

AUTHORSHIP PATTERN AND COLLABORATION OF PHYSICS DURING THE YEAR 2012-2016: A SCIENTOMETRIC STUDY

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ABSTRACT

The objective of the study was to perform a bibliometric analysis of Physics related publications in the Web of Science (WoS). In order to expand upon the limited literature estimating the quantity and quality of worldwide research production in the field of Physics, a bibliometric analysis was conducted for the period 2012–2016 using the WoS. Analyzed parameters included language of publication, publication output, authorship, publication patterns, distribution of word frequency, Country of publication.

Key words: Authorship Pattern, Relative Growth Rate, Arithmetic Mean.

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1. INTRODUCTION

1.1. Scientometric

Scientometrics is a discipline which analyses scientific publications to explore the structure and growth of science. The bibliometric / scientometric / informetric techniques used to analyze various quantitative or qualitative aspects of a publication. Scientometric was introduced by Alan Pritchard in 1969. It is a scientific field that studies the evolution 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.

1.2. Physics

The physics is most fundamental and all inclusive of the sciences, and has had a profound effect on all scientific development. In fact, physics is the present day equivalent of what used to be called natural philosophy, from which most of our modern sciences arose. Students of many fields find themselves studying physics because of the basic role it plays in all phenomena.

2. REVIEW OF LITERATURE

Rajani, S. Ravi, B (2016)¹ this paper depicts an authorship pattern of Indian research productivity in the web of science database during 1999-2014. The data downloaded from indexed SCI expanded in the web of Science database by the publisher of Thomson Reuters, and the software application is used for the analysis called Histcite software. It is also studied by applying the application of Lotka's Law method and degree of collaboration of authorship pattern.

Taşkın, Zehra (2015)² aimed to undertake a bibliometrics investigation of the NASA Astrobiology Institute (NAI) funded research that was published between 2008 and 2012. Based on NAI annual reports 1210 peer-reviewed publications were analyzed.

Rajgoli, I. U., & Laxminarsaiah, A. (2015)³ study reveals that 4,355 authors have contributed 1,907 papers. Journal of Spacecraft and Rockets has published maximum (1,487) number of papers during the study period. Multi-authored papers with 87.15 per cent of contributions have dominated this field of research. Journal of Spacecraft Technology has recorded highest degree of collaboration of 0.90.

Chan, Ho Fai; Onder, Ali Sina; Torgler, Benno (2015)⁴ we investigate whether Nobel laureates' collaborative activities undergo a negative change following prize reception by using publication records of 198 Nobel laureates and analyzing their coauthorship patterns before and after the Nobel Prize.

Sudharani (2014)⁵ conducted a bibliometrics analysis of PEARL: A Journal of Library and Information Science during the period of 2007-2012. This Journal contain 24 issues of 6 volumes with 239 articles. Average level of Degree of collaboration is 0.606. The highest number 47 (19.66%) of articles was published in the year 2009. The maximum number of articles contributed by two authors 98(41%).

2.1. Objectives

- To know the year wise distribution of articles.
- To study the authorship pattern wise of the contribution
- To identify the language wise distribution of articles
- To evaluate the country wise distribution
- To find out the word wise distribution
- To calculate degree of collaboration.
- To analysis of the relative growth rate and doubling time.
- To know the arithmetic mean.

3. DATA ANALYSIS AND INTERPRETATION

Table 1 Year wise Publication

S.No	Publication Year	Records	Percentage (%)
1	2012	379	15.3
2	2013	446	18.0
3	2014	472	19.1
4	2015	533	21.5
5	2016	647	26.1
Total		2477	100

Table-1 shows the year wise distribution of the publication of authorship pattern and collaboration of physics output during the year 2012 to 2016 (5 years). A total of publications 2477 were published. The highest number of publications 647 (26.1%) were published in the year 2016 followed by 2015 i.e. 533(21.5%). In the year 2014 were 472(19.1%) publications followed by 2013 i.e. 446(18.0%). Very less number of publications was 379 (15.3%) published in the year 2012. The study reveals that the majority of the articles published in the year 2016 i.e. 647 (26.1%).

Table 2 Authorship Pattern

Authorship \ Year	2012	2013	2014	2015	2016	Total	Percentage
Single Author	112	91	79	103	123	508	2.40
Double Author	130	106	140	108	178	662	3.13
Three Author	162	210	177	246	228	1023	4.83
Four Author	184	184	26	208	300	902	4.26
Five Author	145	230	230	290	295	1190	5.62
More than 5	6823	1151	1724	4917	2269	16884	79.76
Total	7556	1972	2376	5872	3393	21169	100

Table-2 Shows that the details about the Authorship pattern of articles published during the period of study. The extent of research contributions by the authors are explained under authorship pattern indicates that out of 21169 articles. Maximum number of articles 16884(79.76%) were published by more than five authors. Followed by the five authors had contributed 1190 (5.62%), followed by the four authors had contributed 902 (4.26%), followed by the three authors has contributed 1023(4.83%), followed by the double authors had contributed 662(3.13%), and the minimum contributed is single author 508 (2.40%).

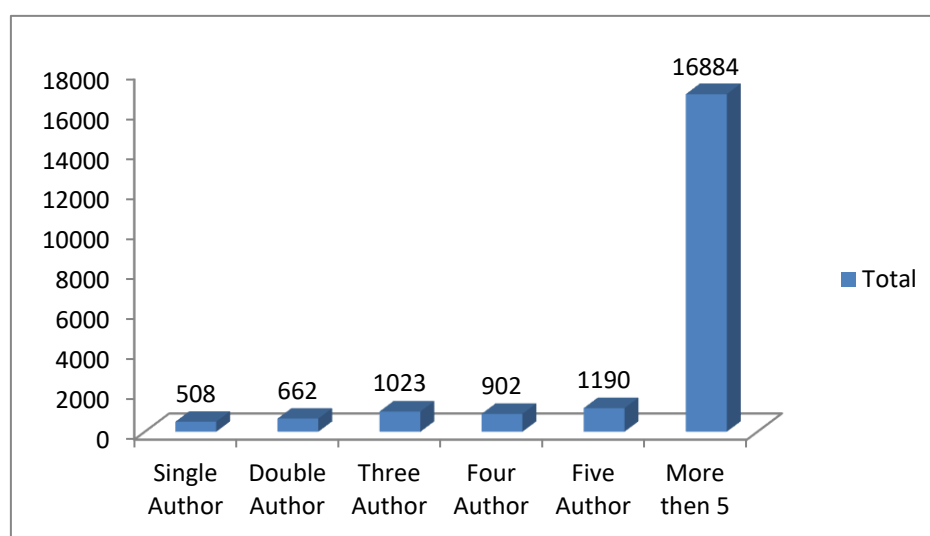


Figure 1 Authorship Pattern

Table 3 Language wise Publication

S.No	Language	Record	Percentage (%)
1	English	2463	99.5
2	Portuguese	7	0.3
3	Russian	6	0.2
4	Spanish	1	0
Total		2477	100

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Table-3 explain the language wise distribution of publication of physics the highest distribution language for English 2463 (99.5%) and followed by Portuguese 7(0.3%) and followed by Russian 6(0.2%) and followed by Spanish 1 (0.0%). The highest number of distribution English 2463 (99.5%).

Table 4 Country wise Publication

S.No	Country	Records	Percentage (%)
1	USA	961	38.8
2	Peoples R China	393	15.9
3	UK	352	14.2
4	Germany	294	11.9
5	France	207	8.4
6	Unknown	160	6.5
7	Italy	153	6.2
8	Japan	139	5.6
9	Switzerland	113	4.6
10	Canada	98	4.0

Table- 4 clearly explain the Physics research of top during the period from 2012 to 2016. The top place of USA was published 961 (38.8%) contribution of publication in first rank and followed by the second rank of Peoples R China contribution 393 (15.9%) records. Among the different countries analysis shows UK, Germany, France are in the middle, and the bottom of Canada 98 (04.0%).

Table 5 Word wise Publication

S.No	Words	Records	Percent
1	Physics	461	18.6
2	Quantum	260	10.5
3	High	101	4.1
4	Using	101	4.1
5	Spin	96	3.9
6	Dynamics	95	3.8
7	Model	82	3.3
8	Phase	81	3.3
9	Dimensional	71	2.9
10	Optical	71	2.9

Table-5: explained the top ten keywords used by the researchers in their publications. It is clearly seen from the table that the word “Physics” has been used in 461 (18.6%) records by the researchers, followed by the Maximum number of word used “quantum” in 260(10.5%) records, “High” in 101(4.1%) records, “Using” in 101(4.1%) records, “Spin” in 96(3.9%) records, “Dynamics” in 95(3.8%) records, “Model” in 82(3.3%) records, “Phase” in 81(3.3%) records, and Minimum number of word used “Dimensional” in 71(2.9%) records, “Optical” in 71(2.9%) records.

Table 6 Degree of Collaboration

Year	Single Author (Ns)	Multiple Author (Nm)	Total	DC
2012	112	7444	7556	0.98
2013	91	1881	1972	0.95
2014	79	2297	2376	0.97
2015	103	5769	5872	0.98
2016	123	3270	3393	0.96
Total	508	20661	21169	0.97

Degree of collaboration is a prominent area of research in Scientometric studies which indicate trends in single and joint authorship during 2012 to 2016.

Table-6 Shows that indicate degree of collaboration single author contributions 508 out of 21169 and rate of 20661 for multiple authors' contributions. The degree of collaboration range started from 0.95 to 0.98 overall degree of collaboration range is 0.97.

3.1. Relative growth Rate (RGR) and Doubling Time (DT)

The Relative Growth Rate (RGR) is the increase in number of articles/pages per unit of time. The mean Relative Growth Rate (R) over the specific period of interval can be calculated from the following equation.

There exists a direct equivalence between the relative growth rate and the doubling time. If the number of articles/ pages of subject double during a given period then the difference the logarithms of number at the beginning and end of this period must be logarithms of number 2. 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, 0.693.

Table 7 Relative growth Rate (RGR) and Doubling Time (DT)

Year	Total articles	Cumulative	W1	W2	(w2-w1)	Mean	DT	Mean
		Total						
2012	379	-	5.94	In		1.05	1.14	0.73
2013	446	825	6.1	6.71	0.61		0.69	
2014	472	1297	6.16	7.17	1.01		0.56	
2015	533	1830	6.28	7.51	1.23		0.52	
2016	647	2477	6.47	7.81	1.34			

4. RELATIVE GROWTH RATE

FORMULA: $R(1-2) = W2-W1$ --- $Dt(a) = 0.693/R(a)$.

Table-7 Shows that the Exponential Growth Rate of publications in Physics during the period 2012 to 2016 (5 Years). The highest growth rate gradually increased from 0.61 to 1.34 the same time doubling time decreased from 0.52 to 1.14 in the year of 2012 to 2016.

Table 8 Arithmetic Mean

Year	2012	2013	2014	2015	2016	Total	A.M
No.of.Articles	379	446	472	533	647	2477	495.4

A.M= $2477/5=495.4$

Table-8 Shows that the arithmetic means of the physics research according to the year of (2012 to 2016). The arithmetic mean value is 495.4 to the all years.

5. FINDINGS AND CONCLUSION

- A Total of publications 2477 were published. The highest number of publications 647 (26.1%) were published in the year 2016. Very less number of publications was 379 (15.3%) published in the year 2012.
- That the details about the Authorship pattern of articles published during the period of study. The extent of research contributions by the authors are explained under authorship pattern indicates that out of 21169 articles. . Maximum number of articles 16884(79.76%) were

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published by more than five authors authors. And the minimum contributed is single author 508 (2.40%).

- The language wise distribution of publication of physics the highest distribution language for English 2463 (99.5%). The very less number of contributions Spanish 1 (0.0%).
- The Physics, research of top during the period from 2012 to 2016. The top place of USA was published 961 (38.8%). The bottom of Canada 98 (04.0%).
- The top ten keywords used by the researchers in their publications. The highest number of words in “Physics” has been used in 461 (18.6%) records. The lowest number of words in “Optical” in 71(2.9%) records.
- That indicates degree of collaboration single author contributions 508 out of 21169 and rate of 20661 for multiple authors’ contributions. The degree of collaboration range started from 0.98 to 0.96 overall degree of collaboration range is 0.97.
- The Exponential Growth Rate of publications in Physics during the period 2012 to 2016 (5 Years). The highest growth rate gradually increased from 0.61 to 1.34 the same time doubling time decreased from 0.52 to 1.14 in the year of 2012 to 2016.
- The arithmetic mean of the physics research according to the year of (2012 to 2016). The arithmetic mean value is 495.4 to the all years.

6. CONCLUSIONS

In Scientometric studies are orderly used to assess in which scientific and systematical research distribution to energetic information should be used to the principle makers and genius. In this study has demonstrated to be useful tools in the assessment of research publications of scientist in information and communication and technology. Into the sum of statistical tools and degree of collaboration, distribution and productivity of authorship pattern, arithmetic mean have been calculation, Should be data analyzed. This study have been highlighted for scientometric analysis to measure various reviews such as growth of articles, authorship pattern, institution of distribution and country wise distribution of articles in which can be used to observation has analysis of the word wise contribution of articles. The study will be helpful to the library professionals and many data collection implement, out of the physics and the research has identify of authors and including to procure core subject in the area of physics. Finally the study concluded that maximum of the articles contributed by multiple authors. The overall degree of collaboration range 0.97.

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