International Scholars Journals

African Journal of Library and Information Science ISSN 5721-610X Vol. 3 (5), pp. 001-007, May, 2017. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Indian journal of physics: A scientometric analysis

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Accepted 17 October, 2016

Scientometric analysis of 829 articles published in the Indian Journal of physics during the year 2004-2008 are taken up to observe the distribution of contributions, authorship pattern, geographical distribution of contributions and the number of pages used in each volume. Results indicate that highest numbers of papers have been written by co- authors. The contributions in this journal from India are slightly more than those from the other countries. The growth and popularity of this journal is found to show an upward trend.

Key words: Scientometrics, distribution of contributions, geographical distribution, Indian journal of physics.

INTRODUCTION

Scientometrics is a branch of science. Scientometricians explain about input and outputs resource in terms of organizational structure. They develop benchmarks to evaluate the quality of information resources and pac-kages of information for decision making in science. It provides a key opportunity to the researcher to publish their articles with new strategies, innovations, new methods and new ideas. Indian journal of physics highly helpful in the field of astrophysics, atmospheric and space physics, bio-physics and so on. They define appro-priate data aggregation producers and methods for diachronic analysis. They empirically describe the con-stantly changing relationships between science, techno-logy and the market. They forecast productivity of scien-tists, so that dynamics of scientific research and technological development can be understood. This consequently sheds more light on our knowledge of the structure of subject of literature and better organization of information resources which can ultimately be effectively used. In this paper an attempt has been made by the research to reveal the trends towards the increase and quality of research articles in Science discipline.

Review of literature

The assumption that one can compare 'like with like' in terms of institutional parameters (Martin and Irvine, 1983) is problematic from this perspective. New scientific developments (e.g., artificial intelligence) emerge in very different institutional settings, and in order to make a fair comparison one should perhaps first define a *cognitive* unit of analysis.

However, the intellectual organization of the sciences cannot easily be observed or measured (Leydesdorff, 1995).

An alternative way to define a unit of analysis would be to base the operationalization on the reflection of scientific developments in the scientific journal literature. The scientific literature is organized in relatively discrete clusters of journals. For example, an article in a bioche-mistry journal will not often cite an article in condensed matter physics, or vice versa. The relations between these textual units of analysis and the institutional units under evaluation generate further research questions since publication and citation rates differ among dis-ciplines.

The relative decomposability of the literature was central to the above noted attempt of Narin to cluster the database of aggregated journal-journal citations. How-ever, the clustering algorithms provide a snapshot. The structure at any given moment in time does not take into account the dynamic development of the sciences over time. One expects scientific specialties to develop in parallel and not in a hierarchical order.

Furthermore, Narin had proposed to *fix* a journal set in order to make comparisons over time possible. However, advanced industrial nations tend to publish in newly emerging areas (and accordingly new journals) relatively more than research units in more conservative systems.

The so-called 'decline of British science' (Irvine et al., 1985) a subject of intense political debate during the

1980s, could with hindsight be deconstructed as partially an artifact of this type of methodological decisions. Within a dynamic database the U.K. is more stable than in a fixed set, since losses on one side tend to be compensated at the other (Leydesdorff, 1988; Braun et al., 1989; Martin, 1991).

A group of researchers at the *École Nationale Supérieure des Mines* in Paris proposed to focus on words and relations among words ('co-words') as an alternative to citation and co-citation analysis (Callon et al., 1983) . One advantage would be that the words and co- words occur not only in the scientific journal literature, but also in policy reports and patent applications.

Can the strengths of the relations among words be used as an indicator of the survival value of an indicated concept during these 'translations' across domains? These authors envisaged that the evaluation of research in terms of performance would become possible by using words and their co-occurrences as indicators of 'translation' (Callon et al., 1986; Latour, 1987).

The analysis of the co-word patterns proceeded technically in a manner analogous to the co-citation analysis being further developed at the Institute of Scientific Information (ISI) by Small's group (Small, 1973). In the meantime, the ISI group had produced an *Atlas of Science* that was based on agglomerative clustering techniques using a graph analytical algorithm (Small et al., 1985). These mappings, however, were flawed by the initial decision to focus on hierarchical *relations* for the study of structure and strategic *positions*.

Structure can be analyzed only in terms of differenttiations into latent dimensions of the system. These dimensions can be revealed using factor analytical techniques (Leydesdorff, 1987 and 1992; cf. Lazarsfeld and Henry, 1968).

While the sciences are discursively constructed as networks of communication in terms of relations among words, the aggregated constructs can be expected to differentiate over longer periods of time according to rules which are functional to the further advancement of the intellectual organization of specialized, and therefore relatively autonomous, structures of scientific communication (Luhmann, 1984 and 1990). The various discourses continuously update and rewrite reflexively their understandings of the relevant history.

Source journal

Indian Journal of Physics has been selected as the source journal for the present study. The Indian Journal of Physics is published by the Indian Association for the Cultivation of Science, Kolkata along with editorial collaboration with Indian Physical Society. The Pioneering journal was started by CV Raman in 1926. The monthly issue of this journal contains Full papers, short notes, rapid communications and Review Articles.

The articles published in this journal cover all areas of research in physics viz. Astrophysics, Atmospheric and space physics, and so on.

Objectives of this study

The following objectives were formulated for the present study:

- To examine the authorship pattern of the contribution.
- To sketch the volume wise distribution of contribution and to find out the average - number of contributions per volume.
- To indicate volume wise geographical distribution of contributions.
- To find out the research productivity count of the contributions on the basis of geographical distribution both at national and international levels.
- To observe the number of pages used in different volumes.

Scope of this study

An attempt has been made to analyse the contributions in 60 issues of 5 volumes of the Indian Journal of Physics in the field of astrophysics, atmospheric and space physics, atomic and molecular physics, biophysics, condensed matter and materials physics, general and interdisciplinary physics, Nonlinear dynamics and complex systems, Nuclear physics, optics and spectroscopy, particle physics, plasma physics, relativity and cosmology, statistical physics during the year from 2004 - 2008.

METHODOLOGY

The data pertaining to Indian journal of physics regarding 829 contributions made from volume 78 in 2004 to volume 82 in 2008. The analysis made an authorship (Volume wise and issue wise); authorship pattern, geographical distribution in national and international wise, citation of publication and number of pages of Indian journal of physics. The authorship pattern has been analysed by using K. Subramaniam's degree of collaboration in quantitative terms. All the data were subsequently examined, observed, analysed and tabulated for making observations.

Data analysis

Table 1 shows the distribution of contributions volume-wise. Table 1 portrays that out of 829 contributions, 28.71% of them were contributed in 2004, 24.13% of them were published in 2005, 17.25% of them were published in the year 2006, 12.42% of them were published in the year 2007. And the rust of them was published in the year 2008. It is inferred from the table of distribution of contributions from 2004 - 2008 that the level of the percentage of distribution has decreased. A notable attribute of the study is that the year 2004 shows the maximum number of contributions.

Table 2 shows the distribution of contributions (Issue - wise). Table 2 exhibits monthly wise contributions of journals. Volume No: 78,

Table 1. Distribution of contributions (Volume- wise).

Year	Vol. No	No. of issues	No. of contributions	%
2004	78	12	238	28.71
2005	79	12	200	24.13
2006	80	12	143	17.25
2007	81	12	103	12.42
2008	82	12	145	17.49
		60	829	100

Table 2. Distribution of contributions (Issue - wise).

Month	Volume Number				
	78	79	80	81	82
January	22	16	11	23	10
February	18	14	10	7	13
March	24	19	13	11	14
April	17	14	13	8	8
May	21	11	18	12	21
June	12	16	12	0	22
July	17	29	9	9	11
August	36	13	11	7	3
September	20	27	12	7	7
October	18	13	13	7	14
November	16	13	11	4	14
December	17	15	10	8	8
Total	238	200	143	103	145

shows the highest number of total contributions. Next to Volume No: 79, monthly-wise distribution of contributions was more in Volume No: 78. The contributions in Volume No: 79 were more in July. The month May shows more issues in volume no 80 regarding Volume No: 81 the issues were more in January. Regarding in Volume No: 82, June has recorded the maximum number of issues.

Authorship pattern

Table 3 shows the authorship pattern of contributions. Table 3 explicates the authorship pattern of contributions. Out of 829 contributors, a single author has contributed 12.42 per cent of the total articles. 33.17 per cent of the contributions were published with two authors, 26.65 per cent of the contributions were contributed by three authors. 16.41 percent of the contributions were published by four authors, 7.36 per cent of the contributions were published by five authors, 1.93 per cent of the contributions were published by six authors, 1.44 per cent of the contributions were published by seven authors, 0.24 per cent of the contributions were published by eight authors, 0.12 of the contributions were published by nine authors and the rest of the contributions were contributed by eleven authors. A significant note of the study is that the majority of the articles are contributed by co- author.

Degree of collaboration in the Indian journal of physics

The formula given by K Subramanyam is useful for determining the degree of collaboration in quantitative terms. The study followed the same formula which is mathematically put as:

$$C = \frac{NM}{NM + NS}$$

Where C = Degree of Collaboration NM
= Number of Multi authored papers NS
= Number of single authored papers.

In the present study

NM = 726
NS = 103

Thus C = 0.781

Thus the degree of collaboration in Indian journal of physics is 0.781 which clearly indicates its dominance upon individual contribution.

Table 4 shows the Authorship pattern of Contributions (Volume - wise). Table 4 depicts that authorship pattern of contributions volume wise. Regarding contributions by a single author, volume no 78 records the highest percentage. Regarding the two author contributions, Volume No 78 shows the maximum percentage. Regarding the three author contributions, Volume No 78 depicts the highest percentage. Regarding the four author contributions, Volume No 79 reflects the maximum percentage. Anyhow it may be concluded that the Co - author contributions has the maximum percentage.

Geographical distribution of contributions is discussed in Table 5 shows the contributors institution - wise

Table 5 depicts the geographical distribution of Contributions University - wise at the national level, followed by Institutions and colleges. It is inferred from the above table that University-wise contributions were the maximum.

Table 6 depicts the Geographical distribution of contributions in India.

Table 6 explains that, a study of the 2192 contributions made reveals first position of Karnataka with 18.89% regarding the states like Arunachalpradesh, Pondicherry and Andaman, the contribution share was of less percentage. A significant observation of the study is that Karnataka dominates the number of contributions.

Table 7 shows the Geographical distribution of contributions at International level.

Table 7 shows that 91.64%of contributions came form India; 1.50 percent of contributions came from Bangladesh; 1.17% of contributions came from Egypt; 0.79% of contributions came from Iran

Table 3. Authorship pattern of contributions.

No. of authors	No. of contributions	Total No. of authorship	%
Single Author	103	103	12.42
Two Authors	275	550	33.17
Three Authors	221	663	26.65
Four Authors	136	544	16.41
Five Authors	61	305	7.36
Six Authors	16	96	1.93
Seven Authors	12	84	1.44
Eight Authors	2	16	0.24
Nine Authors	1	9	0.12
Eleven Authors	2	22	0.24
	829	2392	100

Table 4. Authorship pattern of contributions (Volume - Wise).

Vol. No	Single Author	Two Author	Three Author	Four Author	Five Author	Six Author	Seven Author	More than seven
78	29	71	66	39	23	6	4	0
79	21	63	54	41	16	3	1	1
80	23	52	32	21	9	1	3	2
81	11	29	32	18	8	4	1	0
82	19	60	37	17	5	2	3	2
Total	103	275	221	136	61	16	12	5

Table 5. Contributors (Institution - wise)

Vol. No	Year	University	Institution	College	Total
78	2004	375	232	103	710
79	2005	322	117	135	574
80	2006	230	113	68	411
81	2007	171	97	56	324
82	2008	200	115	58	373
		1298	674	420	2392

and 0.71% of contributions came from Japan; Countries. However, it is inferred that out of the above mentioned twenty nine countries, India gives priority for research when compared to other countries.

Table 8 shows that sixty issues of five volumes of Indian Journal of Physics contained 13481 citations. Based on analysis it was found that physicians make use of journals articles the most that is 8851 (65.66%) citations. This is due to the fact that journals are the premier vehicle of nascent information transfer / dissemination. This is followed by books 3303 (24.50 %) citation. The remaining 1327 (9.84%) citations are from other sources, which include conference proceedings theses and dissertations personal notes etc.

Table 10 shows that regarding 238 research articles covered 1201 pages; 200 articles covered 1137 pages; 143 articles covered 1056 pages; 103 articles covered 1078 pages and, 145 articles covered 1384 pages respectively. It is found that the article-wise study 238 articles covered the maximum number of pages, but in the study average-wise 103 articles had in the maximum number of pages (average 10.46 pages).

FINDINGS

From the observation made in this study, the following points may be inferred:

Majority of the contributions in the journal are by a two author's presumably one being a research scholar and the other is his/her guide.

The degree of collaboration in Indian journal of physics is 0.781 which clearly indicates its dominance upon indivi-

Table 6. Geographical distribution of contributions in India.

Sl. No	Name of the State	No. of Contributions	%
1	Karnataka	414	18.8868613
2	Assam	274	12.5
3	Maharastra	194	8.85036496
3	Uttatpradesh	184	8.39416058
4	Tamilnadu	161	7.34489051
5	Orissa	114	5.20072993
6	Gujarat	112	5.10948905
7	Mathyapradesh	105	4.79014599
8	New Delhi	93	4.24270073
9	Bihar	81	3.69525547
10	AndhraPradesh	69	3.14781022
11	Rajesthan	56	2.55474453
12	Karnataka	41	1.87043796
13	Uttranchal	40	1.82481752
14	Haryana	37	1.6879562
15	Chhatisgarh	28	1.27737226
15	Jammu & Kashmir	26	1.18613139
16	Kerala	24	1.09489051
17	Himalchal Pradesh	22	1.00364964
18	Punjab	21	0.9580292
19	Manipur	20	0.91240876
20	Jarkhand	16	0.72992701
21	Mizoram	13	0.59306569
22	Mysore	9	0.41058394
23	Meghalaya	9	0.41058394
24	Tripura	9	0.41058394
25	Howra	9	0.41058394
26	Manipal	6	0.27372263
27	Pondicherry	2	0.09124088
28	Andaman	2	0.09124088
29	Arunachalpradesh	1	0.04562044
		2192	100

Table 7. Graphical distribution of contributions at International level.

Sl. No	Name of the Country	No. of Contributions	%
1	India	2192	91.638796
2	Bangladesh	36	1.50501672
3	Egypt	28	1.17056856
4	Iran	19	0.79431438
5	Japan	17	0.71070234
6	USA	14	0.58528428
7	Turkey	14	0.58528428
8	Germany	13	0.54347826
9	Saudi Arabia	10	0.4180602
10	Taiwan	6	0.25083612
11	Iraq	5	0.2090301
12	Palestine	4	0.16722408
13	Malaysia	4	0.16722408
14	Mexico	4	0.16722408

Table 7 Contd.

15	Nepal	3	0.12541806
16	Israel	3	0.12541806
17	UK	2	0.08361204
18	Nigeria	2	0.08361204
19	Italy	2	0.08361204
20	Sweden	2	0.08361204
21	Chez Republic	2	0.08361204
22	Norway	2	0.08361204
23	Jordan	1	0.04180602
24	Canada	1	0.04180602
25	Oman	1	0.04180602
26	Ukraine	1	0.04180602
27	Romania	1	0.04180602
28	Chins	1	0.04180602
29	Eritrea	1	0.04180602
30	Tunisia	1	0.04180602
	Total	2392	100

Table 8. Types of publications cited (volume-wise).

Vol. No	Books	Journals	Others	Total
78	868	2160	324	3352
79	698	1946	309	2953
80	621	1621	254	2496
81	458	1432	214	2104
83	658	1692	226	2576
Total	3303	8851	1327	13481
%	24.50	65.66	9.84	

Table 9. Average Citation per Contribution in Each Volume.

Vol. No	No. of contributions	No. of citations	Average
78	238	3352	14.08
79	200	2953	14.76
80	143	2496	17.45
81	103	2104	20.42
82	145	2576	17.76
5 Volumes	829	13481	16.26

Table 10. Average pages (per volume and per contributions).

Vol. No	Total pages	No. of articles	Average
78	1201	238	5.04
79	1137	200	5.68
80	1056	143	7.38
81	1078	103	10.46
82	1384	145	9.54

dual contribution.

Volume Number 78 (2004) has maximum articles contributed.

Among the contributions, the maximum number of contributors is from the Universities at the national level.

The national contributions are slightly more than the international contributions. The national contributions are maximum in the volumes 79 and 80.

All the contributions are with citations. It is observed that the journals are more cited documents.

Conclusion

The publishing trend totally depends on the productivity of contributors, pattern of contributions and the quality of information. In the year 2004 shows the maximum of contributions made in this journal but volume no 82 in June 2008, has recorded the maximum number of issues. A significant note of the study is that the majority of the articles are contributed by co-author and that the University –wise contributions were the maximum. In India Karnataka dominates the number of contributions than any other states. The geographical distributions of international level shows among the 29 countries, India gives priority for research when compared to other countries. A notable attribute of this study is that, this journal really stipulates / induces fruitful research for the researcher. Today, we see that research is done in almost all the branches of knowledge, especially in science and technology.

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