International Journal of Academic Research and Development
www.multidisciplinaryjournal.in
ISSN: 2455-4197
Received: 13-03-2023, Accepted: 28-03-2023, Published: 14-04-2023
Volume 8, Issue 2, 2023, Page No. 37-41

Cluster analysis in library science research: A scientometric study in scopus database

Gaikwad Vaishali baburao[1], Dr. Savita Madhav Mhaske[2]
1 Research Student, Department of Library and Information Science, Babasaheb Ambedkar, Marathwada University, Aurangabad, Maharashtra, India
[2] Indraraj Arts, Commerce and Science College Sillod, Aurangabad, Maharashtra, India

Abstract
The present study is based on the scientometric analysis of 350 research articles published in during the periods of 2013-2017 in scopus database. This Study will review on Reletive growth rate, Co - Authorship Pattern of contribution, no of Author wise distribution, degree of collaboration, country-wise distribution, document type distribution, References wise distribution contribution, Length of Pages distribution contribution, Length of Title wise distribution of contribution. the findings must reveal various aspects of the characteristics and patterns of contributions of the study.

Keywords: scientometrics, cluster analysis

Introduction

scientometric is the branch of science that describes the outputs traits in terms of organizational research structure, resource inputs and outputs, develops benchmarks to evaluate the quality information output. Scientometrics studies characterize the disciplines using the growth of the pattern and other attributes. The scientific measurement of the work of scientists, especially by way of analyzing their publications and the citation. (Khurshid and Sahai 1991) there is great consistency among the various bibliometric, Scientometric ad Informatics Laws. The Bradford law deals with the increased scattering of relevant papers on fixed topic (Bradford, 1934). (Brusilovsky, 1978). The Scientometric law concerns the frequency of author's writing papers. (A Lotka, 1926) and (Lyon, 1979) informatics law concerns the frequency of word occurrence before embracing on a research project in bibliometric, Scientometric an Informatics distributions and laws, it is imperative to know what has been done previously in this area. The techniques of Scientometric and bibliometric are closely similar their different roles are distinguished by their very different contexts (Natarajan, 2010). The purpose of this bibliography is to provide a list of articles and other pertinent publications, so as to facilitate work of other researchers in this field.

Review of literature

Khaparde V S. (2013) [8] the paper studied the Bibliometric Analysis of Research Publication of Department of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, from 1975 to 2012. It analyzed all the 774research publications from the 144 journals. It examines year- wise distribution of papers, authorship pattern, journal in which author publish, it revealed that the number of publications has increased consistently from the year 1975 to the year 2012. 25% of the total publications have been made in 2009, 2010, and 2011. And the majority of the publications are made with 4 authors. And also the majority of the research paper published in journal of heterocyclic chemistry.

Khaparde & Pawar (2013) [8] studied the authorship pattern and author's collaborative research in Information Technology with a sample of 17917 articles collect from LISA during 2000-2009.The average number of authors per article is 1.80. In the study the degree of collaboration (C) during the overall 10 years (2000-2009) is 0.71 but the year wise degree of collaboration is almost same in all the years of mean value 0.49. According to 10 years of period, the multi- authorship articles are higher and predominant on single authorship. The study found that the researches in Information Technology are keep toward team research or group research rather than solo research.

Bala and Singh (2014) [9] analyzed 316 scholarly communications published in the Indian journal of biochemistry & bio-physics. The analysis cover mainly the number of articles from documents cited, and most cited journals etc. study revealed that single author contributed 18 (5.7%), while the rest of 162(51.3%) articles were contributed by multi-authors. The contributions in this journal from India are slightly more than those from the other countries.

Alhamdi, Khapard & kanekar (2014) [5] they attempted on bibliometric analysis of ten volumes (57-66) in the field of journal of Documentation. It is based on the references appended to International Journal of "Journal of Documentation" during 2001-2010. The present study is based on 15150 references appended to 364 articles contributed by the authors in Journal of Documentation. It was found that Journals Citations are more in number than other citations. In Authorship pattern it was found that Solo Researchers are predominant than collaborative Researchers. The extent of collaboration was not much popular among the Journal of Documentation. The mean relative growth for articles and citation in the first five years 2001-2005 is reduced according to the last five years 2006 to 2010.The value of group co-efficient (go) was only 0.46. It was seen that researchers cited latest documents. Universities are the major contributors. The study shows the UK, USA, Finland, and Denmark, have the majority of most cited records in journal of Documentation. Out of 364

articles there are 175 articles have pages length from 11 to 20.

Fawaz Alhamdi, and Vaishali Khaparde (2015) [2] Analyzed Authorship pattern in cloud computing research in LISTA. They collect 108 articles during the year 2009 to 2013. In this study the number of contributions found to be the highest is 24 in the year of 2012. The rate of growth of publication highly decreased from the rate of 0.693 in 2010 to 0.193. In 2013 whereas the corresponding the Doubling time for different years gradually increased from 1 in 2010 to 3.95 in 2013.

Ambhore and Khaparde (2014) [5] studied 57 Open Access Online Journal on Genetics as found in DOAJ. It observed that U.S. was in 1st rank in publishing 15 e-journals followed by U.K. English is the most common communication language for scientific community. Four e-journals on Generics also published simultaneously in English, French, Germany and Turkish languages. Based on results the study suggested that Research scholars, scientists and professionals should browse the DOAJ site and access the free online journals on their subject areas and also suggested that scientists and Research scholars should publish their research work in online open access journals for wider visibility of their research work and for greater impact factor and citation index.

Tupe and Khapard (2016) [7] stated in study mapping of Physics Periodicals: A Bibliometrics study. Total 2131 periodicals in Physics published in 50th edition of Ulrich Periodical Directory, 2012 was considered to the present study. In this study 77 Countries published 2131 physics periodicals. Periodicals of different continents, at the comprehensive level, the European continent stood in the first place with the highest publication 973 (45.66%) and other periodicals published in other five continents. The state wise distribution of periodicals 48 periodicals published in India. Kerala is at the top position with highest 13(27.08%) periodicals.

Alhamdi, Khaparde & Wankhede Raju, (2014) [5] The present study deals a Scientometric analysis of 56 papers published in the Library and Information science & Technical Abstract (LISTA) on internet use in the subject of library & Information science during the period 2004– 2013. Data is collected and analyzed by using the SPSS software. The study focused on various aspects: such as document types, growth Rate (GR) and doubling time (DT) of publications and citations, year-wise, authorship pattern, institutions involved, most prolific authors of the journal. The study revealed that most of the papers (71.4%) of papers were contributed by multiple authors. USA is the top producing country with 8 (14.3%) publications of the total output. All the articles were published in English language. The mean doubling time for the first five years (i.e. 2004 to 2008) is only (1.05) which is increased to (6.07) during the last five years (2009 to 2013). Maximum 35 (62.5%) out of 56 of the authors are not mentioned their email address in the paper.

Objectives of the study

The primary objective of this study is to understand the growth Cluster analysis and their research output in global during the period 2013 - 2017. More specific objectives are as follows

1. To find out the year-wise distribution of contributions.
2. To find out the authorship pattern of contributions. (Year-wise).
3. To find out the authorship pattern of contributions.
4. To find out the institution-wise distribution of contributions.
5. To find out the Growth Rate (GR) and doubling time (DT) of publications.
6. To find out the References wise distribution contribution

Scope and limitation of the study

The present study is based on the Scientometric Profiles of Cluster analysis. The present study is based on over all 350 articles during 2013-2017 in SCOPUS Database.

Data collection

The present study is based on the Scientometrics profile Cluster Analysis in Library Science Research 2013-2017.The present study is based on over all 350 articles during 2013-2017, which collected from Scopus database.

Data Analysis and Interpretation

Table 1. Distribution of Contributions (Year-Wise)

Table 1: Year-Wise Distribution of Contributions

Year	Frequency	Percent
2013	63	18
2014	64	18.29
2015	70	20
2016	74	21.14
2017	79	22.57
Total	350	100

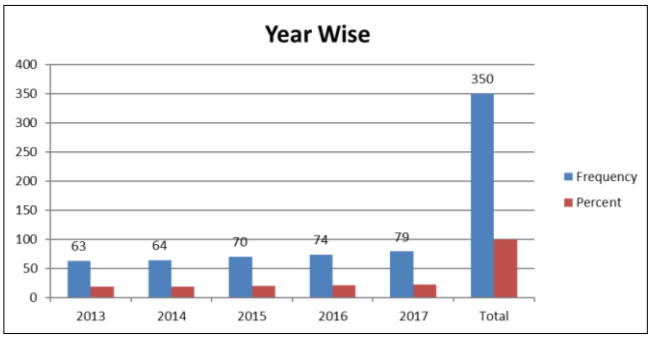

Fig 1

The distribution of contributions is shown in table No.1.Out of the total 350 contributions, the majority 79 (22.57%) of contributions were contributed in 2017, while the minimum contributions 63(18.00%) were contributed in 2013.

Table 2: Authorship pattern of contribution

Sr.No.	Author	Citations	Percent
1	Single Author	17	4.86
2	Two Author	33	9.43
3	Three Author	41	11.71
4	Four Author	51	14.57
5	More than Five	208	59.43
	Total	350	100

Table no.2. Show the Authorship pattern of contributions is the majority of the contributions were contributed by multi-authors with 208 Articles.

Table 3: Shows Most Productive Author

Sr.No.	Author Name	Citation	Percent
1	Pajares S	60	17.14
2	Wang P	49	14.00
3	Zhang R	42	12.00
4	Bradley C	41	11.71
5	Singh A	32	9.14
6	Wang J	22	6.29
7	Battershill C N	21	6.00
8	Schlarb S	21	6.00
9	Dong K	17	4.86
10	Abdel-Aleem H	11	3.14
11	James D J	10	2.86
12	Williams A J	9	2.57
13	Marinho V C C	4	1.14
14	Olarte A	4	1.14
15	Bogen P L	3	0.86
16	Jorge E C	1	0.29
17	Clement S	1	0.29
18	Jeong J E	1	0.29
19	Chen J	1	0.29
	Total	350	100.00

It can be observed from Table No.03 that, the most productive authors are Pajares, S. Who had contributed 60(17.14%) papers and this followed by Wang, P. with contributed 49(14%).and this followed by Zhang, R. Contributed 42(12.00%). The Bradley, C with contribution 41(11.41).and Singh, A., Contribution 32(9.14%).and Wang, J. contribution 22(6.29%).

Table 4: Institution wise distribution of contributions.

Year	University	Institute	School	Research Centre	college	Total	Percentage
2013	60	16	5	13	2	96	27.43
2014	57	8	3	9	5	82	23.43
2015	42	2	3	10	3	60	17.14
2016	36	6	5	10	10	67	19.14
2017	28	8	7	2	0	45	12.86
Total	223	40	23	44	20	350	100

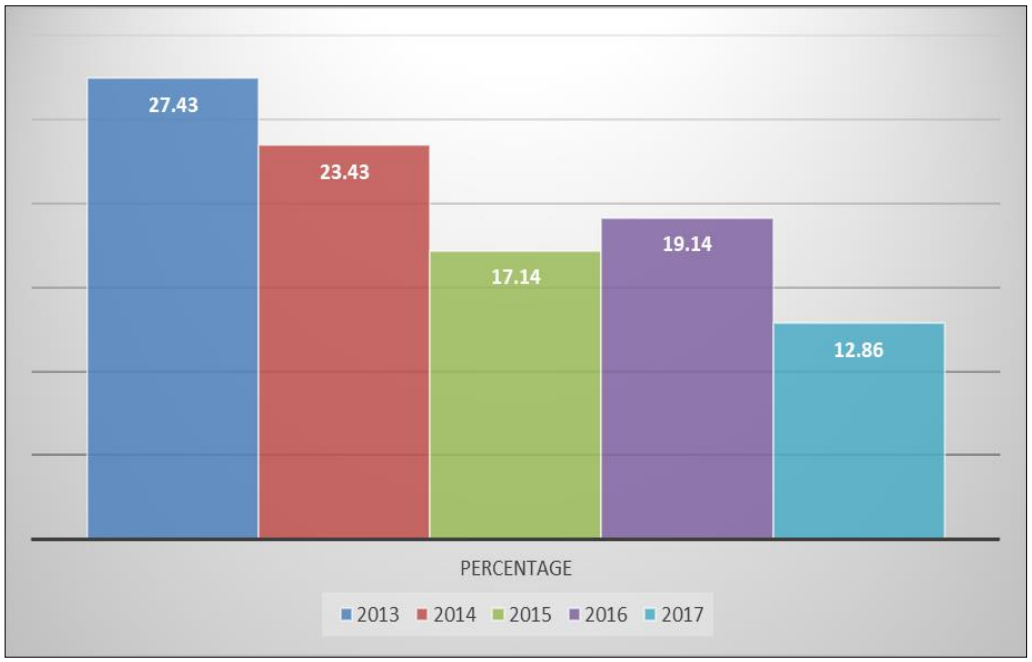

Fig 2

Table No.4.Shows distribution of institution wise. It was seen that universities contribution were maximum (223), followed by institution with (40), Research Centre with (44), School with (23), college with (20) contributions by the colleges.

Relative Growth Rate [r (a)] And Doubling Time [DT (a)] For Publications

- **Relative growth rate (RGR)**

The Relative Growth Rate (RGR) is the increase in number of articles/ pages per unit of time. This definition is derived from the definition of relative growth rates in the study of growth analysis of individual plants and effectively applied in the field of Botany Hunt (1919), Blackman (1919) defined, which in turn had its origin from the study of the rate of interest in the financial investment. The mean

Relative Growth rate (R) over the specific period of interval can be calculated from the following equation.
R 1-2 = Loge 2 W - loge IW
Whereas, 1-2 R = mean relative growth rate over the specific period of interval.
Loge IW = log of initial number of Articles.
Loge 2 W = log of final number of articles after a specific period of interval.
2 T - 1 T = the unit difference between the initial time and final time. The year can be taken here as the unit of time. The RGR for articles is hereby circulated.
Therefore,
1-2 (aa-1 year-1) can represent the mean relative growth rate per unit of year over a specific period of interval.

Doubling Time (DT)
There exists a direct equivalence between the relative growth rate and the doubling time. If the numbers of articles/pages of subject double during a given period then the difference the logarithms of numbers at the beginning and end of this period must be logarithms of number.
If natural logarithm is used this difference has a value of 0.693. Thus the corresponding doubling time for each specific period of interval and for both articles and pages can be calculated by the formula,
Doubling time (DT) = 0.693/ R (A)
Therefore,
Doubling time for articles D (t) = 0.693/1-2 R (aa-1 year-1)

Table 5: Relative growth rate &doubling time for 2013-2017

Sr. No	Year	No. of articles	Cumulative	W1	W2	RGR	Mean	DT	Mean DT
1	2013	63	63		4.14				
2	2014	64	127	4.14	4.84	0.7		0.99	
3	2015	70	197	4.84	5.28	0.44	0.342	1.57	1.50
4	2016	74	271	5.28	5.6	0.32		2.16	
5	2017	79	350	5.6	5.85	0.25		2.77	
						1.71		7.49	

From the table no.07 no, it noticed that the mean relative growth for the first years 2013 to 2017 is (0.342). While the Doubling time for different years [DT (A)] gradually increased from (1.50). Thus as the rate of growth of publication was decreased, the corresponding Doubling Time was

Table 6: of References wise distribution of article

Year	Print References	Web References	Total References	Percentage
2013	569	302	891	29.41
2014	348	241	589	19.44
2015	432	322	734	24.22
2016	275	120	395	13.04
2017	322	99	421	13.89
Total	1946	1084	3030	100

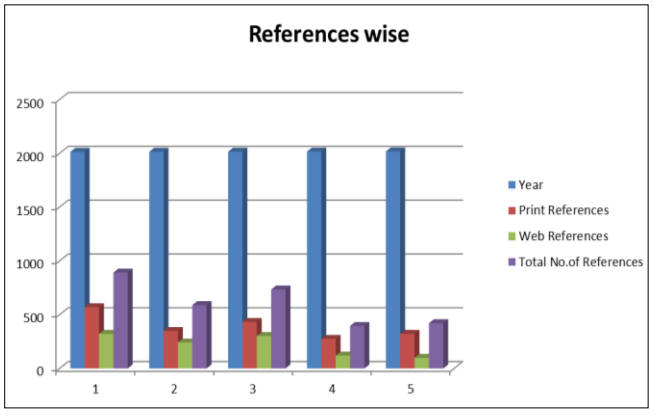

Fig 3

It can be observed from the table no 08. Out of 350 contributions, it is seen that maximum references 891(29.41%) in the year of 2013, while the minimum references were 395(13.89%) in the year of 2016. It was seen the maximum references used print References 1946; whereas 1084 references were web references.

Findings
The findings are based on the analysis of collected data appended in 350 articles and 3030 reference in scopus database.

1. The distribution of contributions is shows in out of the total 350 contributions majority of the contributions i.e. 79(22.57%) contributions were contributed in 2017 were as minimum contributions i.e. 63(18.00%) contributions were contributed in 2013.
2. "Majority of the contributions are contributed by more than four author".
3. Authorship pattern of contributions (year-wise) during the period of five years. Maximum publications contributed by 17 and minimum publications contributed by 51.
4. Distribution of institutions wise contribution year wise. It was seen that university wise contribution were maximum (223) than institution wise (40), (23), (44) and (20) contributions were contributed by the colleges.
5. Country wise distribution of contributions which indicates that the majority of the contributions were contributed by united states 84(24.00%) were as the minimum contributions were contributed by other countries i.e. (0.57) respectively
6. Types of publication year wise. The total 350 contributions majority (74.86%) of the citations is the article citations and minimum (0.01%) are Letter citations.
7. Average pages (per contributions). The maximum pages were covered in the 1 to 5 pages i.e. 151(43.14%) & minimum pages were covered in the 26 to 30 i.e. 18(5.14).
8. It was seen the maximum references used print references i.e. 1946 whereas 1084 references were web references.

Conclusion
Scientometric analysis is the major techniques of Bibliometric which is used in the further study. Considering published literature present study has used quantitative

method. Scientometric is relatively new subject of information. It helps to evaluate information & to handle the information in libraries and information centers by the quantitative analyzed information. It deals with the mathematical and statistical analysis.

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