A Bibliometric Analysis of Contributions in *Scientometrics* Journal

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Abstract

This paper presents an analysis of the contributions in the international journal entitled 'Scientometrics' published during the period 1991-2014 as reflected in the Web of Science database. A total of 156 papers are found to be Indian contribution and that are refined from the global output (3016 papers). Analysis is based on the traditional bibliometric indicators by means of number of publications and citations. USA with more number of papers, and also received the highest number of citations. The study also observed that the total scientometrics research output of India constituted about 5% of the total world output. Multiple authorship pattern is dominant during the study period and is about 68.59% of the total Indian output. CSIR, Karnatak University and BARC are the major contributors of scientometric research from India.

Keywords: Scientometrics, Authorship pattern, Bibliometrics, Citations, Activity Index.

1. Introduction

'Scientometrics' is an international journal for all quantitative aspects of the science of science, communication in science and science policy. It is published by Akadémiai Kiadó and Springer Science+Business Media and was established in 1978. The term scientometrics is concerned with the quantitative aspects and characteristics of science and scientific research. The emphasis of scientometrics is placed on investigations in

which the development and mechanism of science are studied by statistical as well as mathematical methods. The journal publishes original studies, short communications, preliminary reports, review papers, letters to the editor and book reviews on scientometrics. Due to its fully interdisciplinary character, the journal is indispensable to research workers and research administrators. It provides valuable assistance to librarians and documentalists in central scientific agencies, ministries, research institutes and laboratories.

The present study aims to provide an analysis of the Indian papers published in '*Scientometrics'* journal during the period 1991-2014.

2. Review of Literature

Thanuskodi (2011) depicted a bibliometric analysis of the journal *Library Herald* for the period 2006-2010. The study revealed that it has published 138 articles and the highest number of articles has appeared in the area of library automation. By the use of bibliometric techniques, Park (2010) studied the authorship characteristics of *D-Lib Magazine* and the impact was investigated by utilizing Web of Science (WoS) database. The analysis of contributions in *Annals of Library and Information Studies* was analysed by Neerja Verma et al. (2007), found that most of the contributions were appeared as single authored and journal were the most cited publication. An analysis of 1317 papers published in the first fifty volumes during 1978-2001 of the international journal *Scientometrics* done by Bharvi et al. (2003) observed that the scientometric output is dominated by the single authored papers, however, multi-authored papers were gaining momentum. Dhiman (2000) conducted a bibliometric study of *Ethnobotany Journal* published during 1989-1998 and examined year-wise, institution-wise and country-wise distribution; authorship pattern, cited references, etc.

3. Objectives

The major objectives of the study are:

- To determine India's position among the productive countries those published their papers in *Scientometrics* journal.
- To investigate the chronological growth and activity of Indian contribution on scientometric literature published in the journal during 1991-2014.
- To ascertain the document types in the journal.

- To depict the authorship pattern and scientific productivity.
- To identify the most productive authors in the field of scientometrics who published their contributions in the journal.
- To examine the institution-wise distribution of scientometric literature.

4. Methodology

The data for the study has been downloaded from Web of Science (WoS), a versatile online citation database. The term 'scientometrics' is provided on the publication name field and '1991-2014' on the publication year field, a total of 3016 data is retrieved as global output. Moreover, 156 unique records were found as Indian contribution that is considered as a reasonable sample for the study. These records were downloaded and analysed using Bibexcel and MS Excel based on bibliometric parameters.

5. Data Analysis

The analysis of the study is based on the major bibliometric parameters.

5.1 Ranking of Countries

There are altogether 62 countries those contributed 3016 papers published in *Scientometrics* journal during the period 1991-2014. The contribution of different countries is estimated by the location of the affiliation of the author/authors of the published articles. The publication productivity of top 10 countries actively involved in scientometric research is depicted in table 1. USA contributed the largest share with 393 publications (13.03%) among the leading countries followed by China with 321 papers (10.64%) and Spain with 287 papers (9.52%). India's global publication share in scientometric research is about 5.17% (156 papers), 8th position among the productive countries based on the quantity of papers.

Table 1.

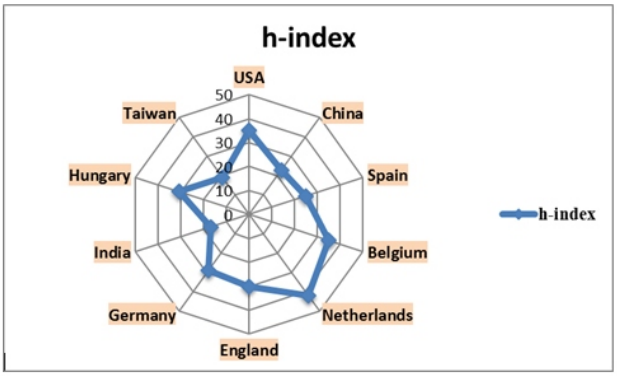
Ranking of Countries based on quantity of Papers published in *Scientometrics* Journal

Rank	Country		No. of Papers	Citations	Avg. Citation per Paper	h-index
1	USA		393	5445	13.85	35
2	China		321	2353	7.33	23
3	Spain		287	2634	9.18	25
4	Belgium		244	4554	18.66	35
5	Netherlands		233	5352	22.97	42
6	England		198	3136	15.84	30
7	Germany		195	3122	16.01	29
8	India		156	1183	7.58	17
9	Hungary		147	3564	24.24	31
10	Taiwan		146	1777	12.17	19

Based on the quality (in terms of citations per paper), Hungary having 147 papers with high impact followed by Netherlands and Belgium. It is also observed that Netherlands having more h-index followed by USA and Belgium (figure 1). India having slightly low h-index compared to other countries, and with a total of 1183 citations for 156 papers.

Fig. 1. h-index map of productive countries

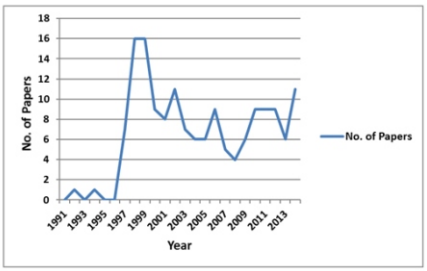
5.2 Year-wise Growth and Activitv Index



- **Year-wise growth of Papers**

There are 156 papers appeared as Indian output related to scientometrics during the period 1991-2014. Of the total publications, the years such as 1998 and 1999 picked up maximum coverage having 16 papers each. In 2002 and 2014, India produced 11 papers each (table 2). It is excruciating to note that there hadn't any Indian contribution in the journal during the years 1991, 1993, 1995 and 1996 (figure 2).

Figure 2. Year-wise growth of Indian Papers in *Scientometric* Journal during 1991-2014India's Share and Activity Index



A comparison of India's share with the world contributions was carried out using Relative Activity Index (RAI), first suggested by Frame (1977) and subsequently made use of by many other bibliometricians. The Relative Activity Index indicates whether a unit is more or less active in their chosen sub domains than the rest of the world. It is defined as:

RAI = Given field's share in the country's publication output / Given field's share in the world's publication output.

Mathematically,AI=((nij / nio)/noj / noo))x100

Where n_{ij} is the Indian output of papers in a particular field; n_{io} is the total Indian output in all fields; n_{oj} is the world output of papers in a particular field; and n_{oo} is the total world output in all fields. RAI = 100 indicates that the country's research effort in the given field corresponds precisely to the world's average. RAI >100 reflects higher activity than the world's average, and RAI <100 indicates lower than average effort dedicated to the field under study (Salini, Nishy, Vishnumaya & Mini, 2014).

Table 2.

Year-wise Distribution and Activity Index of Contributions from India

Year	Indian Output	World Output	Activity Index
1991	0	14	0
1992	1	18	107.37
1993	0	13	0
1994	1	26	74.33
1995	0	18	0
1996	0	55	0
1997	7	81	167.02
1998	16	89	347.45
1999	16	140	220.88
2000	9	89	195.44
2001	8	115	134.45
2002	11	87	244.36
2003	7	94	143.92
2004	6	101	114.81
2005	6	114	101.72
2006	9	160	108.71
2007	5	129	74.91
2008	4	131	59.01
2009	6	192	60.40
2010	9	233	74.65
2011	9	226	76.97
2012	9	267	65.15
2013	6	262	44.26
2014	11	362	58.73
Total	**156**	**3016**	**Avg. AI=103.11**

From table 2, it is observed that the total scientometrics research output of India constituted about 5 per cent of the world output. It is observed that during 1992 and the period from 1997 to 2006 reflects higher activity in the journal than the world's average. But during the year 2007-2014, the activity of Indian scientometric research is slightly less than the world's average.

5.3 Document Types

Scientometrics journal contains different types of documents, including research articles, proceedings papers, book reviews, editorial materials, letters to editor etc. From table 3, it is shown that research articles of Indian authors are more with 130 papers (83.33%) followed by proceedings paper (18 papers) and letters (only 5 papers).

Table 3. Document types in *Scientometrics* Journal

Doc. Type	No. of Papers	Percentage
Article	130	83.33
Proceedings Paper	18	11.54
Letter	5	3.21
Book Review	2	1.28
Editorial Material	1	0.64
Total	**156**	**100.00**

5.4 Authorship Pattern

There are altogether 155 authors who contribute 156 papers published in 'Scientometrics' journal. Table 4 presents the authorship pattern of Indian contributions in the journal during 1991-2014. It shows that single authored papers is about 49, and 61 papers were contributed by two authors. Three authored and four authored papers are about 30 and 12 respectively. Only 4 publications were contributed by more than 4 authors.

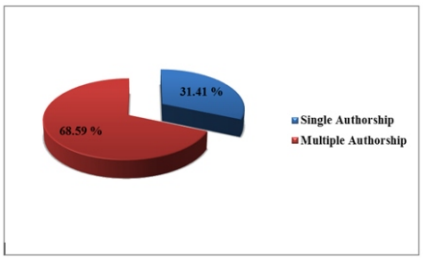
Table 4. Authorship Pattern of Indian Papers

Authorship Pattern	No. of Paper	Percentage
Single Author	49	31.41
Two Authors	61	39.10
Three Authors	30	19.23
Four Authors	12	7.69
More than Four Authors	4	2.56
Total	**156**	**100.00**

It is also interesting to note that multiple authorship pattern (68.59%) is predominant in the journal rather than single authorship (31.41%) during

the study period (figure 3).

Figure 3. Single Vs. Multiple Authorship Pattern



5.5 Leading Indian Authors

A list of 19 leading Indian authors ranked according to the quantity of publications is given in table 5. Based on the analysis, B. M. Gupta from CSIR-National Institute of Science, Technology and Development Studies (NISTADS), New Delhi topped the list having 27 papers. K. C. Garg also from CSIR-NISTADS and Gangan Prathap from CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram obtained the second place by means of number of papers with 18 publications each. While considering the quality of papers in terms of citations received, K. C. Garg having high impact papers with an h-index of 9 followed by B. M. Gupta with 177 citations and having h-index of 8.

Table 5.

Most Productive Indian Authors in the field of Scientometrics

Sl. No.	Author	No. of Papers	Citations	h-index
1	Gupta, B. M.	27	177	8
2	Garg, K. C.	18	187	9
3	Prathap, G.	18	114	6
4	Kumar, S.	11	96	7
5	Bhattacharya, S.	11	163	7
6	Basu, A.	8	73	5
7	Kademani, B. S.	7	36	5
8	Karisiddappa, C. R.	7	50	5
9	Kumar, V.	7	31	4
10	Padhi, P.	6	82	5
11	Kalyane, V. L.	6	26	4
12	Sangam, S. L.	6	19	3
13	Ravichandra Rao, I. K.	5	14	3
14	Kundra, R.	5	28	3
15	Sharma, P.	4	34	4
16	Nagpaul, P. S.	4	44	4
17	Dastidar, P. G.	4	34	3
18	Dhawan, S. M.	4	28	3
19	Arunachalam, S.	4	45	3

5.6 Major Institutions

With regard to '*Scientometrics*', the 10 most productive institutions based on author affiliation is given in the table 6. From the analysis, it is clear that Council of Scientific and Industrial Research (CSIR institutes taken together) topped the list with 122 papers (78.21) followed by Karnatak University and Bhabha Atomic Research Centre (BARC) with 14 publications each.

Table 6.

Leading Institutions Contributing Scientometric Research

Sl. No.	Institution	No. of Papers	Percentage
1	CSIR	122	78.21
2	Karnatak University	14	8.97
3	BARC, Mumbai	14	8.97
4	IITs	8	5.13
5	Utkal University, Bhubaneswar	5	3.21
6	Indian Statistical Institute, Bangalore	4	2.56
7	Bharathidasan University	4	2.56
8	Bose Institute, Kolkata	4	2.56
9	Anna University	4	2.56
10	University of Madras	3	1.92

6. Findings and Conclusion

The study provides a bibliometric analysis of Indian contribution in the international journal *Scientometrics* during the period 1991-2014. There were 156 publications retrieved as Indian contribution and was about 5% of the total world output. India has also made a significant place, i.e. 8th position among the leading countries contributing scientometrics research. While considering the authorship pattern of the papers, authors in the journal made slightly more multiple contributions during the study period. Regarding the productive institutions, CSIR, Karnatak University and BARC published highest number of papers out of the total Indian contribution. The study may encourage to the authors from India who specializing scientometrics research may contribute in the highly influencing journal, *Scientometrics*.

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