

## Mapping the Research Trends on Information Literacy of Selected Countries during 2008-2017: A Scientometric Analysis

Manoj Kumar Verma\* and Ravi Shukla

*Mizoram University, Aizawl - 796 004, India*

*\*Email- manojdlis@mzu.edu.in*

### ABSTRACT

The growth rate of literature on 'Information Literacy' during the period of 10 years i.e. (2008-2017) in which a total of 9496 research papers were published in the field of Information Literacy is analysed. A scientometric study is one of the most famous measurement tools to identify and find out the publications trends in the field of sciences. The study analysed and examined the different scientometric parameters i.e. year wise distributions of publications, annual growth rate, compound annual growth rate, relative growth rate and doubling time, most productive authors, geographical distributions and found that the maximum 1234 (12.99 %) were published in 2016, 25.679 per cent annual growth rate was recorded in the year 2010 and the maximum 10.212 per cent CAGR recorded in 2009. The maximum RGR 0.795 and Dt. 5.824 were recorded in 2009 and 2017, respectively. The most prolific authors were Wolf, M.S with 65 publication, followed by 31 publication by Pinto, M. The maximum citations were recorded in the 2010 i.e. 14298, followed by 13594 citation in 2011. The maximum 5770 of contributions were published by the United States, followed by the United Kingdom with 1028 contribution.

**Keywords:** Scientometrics; Information literacy; Annual growth rate; Compound annual growth rate; Relative growth rate; Doubling time

### 1. INTRODUCTION

The term 'Scientometrics' is first used by Russian inventors and the term "Naukometriya" (the Russian term for "Scientometrics") for the quantitative methods of studying the development of science was suggested by Russian statistician Nalimov<sup>1</sup>. Worldwide scientometrics is becoming a more powerful instrument of science policy, determining to a great extent the way of a project and institutional funding by an assessment of priorities, perspectives, and capacity. Scientometrics is the study of measuring and analysing science, technology and innovation. The parameters measured at that time were the number of scientists, publications, institutions and the effectiveness of the scientific work. Scientometric is referred to as a science about science; it is a distinct, recognised and well-established scholarly field with its own identity, history, theories, and methodologies. There are several prominent academics – for example, Robert King Merton, Derek J. de Solla Price and Eugene Garfield – who formed the foundation of scientometrics.

Information literacy is a key factor in long-lasting learning. They are the initial phase in accomplishing instructive objectives. The improvement of such skills should happen for the duration of natives' lives, particularly amid their instructive years, where Librarians, as a part of the learning group and, as specialists in information administration, have or ought to

accept the key part of encouraging information proficiency. Through the creation, with the workforce, of educational modules coordinated projects, librarians ought to effectively add to the student's learning forms in their pursuit to improve or build up the skills, information and qualities expected to become lifelong learners. The significant of the study is to present the trends of Information Literacy research during the period of study and to calculate the popularity of IL publications in society.

### 2. SCOPE OF THE STUDY

The study is limited to top ten (United States, United Kingdom, Australia, Canada, India, Germany, China, Spain, South Africa, and the Netherlands) contributed countries on information literacy subject which was indexed in Scopus database during the period of study. The study also limited to ten year from 2008-2017.

### 3. LITERATURE REVIEW

Amsaveni and HariKrishnan<sup>2</sup> conducted a scientometric analysis of Environmental Management research output during (1989–2014). The present study reveals the growth of research in Environmental Management subject in which a total 61877 research papers were published and after analysis it is found that in the year 2014, the maximum number of research papers were published, and Huang GH was the most popular author with 213 contribution, followed by Change NB with 83

contribution, 0.19 is relative growth rate and 0.85 degree of collaboration recorded maximum in the year 2008 and 2009.

Yeshawant and Ravi<sup>3</sup> collected there data from PubMed database and all the details were transferred to a spreadsheet and the data were analysed as per the objectives of the study. the study examines various scientometric parameter i.e. year wise distribution, relative growth rate and doubling time, comparison of the growth of publication of India and World and found that in the year of 2012, the highest 324 paper were published in which India contributions was 286. The highest relative growth rate (1.91) and doubling time (1.28) was recorded in the year 2013 and 2005 respectively.

Gupta<sup>4</sup>, *et al.* analysed the different scientometric parameter such as subject wise distribution of articles, distribution of publications by type of lung cancer, organisation-wise distribution of publications, most prolific authors and found that the in the field of medicine the maximum 4648 paper were published, and the highest 4724 of publications were published on Non-Small Cell type Lung Cancer subject. A total 267 of publications were contributed by the Tata Memorial Centre, Mumbai, followed by All India Institute of Medical Sciences, Delhi with 210 contribution. N. Singh and A. K. Saxena was a most productive author with 37 publication each.

Hadagali<sup>5</sup> conducted the scientific productivity of Karnataka state during (1999-2011) the data was collected by Web of Science database and found a total 44,446 publication and 3,56,323 citation from the marked period of study, among the different states in India, The maximum (53,414) of research papers were contributed by Maharashtra state, relative growth rate has been decreasing from 2000 (0.73) to 2011 (0.14), on the other hand, the doubling time of literature growth has increased from 0.94 (2000) to 4.95 (2011); among the different collaborative countries, the USA ranked first with 4396 publication and 72,207 citation (16.43 ACP) and 98 h-index.

Jeysankar and Babu<sup>6</sup> analysed the different scientometric pattern such as authorship pattern, forms of publications, degree of collaboration, institution's contribution, most productivity journal, and found that the maximum 79.67 per cent of publication were contributed by multiple authors, out of a total 2120 publication, 1524 of publication were journal articles type documents. The highest 0.96 degree of collaboration was recorded during the period (1987-1991). The research literature contributed by R&D institution with 47.78 per cent at the most. The most productive journal was 'Journal of the National Cancer Institute' with 237 contribution and got the rank first.

**4. OBJECTIVES OF THE STUDY**

The main objectives of the study are:

- To analysis the year wise growth rate of the publications
- To identify the annual growth rate and compound annual growth rate of publications
- To identify the relative growth rate and doubling time of publications
- To find out the most productive authors
- To analysis the document wise publication

distribution

- To identify the geographical distribution of the publication.

**5. METHODOLOGY**

Scopus is a large abstract and citation database of peer-reviewed literature from different disciplines with smart tools that track, analyse and visualise research and also most of the conference papers will be available directly from the Scopus database. It is owned by Elsevier and it is available by subscription. The following search string to be used for collecting the data (TITLE-ABS-KEY (Information Literacy) AND (LIMIT-TO (PUBYEAR, 2017 to 2008))) and also selected top ten countries having the highest number of publications on information literacy were included in the particular study. A total of 9496 publication were published during the period of study, out of total 9496 publication, 227 are from open access publication while a large number of 9269 are from other access type publication. These records along with full bibliographical details such as Title, Year, Document Type, geographical distributions, etc. have been extracted from

**Table 1. Year wise distribution of publication**

Year	Number of publications	Percentage of publication	Cumulative
2008	545	5.74	5.74
2009	662	6.97	12.71
2010	832	8.76	21.47
2011	834	8.78	30.25
2012	856	9.01	39.26
2013	1038	10.93	50.19
2014	1073	11.3	61.49
2015	1221	12.86	74.35
2016	1234	12.99	87.34
2017	1201	12.65	100
Total	9496	100	



**Figure 1. Year wise distribution of publication.**

the Scopus database. The data was tabulated in MS Excel and tested by the scientometrics tools to achieve the objectives.

**6. DATA ANALYSIS**

**6.1 Year Wise Distribution of Publication**

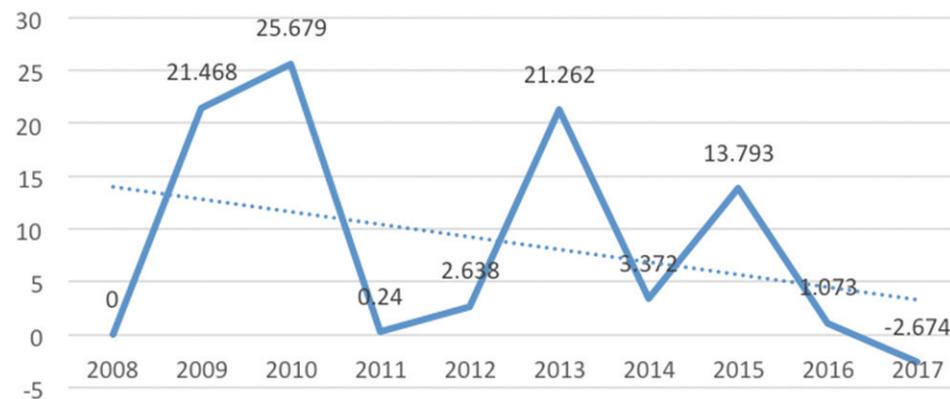
Table 1 and Fig. 1 depicts the year wise distribution of publication on ‘Information Literacy’ from the marked period of study. The publication output in ‘Information Literacy’ research expanded from 545 in 2008 to 1201 in 2017. Out of a total 9496 publications, 1234 (12.99 %) were maximum recorded in the year 2016, followed by 1221, constituting (12.86 %) of publications were published in the year 2015 and the minimum 545 (5.74 %) of publication recorded in the year 2008. The overall year wise distribution of publication data shown in as Table 1.

**6.2 Annual Growth Rate of Publications**

Table 2 illustrate the annual growth rate of publication on ‘Information Literacy’ during the period (2008-2017). The maximum 25.679 AGR was recorded in the year 2010, followed by 21.468 AGR in the year 2009 and the minimum -2.674 AGR recorded in 2017. Whole AGR data as shown in Table 3. The annual growth rate (AGR) are calculated on the formula given by (Kumar and Kaliyaperumal, 2015)<sup>7</sup> and

**Table 2. Annual growth rate of publications**

Year	Number of Publications	AGR
2008	545	0
2009	662	21.47
2010	832	25.68
2011	834	0.24
2012	856	2.64
2013	1038	21.26
2014	1073	03.37
2015	1221	13.79
2016	1234	1.09
2017	1201	-2.67



**Figure 2. Annual growth rate of publications.**

mentioned as follows:

$$AGR = \frac{EndValue - FirstValue}{FirstValue} \times 100$$

**6.3 Compound Annual Growth Rate of Publications**

Table 3 reveals the compound annual growth rate of publication on the particular topic from (2008-2017). The compound annual growth rate is calculated by taking the n<sup>th</sup> root of the total percentage growth rate, where n is the number of years in the period being considered. The maximum 10.212 per cent CAGR recorded in 2009, followed by 7.917 per cent CAGR was recorded in 2010. The compound annual growth rate was calculated by the following formula available on <https://www.investopedia.com/terms/c/cagr.asp>.

$$CAGR = [(Ending Value / Beginning Value)^{1/n} - 1]$$

**Table 3. Compound annual growth rate of publications**

Year	Number of Publications	Cumulative Frequency	CAGR
2008	545	545	0.00
2009	662	1207	0.10
2010	832	2039	0.08
2011	834	2873	0.00
2012	856	3729	0.01
2013	1038	4767	0.03
2014	1073	5840	0.00
2015	1221	7061	0.02
2016	1234	8295	0.00
2017	1201	9496	0.00

**6.4 Relative Growth Rate and Doubling Time**

Table 4 depicts the relative growth rate and doubling time of publication on ‘Information Literacy’ from the marked period of study. The maximum 0.795 RGR was recorded in the year 2009, followed by 0.524 RGR was recorded in the year 2010. The growth rate of all publication has been measured on the basis of RGR and Dt model, the particular model is developed by Mahapatra<sup>8</sup>. RGR is calculated to analyse the increase in the number of publications on time and the Dt is directly related to RGR. The mathematical representation of the mean relative growth rate of articles over a specific period is derived from the following formula:

$$RGR = \frac{W2 - W1}{T2 - T1}$$

where RGR = Growth Rate over the specific period of the interval

W1 = Log<sub>e</sub> (natural log of the

**Table 4. Relative growth rate and doubling time of publication**

Year	Number of Publications	Cumulative Sum	W1	W2	RGR	Dt
2008	545	545	0	6.30	0	0
2009	662	1207	6.30	7.09	0.79	0.87
2010	832	2039	7.09	7.62	0.52	1.33
2011	834	2873	7.62	7.96	0.34	2.03
2012	856	3729	7.96	8.23	0.27	2.62
2013	1038	4767	8.23	8.47	0.24	2.9
2014	1073	5840	8.47	8.67	0.20	3.43
2015	1221	7061	8.67	8.86	0.19	3.66
2016	1234	8295	8.86	9.02	0.16	4.32
2017	1201	9496	9.02	9.16	0.12	5.82

initial number of contributions)

W2 = Log<sub>e</sub> (natural log of the final number of contributions)

T1 = the unit of initial time

T2 = the unit of final time

**6.4.1 Doubling Time**

From the calculation, it is defined that there is a direct equivalence existing between the RGR and Dt. If the number of contributions of a subject doubles, during the period of study, then the difference between the logarithm of the numbers at the starting and at the last of the period must be the logarithms of the number 2. If one uses a natural logarithm, this difference has a value of 0.693 (Beaie and Acol, 2009)<sup>9</sup>. The formula of corresponding Dt for contributions and pages measurement.

**Table 5. Top 10 most productive authors**

Author Name	No. of Publication
Wolf, M.S.	65
Pinto, M.	31
Osborne, R.H.	27
Garcia-Retamero, R.	25
Bruce, C.	23
Fosmire, M.	22
Lloyd, A.	22
Paasche-Orlow, M.K.	22
Schillinger, D.	22
Julien, H.	21

The maximum 5.824 doubling time was recorded in 2017, followed by 4.323 Dt recorded in the year 2016. The overall data of relative growth rate and doubling time is as shown in Table 4.

$$Dt = \frac{0.693}{R}$$

**6.5 Productive Authors Name**

Table 5 shows the top 10 most productive authors the maximum 65 of publications were contributed by Wolf, M. S, followed by Pinto, M with 31 publication and Osborne, R.H. contributed 27 publication during the period of study. The

**Table 6. Year wise distribution of citations**

Year	Number of Publications	Citations
2008	545	10375
2009	662	12636
2010	832	14298
2011	834	13594
2012	856	11844
2013	1038	9604
2014	1073	10525
2015	1221	8024
2016	1234	4516
2017	1201	2699
Total	9496	98115

**Table 7. Document wise distribution of publication**

Document Types	Total No Of Publication	Percentage
Article	6775	71.59
Conference Paper	1083	11.44
Review	619	6.54
Book Chapter	553	5.84
Book	129	1.36
Note	118	1.25
Editorial	105	1.11
Letter	53	0.56
Short Survey	44	0.46
Article in Press	12	0.13
Conference Review	4	0.04
Erratum	1	0.01
Total	9496	100

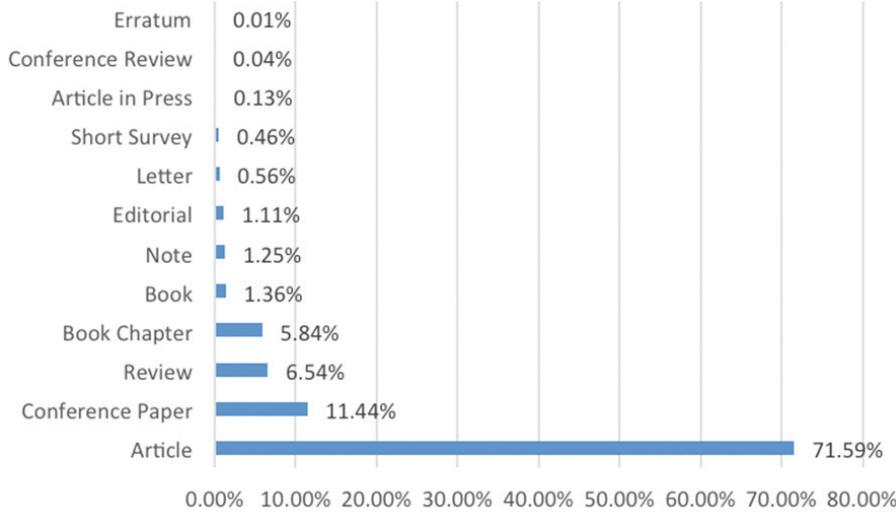


Figure 3. Document wise distribution of publication

data of year wise distribution of citations is as shown in Table 6.

**6.7. Document Wise Distribution of Publication**

Table 7 and Fig. 3 illustrates the document wise distribution of publications on ‘Information Literacy’ during the period of 10 year i.e. (2008-2017). The maximum 6775 (71.59 %) of publications were ‘Article’ type documents, followed by ‘Conference Paper’ type document with 1083 (11.44 %) of publications and 619 (6.54 %) of publication was ‘Review’ type documents. Whole data of document wise distribution of publication is as shown in Table 7.

**6.8. Country Wise Distribution of Publication**

Table 8 and Fig. 4 depicts the country-wise distribution of publications on ‘Information Literacy’ from the marked period of study. The maximum 5770 publication were contributed by the United States Nation, followed by the United Kingdom with 1028 contribution and 917 publication contributed by Australia. Canada and India contributed 715 and 332 publications respectively.

**Table 8. Top 5 country wise distribution of publication**

Country	Publication
United States of America	5770
United Kingdom	1028
Australia	917
Canada	715
India	332

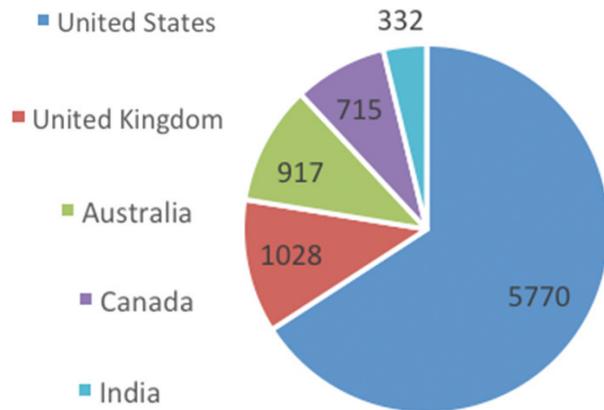


Figure 4. Country wise geographical distribution of publication.

overall data of the top 10 most productive authors is as shown in Table 5.

**6.6 Year Wise Distribution of Citations**

Table 6 illustrates the year wise distribution of citations in information literacy literature in which 98115 citation were recorded in 9496 publication during the period of study. On the observations of Table 6, it has been shown that the maximum 14298 citation were recorded in the year 2010, followed by 13594 citation in 2011 while the minimum 2699 citations were recorded in the ending year of the study i.e. 2017. The overall

**7. CONCLUSION**

A total of 9496 contributions on Information Literacy literature analysis during the period of 10 year from (2008-2017) have been identified. The United States has contributed the maximum number of research papers from the marked period of study. Next major contribution belongs to the United Kingdom. The most productive authors were Wolf, M S with 65 contribution. The highest number of 14298 citations were found in the year 2010, followed by 13594 citation in 2011. In the year 2016, the maximum number of publications were contributed by scientists and the maximum annual growth rate and compound annual growth rate were recorded in the years 2010 and 2009 respectively. According to Ludmila Ivancheva<sup>10</sup>, “Scientometrics becomes a very perspective research field in the general studies of science, providing powerful and effective instruments for analyses and evaluations in the sphere of science as a significant accelerator of the economic growth and social prosperity, helping to realise the Lisbon strategy for establishing a knowledge-based society.”

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## CONTRIBUTORS

**Dr Manoj Kumar Verma** has completed his MLIS & PhD from G.G. University, Bilaspur. Presently working as Assistant Professor at Department of Library & Information Science, Mizoram University, Aizawl. He has published 105 paper in journals/conference proceedings, 17 book chapter and 7 book/edited books. His area of interest includes: Library automation, knowledge management, information literacy, bibliometric, scientometrics and webometrics

**Mr Ravi Shukla** has completed MLIS from Department of Library and Information Science, B.H.U Varanasi and PGDCA from Dr CV Raman University, Chhattisgarh and pursuing his PhD from Department of Library and Information Science, Mizoram University, Aizawl, Mizoram. He has published more than 8 research papers in journals, 2 Book chapters, and 3 conference papers. His area of interest includes : Scientometric, bibliometric and information literacy.