Author	13		16.05	16.05
	Co-Authors	68	81	83.95	100
Total			382		

It is observed from the **Table No -2.1** that the value of Co- Authorship Pattern for Single authored papers during 2019-2023. From this table Observed that the highest Single authored papers with 20 publications(23.53%) in the year 2022&in that same year Multi author papers are 65 publications (76.47%). And in the 2021 Co - Authorship Pattern for multi authored papers highest with 73 publications (81.11%) which indicated that the collaborative research is increasing over the study of “Bibliometrics”.

- **Pareto’s 80/20 Rule**

In 1906, Italian economist Vilfredo Pareto created a mathematical formula to describe the unequal distribution of wealth in his country, observing that twenty percent of the people owned eighty percent of the wealth. In the 1940s, Dr. Joseph M. Juran inaccurately attributed the 80/20 rule to Pareto, calling it Pareto’s Principle. More generally, the Pareto Principle is the observation (Not Law) that most things in life are not distributed evenly. It can mean all of the following things: 20% of the input creates 80% of the result 20% of the workers produce 80% of the result 20% of the customers create 80% of the revenue, 20% of the bugs because 80% of the crashes, 20% of the features cause 80% of the usage and so on. We must remember that idea: The numbers 20 and 80 must add to 100 –they don’t! 20% of the workers could create 10% of the result, or 50%. Or 80% or 99%, or even 100%. Think about it- in a group of 100 workers, 20 could do all the work while the other 80 goofs off. In that case, 20% of the workers did 100% of the work. Remember that the 80/20 rule is a rough guide about typical distributions.

Table 2.2: Pareto 80/20 Rule Distribution

Sr. No	Authorship Single Author	Total Contributions	Percentage	Cumulate
1	Single	82	21.47	21.47
2	Two	93	24.35	45.82
3	Three	72	18.85	64.67
4	Four	57	14.92	79.59
5	Five	28	7.33	86.92
6	Six	26	6.81	93.73
7	Seven	8	2.09	95.82
8	Eight	3	0.79	96.61
9	Nine	2	0.52	97.13
10	Ten	2	0.52	97.65
11	More than Ten	9	2.36	100
	<b>Total</b>	<b>382</b>	<b>100</b>	

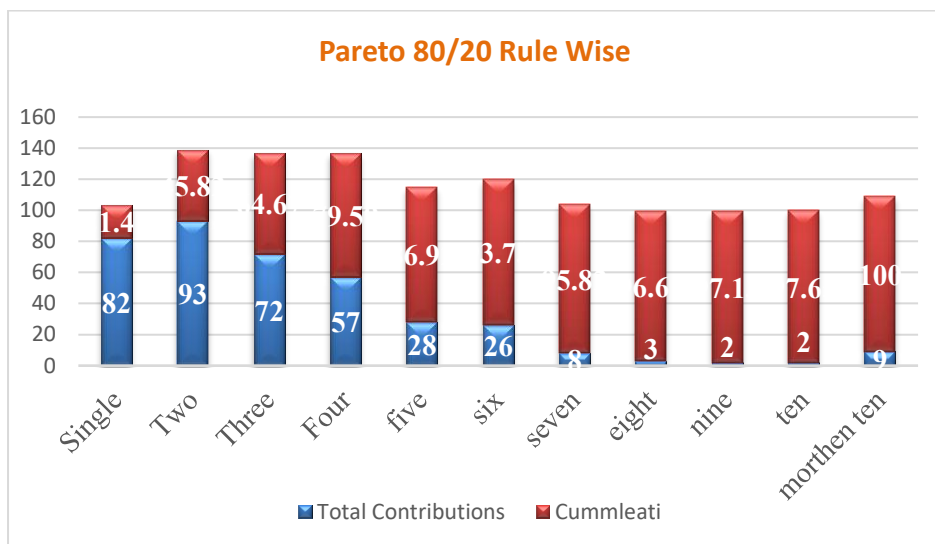


Figure 1: Pareto 80/20 Rule Distribution

This implies that the numbers of items are much more than the number of sources. In bibliometric/Informetric context, 20% of holdings account for 80% of circulation of library books, 20% of authors account for 80% of publication, etc. It is observed from the above

**Figure 1** that, the of single authors have written 21.47 total publication, two authors written 45.82, followed by three authors 64.67, four authors 79.59& Top Ten is 100 that it should be in increasing order.

- **Lotka's law (No. of authors)**

Generally, Lotka's Law describes the frequency of publications by authors in a given subject/discipline.

**Table 2.3: Lotka's law (No. of authors)**

X(No of Author)	Y(No. of Publication)	Log of X	Log of Y	XY	X2
1	82	0	1.91	0	0
2	93	0.3	1.97	0.59	0.09
3	72	0.48	1.86	0.89	0.23
4	57	0.60	1.76	1.06	0.36
5	28	0.70	1.45	1.01	0.49
6	26	0.78	1.41	1.10	0.61
7	8	0.85	0.90	0.76	0.72
8	3	0.90	0.48	0.43	0.81
9	2	0.95	0.30	0.29	0.90

**Table 2.3** Identifies the distribution of articles according to the number of contributors. The highest number of three authors is accounts for 93 (24.35%) and the number of Nine times authors is the lowest and it accounts for 02 (0.52%) and Single authors accounts 82(21.47%). Where, Collaborative Research is Predominant than Solo Research.

- **To find Collaborative Index of Contribution**

**Table 2.4: Collaborative Index**

Year	Single	Two	Three	Four	Five & above	Total Article	CI
2019	15	19	16	9	4	63	2.49
2020	17	15	11	10	10	63	2.70
2021	17	20	13	13	27	90	3.14
2022	20	17	15	14	19	85	2.94
2023	13	22	17	11	18	81	2.99
<b>Total</b>	<b>82</b>	<b>93</b>	<b>72</b>	<b>57</b>	<b>78</b>	<b>382</b>	<b>2.88</b>

Table 3.4 shows the variation in the CI. Lowest CI in the year 2019 i.e. 2.49 and highest Collaboration we can notices in 2021 i.e. 3.14 this may be due to the geographical or environmental factors of the organization. Final total Collaborative Index is 2.88.

- **To study Collaborative Coefficient**

According to Ajiferukeet al. (1988) who have shown the mean number of authors per paper, the proportion of multiple authorship as a measure of degree of collaboration in a discipline, is inadequate. Therefore, they have proposed a measure combining some of the merits of both measures into what is known as Collaborative Coefficient. Suppose, if a paper has a single author, the author receives one credit; if two, each receives  $\frac{1}{2}$  credits. In general, if we have 'n' authors each receive  $\frac{1}{n}$  credits. Hence, the average credit awarded to each author of a random paper is  $E [1/n]$ , a value which lies between 0 and 1. If '0' is to correspond to single authorship, then the CC is defined as:

$$CC = 1 - E [1/n]$$

$$= 1 - (1/j) p (N=j) \quad \text{and its sum } \sum \text{rate} = 1 - f_1 + (1/2) f_2 + (1/3) f_3 + \dots + (1/k) f_k / N$$

Where:  $F_j$  is the number of  $j$ -authors research papers published in a discipline during a certain period of time,  $N$  is the total number of research papers published in a discipline during a certain period of time (excluding anonymous authors) and  $K$  is the greatest number of authors per paper in a discipline. Ajiferuke et al were of the opinion that the  $CC$  incorporates the sum of the merits of both  $CI$  and  $DC$ . It lies between 0 and 1 ( $0 \leq CC \leq 1$ ). It tends to zero as single authored papers dominate and differentiates among levels of multiple authorship.

**Table 2.5: Collaborative Coefficients**

Year	Single	Two	Three	Four	Five & above	Total Article	CC
2019	15	19	16	9	4	63	0.52
2020	17	15	11	10	10	63	0.52
2021	17	20	13	13	27	90	0.44
2022	20	17	15	14	19	85	0.48
2023	13	22	17	11	18	81	0.44
<b>Total</b>	<b>82</b>	<b>93</b>	<b>72</b>	<b>57</b>	<b>78</b>	<b>382</b>	<b>0.48</b>

**Table 2.5** shows the  $CC$  has increased from 0.52 in 2019 to 0.44 in 2023 indicating that research among scientists is fairly collaborative with an average  $CC$  is 0.48.

$$CC = 1 - [f_1 + (1/2) f_2 + (1/3) f_3 + \dots + (1/k) f_k] / N$$

Based on the data in the 3.5, using the values for  $f_1$ ,  $f_2$ , and  $f_3$ ,  $CC$  for the year 2019

$$CC = 1 - \{[15 + (1/2) 19 + (1/3) 16 + (1/4) 9 + (1/5) 4] / 63\}$$

$$= 1 - \{[15 + 9.5 + 5.33 + 2.25 + 0.8] / 63\}$$

$$= 1 - [32.85 / 63]$$

$$= 1 - 0.5214$$

$$CC = 0.48$$

- **Collaborative - Authorship Index**

The Co - Authorship Index (CAI) can be measured by calculating proportional output of single, two, multi, and Mega-authored papers for different nations. The following mathematical formula of Garg and Padhi has been used to determine the Co-authorship pattern.

$$CAI = \{(N_{ij} / N_{io}) / (N_{oj} / N_{oo})\} \times 100$$

$N_{ij}$ : number of papers having  $j$  authors in block  $i$

$N_{io}$ : Total output of block  $i$

$N_{oj}$ : number of papers having  $j$  authors for all blocks



Noo: total number of papers for all authors and all blocks  $j = 1, 2, 3, 4, \geq 5$ . CAI = 100 implies that co-authorship in a particular block for a particular type of authorship corresponds to the world average, CAI > 100 reflects higher than average co-authorship effort and CAI < 100 indicates lower than average co-authorship effort in a particular block for a particular type of authorship.

**Table 3.6: Collaborative - Authorship Index**

Year	Single	CAI	Two	CAI	Three	CAI	Four	CAI	Five & Above	CAI	Total Article
2019	15	1.11	19	1.24	16	1.35	9	0.96	4	0.31	63
2020	17	1.26	15	0.98	11	0.93	10	1.06	10	0.78	63
2021	17	0.88	20	0.91	13	0.77	13	0.97	27	1.47	90
2022	20	1.10	17	0.82	15	0.94	14	1.10	19	1.09	85
2023	13	0.75	22	1.12	17	1.11	11	0.91	18	1.09	81
<b>Total</b>	<b>82</b>	<b>100</b>	<b>93</b>	<b>100</b>	<b>72</b>	<b>100</b>	<b>57</b>	<b>100</b>	<b>78</b>	<b>100</b>	<b>382</b>

Table 2.6 illustrates the Co-Authorship Index. It is observed that a decreasing trend has been seen in the value of CAI for Single (i.e. 1.11 to 0.75) two, three authored papers respectively. Conversely, an increasing trend has been seen in four (i.e.0.96 to 0.91) and five & above authored articles during the study period. This indicates that four and five & above - authored papers are increasing year by year in Indian LIS publications.

- **Authorship Per-capita Analysis**

The analysis revealed that 11655 authors contributed 1920 items during the period between 2009 and

2018. From this data, the per capita authorship could be calculated as

Per Capita Authorship = number of items / Number of authors

= 1248/382 = 0.31 the per capita authorship is 0.31

**Table 2.7: Authorship Per capita Productivity – Year wise analysis**

Year	Authors	Publication	Per Capita
2019	172	63	0.37
2020	204	63	0.31
2021	323	90	0.28
2022	280	85	0.30
2023	269	81	0.30
<b>Total</b>	<b>1248</b>	<b>382</b>	<b>0.31</b>

From the collected data is observed that there is large variation in the per capita authorship in each year that is shown in Table 3.7the per capita authorship ranges from 0.28 to 0.37 while the overall per capita authorship is 0.31. This indicates that the survival rate of most of the authors is more.

**Table 4: Country Wise Distribution of publication**

Sr. No	Countries	Record Count	Percentage
1	India	285	74.61
2	Oceania	14	3.66
3	USA	11	2.88
4	Canada	10	2.62
5	China	9	2.36
6	UK	10	2.62
7	France	5	1.31
8	Turkey	4	1.05
9	Bangladesh	3	0.79
10	Germany	3	0.79
11	Japan	3	0.79
12	Malaysia	3	0.79
13	Russia	3	0.79
14	Brazil	2	0.52
15	Norway	2	0.52
16	Philippines	2	0.52
17	South Africa	2	0.52
18	South Korea	2	0.52
19	Switzerland	2	0.52
20	Europe	3	0.79
22	Indonesia	1	0.26
24	Pakistan	1	0.26
26	Spain	1	0.26
28	Thailand	1	0.26
<b>Total</b>		<b>382</b>	<b>100</b>

Certain countries give more research output in a particular subject than others. This is very much useful not only for the information manager in finalizing the subscription list of periodicals but also for the research scholars as they tend to know the countries that are leaders in their respective field of research. The study regarding the country wise distributions has been done in order to know the most dominant countries in which the information is available.

It can be observed from Table No. 4 reveals that the India with 285 (74.61%) research papers is in the highest position followed by, Oceania 14 (3.66%) USA 11 (2.88%) The Canada 10 (2.62%) follows in table & Geographical Maps.

### Findings

The findings are based on the analysis of collected data appended in 382 articles.

- The majority of the contributions are made by the India.
- The highest Collaborative Index (CI) of 2.99 was recorded in the Year 2023.
- The average of CC of 0.58

- Single- authorship articles are higher and more predominant than multi-author. The multi-authored articles are highest in the year 2021
- The highest publication of proceeding form. The Collaborative Index varies from 2.49 in 2019 with highest collaboration of 2.99 in 2023.

## Conclusion

Bibliometrics relatively new subject of information. It helps to evaluate information & to handle the information in IPR and information centers by the quantitative analyzed information. It deals with the mathematical and statistical analysis. This is an umbrella term used for many studies where quantitative method or techniques are used to investigate various aspect of written document. This study is completed with the help of MS -Excel. This study is helpful for researchers as well as information scientists. It is good and informative for the researcher.

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