Scientometric Analysis of Journal of Bio-technology Reports from the Year 2014-2018

K Praveena[1], S Rajeswari[2]

Authors Affiliation:

[1]Associate Professor, Department of Library and Information Science, Annamalai University, Tamil Nadu 608002, India. [2]Assistant Librarian Department of Library, College of Engineering, Anna University, BIT Campus, Tiruchirappalli, Tamil Nadu 620024, India

Address for correspondence

S. Rajeswari, Assistant Librarian, Department of Library, University College of Engineering, Anna University, BIT Campus, Tiruchirappalli, Tamil Nadu 620024, India

E-mail: drrajeswari19772009@gmail.com

Abstract

Scientometric analysis of 290 research articles published in Journal of Bio-technology Report during the period 2014-2018. The number of contributions, authorship pattern and author productivity, keywords and length of articles, Citation of the articles, degree of collaboration, Relative Growth Rate and Doubling time, Institution wise contribution has been analyzed. Out of 290 contributions, only 8 is single author and rest by multi authors with degree of collaboration 0.972, The study revealed that the author productivity is 0.21 and dominated by the multiple authors.

Keywords: Scientometrics; Journal of Bio-technology reports; Author Productivity; Degree of Collaboration; Related Growth Rate and Doubling Time; Institution wise contribution.

Introduction

Scientometrics is a discipline which analyses scientific publications to explore the structure and growth of science. Scientometrics techniques used to analyze various quantitative or qualitative aspects of a publication. It is a scientific field that studies the evaluation of science through some quantitative measures of scientific information, as the number of scientific articles published in a given period of time, their citation impact etc. The history of science and technology, philosophy of science and sociology of scientific knowledge are the related fields of Scientometrics.

Scientometrics research includes studies related to the scattering and growth of literature, author productivity, obsolescence of documents, distribution of scientific literature by country, by language etc., which helps to monitor the growth and pattern of research.

Pritchard[1] (1969) described the Bibliometrics as the application of mathematics and statistical methods to books and other media.

Scientometric research is devoted to quantitative studies of science and technology according to A.F.J.Van Raan.[2]

In this study, an attempt has been made to analyze to contributions to Bio-technology Report published during the year 2014-2018, in order to explore the author pattern, collaboration research, keywords and length of the articles, Relative Growth Rate and Doubling time, Author productivity, Institution wise among the contributions.

Bio-Technology

In 1919 Hungarian agricultural engineer Karl Ereky Foresaw a time when biology could be used for turning raw materials in to useful products. He coined the term biotechnology to describe that merging of biology and technology. Ereky,s Vision has now been realized by thousands of companies and research Institutions. The growing list of biotechnology products includes medicines, medical devices and diagnostics as well as more resilient crops, bio fuels biomaterials and pollution controls. In the 21st centuries biotechnology has expanded to includes new and diverse science such

as genomics, recombinant gone techniques, applied immunology and development of pharmaceutical therapies and diagnostic tests.

About the Bio-Technology Report

Biotechnology Report was selected as the Source journal for the present research study. The journal was started in 2014 and published quarterly, Bio technology Reports covers all aspects of Biotechnology particularly those reports that are useful and information and that will be of value to other researchers in related fields. The journal publishes articles in the following subject area that is immunology and microbiology, Applied microbiology and Bio technology, Bio chemistry and genetics and molecular Biology.

Objectives of the Study

1. To find out the year wise distribution of Publication.

2. To examine the Authorship Pattern and author productivity.

3. To determine the Degree of Collaboration.

4. To analyze Relative Growth Rate and doubling time.

5. To find out the average Keywords and average length of papers.

6. To identify Institution wise contribution of papers.

7. To study the citation counts of all the published papers of the journal.

Scope and Methodology

Bio-technology Reports published in the year 2014 to 2018 containing 20 issues have been taken in to consideration to the present study. The present study tries to find out the literature growth, authorship and collaboration pattern, Keywords and length of articles, citation of the articles, institution wise contribution in the source journal. The collected data was analyzed with the following bibliometric indicators. Extent of Authorship Pattern (Single Vs Multiple), Degree of Collaboration, Relative Growth Rate and Doubling time.

Bibliometric Indicators

Relative Growth Rate

In order to identify the relative growth rate, the

researcher has adopted a model developed by Mahapatra.[3] The relative growth rate is the increase in the number of publications/pages per unit of time. The mean relative growth rate $\overline{R}$ (1-2) over a specified period of interval can be calculated from the following equation.

$$\overline{R}\ (1\text{-}2) = \frac{W_2 - W_1}{T_2 - T_1}$$

Where $\overline{R}$ (1-2) = mean relative growth rate over the specified period of interval;

W_1 = Log W_1 (Natural log of initial number of publications/pages);

W_2 = Log W_2 (Natural log of initial number of publications/pages);

T_2-T_1 = The unit difference between the initial time and final time.

The relative growth rate for both publications and pages can be calculated separately.

Therefore,

$\overline{R}$ (a) = Relative growth rate per unit of publications per unit of time (year);

$\overline{R}$ (p) = Relative growth rate per unit of pages per unit of time (year)

Doubling Time

It is also calculated that there is a direct equivalence existing between the relative growth rate and doubling time. If the number of publication/pages of a subject doubles during a given period, then the difference between the logarithms of the numbers at the beginning and the end of the period must be the logarithms of the number 2. If one uses natural logarithms, this difference has a value of 0.693. Thus, the corresponding doubling time for publications and pages can be calculated by the following formula:

Doubling time (Dt) = 0.693/$\overline{R}$

Therefore,

Doubling time for publications Dt(a) = 0.693/$\overline{R}$ (a)

Doubling time for pages Dt(p) = 0.693/$\overline{R}$ (p)

Degree of Collaboration

In order to identify the degree of collaboration, the researcher has adopted K.Subramanyam's formula.[4]

The formula is

$$C = \frac{N_m}{N_m - N_s}$$

Where,

C = Degree of collaboration in a discipline

Nm = Number of multiple authored papers

Ns = Number of single authored papers

Results and Discussion

Table 1: Year Wise Distribution of Publication.

S. No	Year	No. of Issue	No. of Contribution	Percentage
1	2014	4	45	15.52
2	2015	4	78	26.90
3	2016	4	48	16.55
4	2017	4	48	16.55
5	2018	4	71	24.48
	Total		290	100

Table 1 Shows that the distribution of research articles published in Bio technology Reports during 2014-2018. It is observed that 290 research articles was published in the study period. It shows that 78(26.90%) maximum number of articles published in the year 2015 and 45(15.52%) minimum number of articles published in the year 2014. It reveals that articles publication rate is gradually increase.
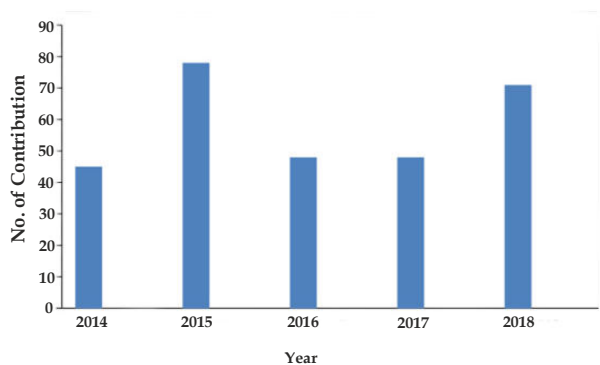

Fig. 1: Year wise distribution of Publication.

Table 2: Authorship Pattern of Publication.

S.No	Authorship Pattern	No. of Contribution	Percentage
1	Single	8	2.76
2	Two	35	12.07
3	Three	49	16.90
4	Four	51	17.59
5	Five	69	23.79
6	Six	35	12.07
7	Seven	19	6.55
8	Eight	11	3.79
9	Nine	2	0.69
10	Ten	2	0.69
11	More than Ten	9	3.10
		290	

It is observed from table 2, Out of 290 articles, the highest number of articles was published 69(23.79%) by five authors. The lowest number of articles was published 2(0.69%) by nine and ten authors.
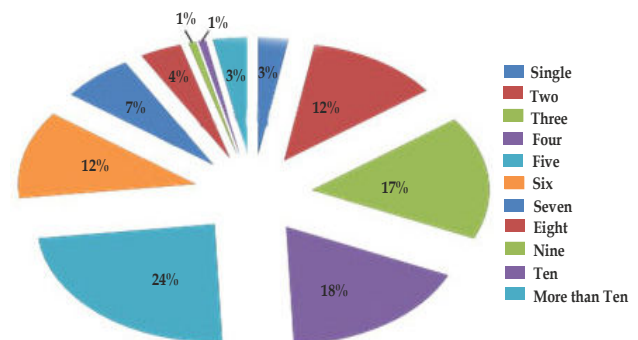

Fig. 2: Authorship Pattern of Publication.

Table 3: Calculation of Degree of Collaboration.

S. No	Year	Single	Multiple	Total	Collaboration
1	2014	4	41	45	0.911
2	2015	-	78	78	1.000
3	2016	2	46	48	0.958
4	2017	1	47	48	0.979
5	2018	1	70	71	0.986
	Total	8	282	290	0.972

The Degree of Collaboration of authors by year wise is presented in the table 3. The degree of collaboration ranges from 0.91 to 0.98. The average degree of collaboration is 0.97 during the period 2014-2018.

Table 4: Author Productivity.

S. No	Year	Total Number of Papers	Total Number of Authors	Average Authors Per Paper	Productivity Per Author
1	2014	45	187	4.16	0.24
2	2015	78	371	4.76	0.21
3	2016	48	219	4.56	0.21
4	2017	48	221	4.60	0.22
5	2018	71	351	4.94	0.20
	Total	290	1349	4.65	0.21

Table 5: Related Growth Rate and Doubling Time.

S.No	Year	No. of Contribution	Cumulative of no. of Contribution	W1	W2	RGR	Dt
1	2014	45	45	-	3.8066	-	-
2	2015	78	123	3.8066	4.8121	1.0055	0.6892
3	2016	48	171	4.8121	5.1416	0.3295	0.4755
4	2017	48	219	5.1416	5.3890	0.2474	0.3570
5	2018	71	290	5.3890	5.6698	0.2808	0.4052
	Total	290					

Table 6: Average Keywords of Contribution.

S.No	Year	Number of Contribution	Total Keywords	Average Keywords per Contribution	Rank
1	2014	45	189	4.20	5
2	2015	78	345	4.42	4
3	2016	48	223	4.65	2
4	2017	48	228	4.75	1
5	2018	71	327	4.61	3
	Total	290	1312	4.52	

Table 7: Average Pages Per Contribution.

S.No	Year	Number of Contribution	Total Pages	Average Pages per Contribution
1	2014	45	312	6.94
2	2015	78	587	7.53
3	2016	48	383	7.98
4	2017	48	339	7.06
5	2018	71	590	8.30
	Total	290	2211	7.63

The data pertaining to author productivity has presented in the table 4. It is shows that the total average number of author per paper is 4.65 for the 290 articles. The average productivity per author is 0.21 during the year 2014 to 2018.

It is observed from table 5 the computed value for Related Growth rate and Doubling Time was clearly proved that the relative growth rate of published articles was declined trend from 2014-2018. The maximum computed value RGR 1.0055 was recorded in the year 2014 and lowest value 0.2808 was recorded in the year 2018. The doubling time shown increasing trend in the study period.

Table 6 reveals that 1312 keywords have been appended to 290 articles. It is observed that the average keyword of the articles varied from a minimum of 4.20 to a maximum 4.75 during the year 2014 to 2018. The overall average keywords per article is 4.52.
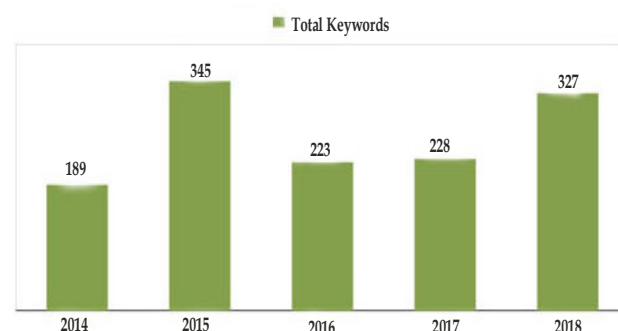

Fig. 3: Average Keywords of Contribution.

Table 7 shows that 290 articles published with total pages of 2211 during the year 2014 to 2018. It is observed that the average length of the articles varied from a minimum of 6.94 pages to a maximum of 8.30 pages. The overall average page per articles is 7.63.
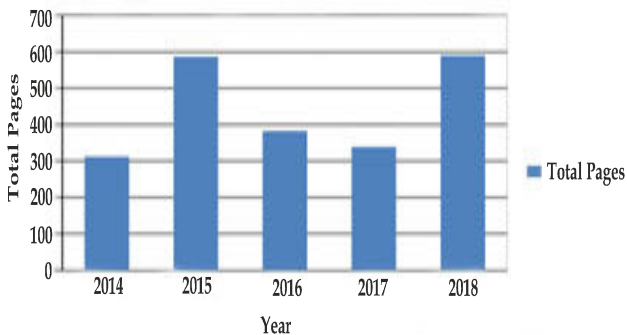

Fig. 4: Average Pages of Contribution

Table 8: Institution–Wise Contribution of Articles

S. No	Institution	No. of Contribution	Percentage
1	Universities	188	64.83
2	Colleges	8	2.76
3	Research Centre's	94	32.41
	Total	290	100

Table 8 shows that majority of the articles 188 (64.83%) are published from University followed by 94 (32.41%) from Research Centre's and 8 (2.76%) from Colleges.
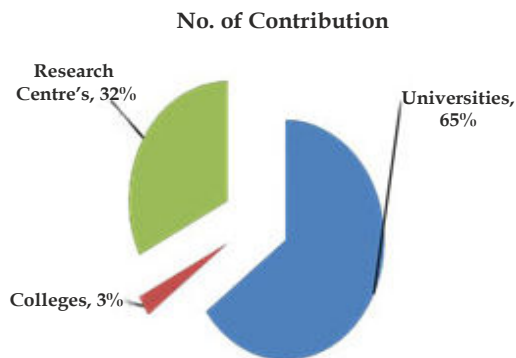
No. of Contribution

Fig. 5: Institution–Wise Contribution of Articles.

Table 9: Year Wise Distribution of Citations.

S. No	Year	Number of Contribution	No. of Citations	Average No. of Citations
1	2014	45	1645	36.56
2	2015	78	3077	39.45
3	2016	48	1878	39.13
4	2017	48	2204	45.92
5	2018	71	2780	39.15
	Total	290	11584	39.94

Table 9 Shows that year wise distribution of citations. 290 contributions of the journal having 11584 citation. The table revels that 3077 maximum number of citation of articles published in the year 2015. 1645 minimum number of citation of articles published in the year 2014. The overall average citation per articles are 39.15.
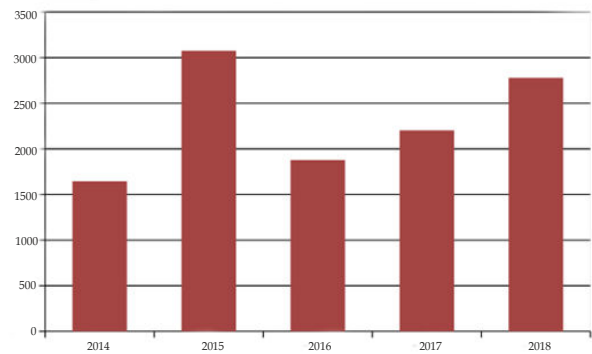

Fig. 6: Year Wise Citation of the Articles.

Findings

The maximum number of articles published in 2015 and minimum in 2014.

The highest number of research articles contributed by multiple authors during the study period.

The degree of collaboration was 0.986.

The author productivity is 0.21 and the average number of authors per paper is 4.65.

The average pages per articles are 7.63 and average keywords per articles are 4.61.

The Institution-wise contribution is more from University 188(64.83) followed by by 94 (32.41%) by Research Centre's and 8 (2.76%) from Colleges.

As per the year wise distribution of citations, there are 11584 citations appended to 290 papers published in the journal. Maximum number of citation have been found with 2780(39.15%) in the year 2018. The average number of citation per paper comes out to be 39.94%.

Conclusion

The analysis explores that the majority of articles published by multi authors. The average page is 7.63 and it is the ideal for research articles. The Degree of collaboration (using K Subramanyam's formula) indicates the there exists a high degree of collaboration and when compared to the Relative growth rate of the published articles the doubling time values are increasing trend during the study period.

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