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Research on e-Resources in India: A Scientometric Assessment of Publications Output on the Basis of SCOPUS Database during 1993-2018

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Abstract

This paper is a scientometric study focus on the publications on the title of e-resources based on Scopus database during the period of 1993-2018. A total 167 research articles were published on the title e-resources during the study period. The maximum numbers of publications 24 were published in 2013 followed by 21 in the year 2012. A fluctuation was found in annual growth rate during the period of study. The highest AGR is in the year 2009 with 800. The most prolific author was Bhardwaj, R.K. contributing 6 publications, followed by Bhat, N.A. and Tripathi, M. scored second rank in the list with 5 publications. It was found that the leading source title is Desidoc Journal of Library and Information Technology with 31 publications, leading keyword is e-resources with 52 publications and leading affiliation is University of Delhi with 12 publications. It found that the single most prevalent type of publications was journal articles, in which 115(68.86%) of the total publications was published.

Keywords: E-Resources, Scientometric Study, Annual Growth Rate, Compound Annual Growth Rate, Relative Growth Rate, Doubling Time

Introduction

Scientometrics known as the branch of science that defines the output feature in terms of structural research, inputs and outputs resource develops targets to evaluate the quality of information. Scientometric research publications are a quantitative measure for the basic research activity in a particular country. Scientometric study is a branch of bibliometrics. Scientometric is an important tools for measuring the utility of documents and relationships between documents and fields. It is an application of mathematical and statistical methods of various aspects of literature and used to identify the dynamics growth of knowledge. At present scenario the scientometrics study is one of the versatile research fields enlarge to all scientific fields. Scientometrics applications are used to evaluate scientific activities, primarily by producing statistics on scientific publications tabulated in databases.

The rapid improvement of information and communication technology (ICT) has brought a radical change in the current information scenario and rise to an amount of options to stock diverse information sources accessibly and fluently. The importance and use of e-resources have enlarged in the recent time. Therefore, there is essential to make study on the diverse features of resources and the problems relating to the use of e-resources by scientist. E-resources has emerged as a powerful tool it offering comprehensive opportunities to access information online and it is all about generating information in electronic form and hosting the resources on the web servers, providing accessibility to

e-resources online on the internet. The rise of e-resources has started a revolution in the world and is considered as a movement from traditional to digital resources.

Scope and coverage

The scope of present study is limited to analyse the research on e-resources from India during 1993-2018 on the basis of scientometrics parameters on the basis of Scopus database. The coverage of present study is limited to 167 papers which were published from India on e-resources during the period and listed in Scopus database.

Literature review

Verma (2018) conducted a scientometric study on research productivity of library review 2000-2017. Total 1012 articles published during the study period out of which 93(9.19%) articles were published in the year 2002. 706(69.76%) articles are journal articles in the library review. University of Strathclyde has 130 articles alone. Major contributions are made by U.K. which is 365 articles out of 18 countries.^[1]

Gupta et al. (2017) conducted a scientometric study on world mobile research during 2007-2016 and it found that total 140375 articles were published globally on mobile research based on Scopus database. The annual average growth rate of publication was 1.68%. The top most productive country on mobile research was China with 20.52%, followed by USA with 17.09% publications. The top 20 most productive countries have 95.05% publications during the period of study. Computer science was the broad subject which contributed the maximum publication share with 67.69% followed by engineering with 42.65% publications. From the total mobile research output 503 articles were highly cited articles with 100 or 100+ citations per articles with average of 180.04 citations per articles.^[2]

Dhawan et al. (2016) conducted a scientometric study on research in electronic publishing field during 2005-2014. The paper presents an analytical study of the research output in e-publishing field with scientometric indicators. The total 7010 publications were published during the study period. It found that the e-publishing is still growing at a slow pace with 3.14% compound annual growth rate and averaged 1.08 citations per publication. The top 15 most productive organizations publication share was 5.72% and citation share is 12.73% during 2005-2014. The average productivity rate per organization during the study was low 26.7, citation impact per paper was 2.41, h-index was 6.93 and international collaboration was 23.44% during the period of study.^[3]

Kumar (2014) conducted a scientometric study in online library information science and technology abstracts (LISTA) on digital literacy during 1997-2011. The study tries to examine the distribution year and article wise age, authorship pattern, subject, language and geographical distribution. Total 137 articles were published during the study period and out of that 53.28% articles focused significantly on digital literacy. In academic journal and periodicals, 69.34% primarily publish articles are on digital literacy and triple authorship pattern was dominating with 35.04% publications, 35-40 age group authors publish high number articles (39.42%). U.K. (27.01%) and U.S.A. (24.82%) were generated more numbers of articles. International journal of information and library review have published greatest number of articles with 8.03% publications.^[4]

Santhakumar and Kalitaperumal (2014) conducted a scientometric study and focused on the growth and development of mobile technology in relations of published articles available on engineering index database during 2003-2012. It found that total 144567 articles were published during the period of study. The average number 14456.7 articles were published per year and the highest numbers of publications 20318 were published in the year 2011. China's authors have contributed maximum number of publications in comparison of other countries and the most prolific author was Wang Wei with 223 contributions while Institute of Electrical and Electronic Engineering (IEEE) New York

(USA) was the highly contributed institution with 1248 publications. The relative growth rate (RGR) of publications has decreased from 2004(0.98) to 2012(0.13) and doubling time (Dt) has gradually increased from 2004(0.71) to 2012(5.15) during the period of study. ^[5]

Rathinasabapathy (2013) conducted a study on bluetongue research during the period of 1979-2012 as per CAB Direct Online database. It found that a total 2535 articles were published in the field of bluetongue research and average number of publication per year was 59. The highest number of publication 171 was in the year 2009. Highest publication was counted during 2008-2011. USA with 223 (8.79%) articles was the highest publishing country followed by Europe with 169 (6.66%) was second largest publishing and India ranks third position with 152 (5.99%) publications. The most preferred journal was Veterinaria Italiana with 121 publications and the document type are concerned journal articles with 1875 publication. English was the preferred language used by the scientists for communication. The most prolific author is B.I. Osburn with 216 publications. ^[6]

Methodology

The investigation is based on the research publication published on the topic of e-resources based on Scopus database (<http://www.scopus.com>) during the period of 1993-2018. The data was collected from Scopus database in month of July, 2018 by using the search string TITLE-ABS-KEY i.e. (e-resources) and LIMIT-TO AFFILIATION COUNTRY (India) and a total of 167 record were published on the topic of e-resources from India, out of which only 03 papers are in open access and 164 papers are in closed access. The collected data was coded in MS-Excel sheet for scrutiny and statistical inferences.

Objectives of the study

The objectives of the study are:

1. To analysis the year wise distribution of the research on e-resources in India
2. To determine the annual growth rate (AGR) and compound annual growth rate (CAGR) on e-resources research
3. To analysis the relative growth rate (RGR) and doubling time (Dt) of research on e-resources
4. To find out the most productive authors from India on e-resources research
5. To identify top 20 source title, keyword and affiliation name

Data analysis

Year wise distribution of publication

Table and figure 1 shows that year wise distribution of publication on the title of e-resources during the period (1993-2018) and resolved that total 167 research publication were published during this period, it is clearly shown that the highest 24(14.37%) number of publications were published in the year 2013, 2012 with 21(12.57%) publications and 2016 with 20(11.98%) publications. The lowest number of publication is in 1993, 2005 and 2008 with only 1(0.60%).

Table-1: Year wise distribution of publication on e- resources research

Year	No. of Publication	Cumulative	Percentage of Publication	Cumulative %
1993	1	1	0.60	0.6
2004	8	9	4.79	5.39
2005	1	10	0.60	5.99
2007	2	12	1.20	7.19

2008	1	13	0.60	7.79
2009	9	22	5.39	13.17
2010	10	32	5.99	19.16
2011	7	39	4.19	23.35
2012	21	60	12.57	35.93
2013	24	84	14.37	50.30
2014	18	102	10.78	61.08
2015	18	120	10.78	71.86
2016	20	140	11.98	83.83
2017	18	158	10.78	94.61
2018	9	167	5.39	100.00
Total	167	969	100.00	

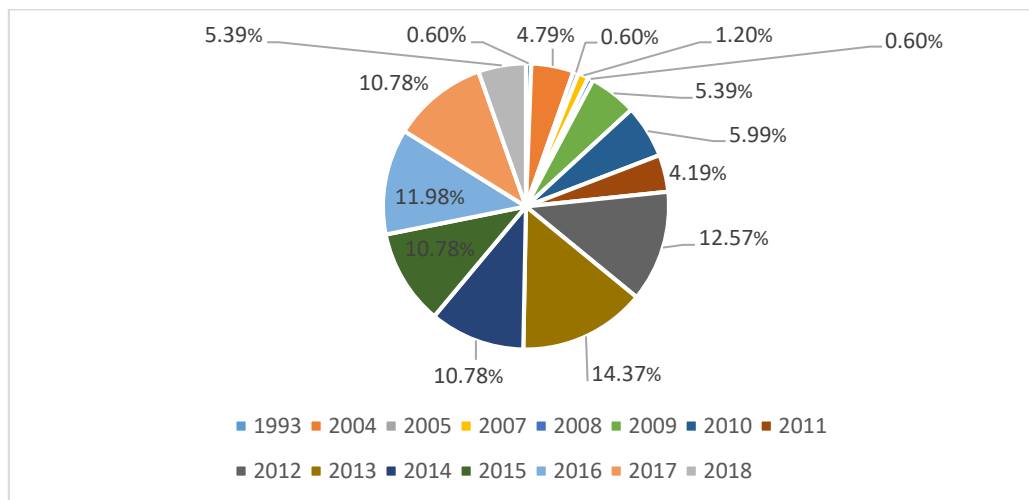


Figure-1: Year wise distribution of publication on e-resources research

Document wise publication distribution

Table and figure 2 shows then document wise publication distribution from the marked period of study. The highest 115(68.86%) of the publications was article type, followed by conference paper with 24(14.37%) of publications, book chapter was with 17(10.18%) of publications and review type of document was with 6(3.59%) of publications. Book, article in press, letter, note and short survey type of document had 1(0.60%) publication.

Table-2: Document wise distribution of publications on e-resources research

Document Type	Total No. of Publications	Percentage of Publication
Article	115	68.86
Conference Paper	24	14.37
Book Chapter	17	10.18
Review	6	3.59
Book	1	0.60
Article in Press	1	0.60
Letter	1	0.60
Note	1	0.60
Short Survey	1	0.60
Total	167	

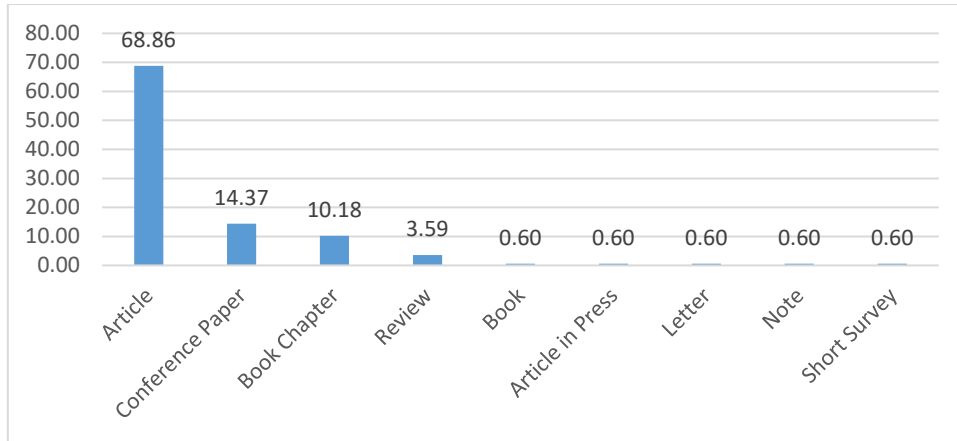


Figure-2: Document wise distribution of publications on e-resources

Annual growth rate

Table and figure 3 depicts annual growth rate of publications calculated during the study period 1993-2018 in which a total 167 e-resources related documents were published in the Scopus database. There is a fluctuation in annual growth rate during the period of study. The highest growth rate was recorded 800 in the year 2009. The annual growth rate (AGR) is calculated on the basis of the formula given by Kumar and Kaliyaperumal (2015)^[7]:

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

Table-3: Annual growth rate of publications on e- resources research

Year	No. of Publication	AGR
1993	1	0.00
2004	8	700.00
2005	1	-87.50
2007	2	100.00
2008	1	-50.00
2009	9	800.00
2010	10	11.11
2011	7	-30.00
2012	21	200.00
2013	24	14.29
2014	18	-25.00
2015	18	0.00
2016	20	11.11
2017	18	-10.00
2018	9	-50.00
Total	167	

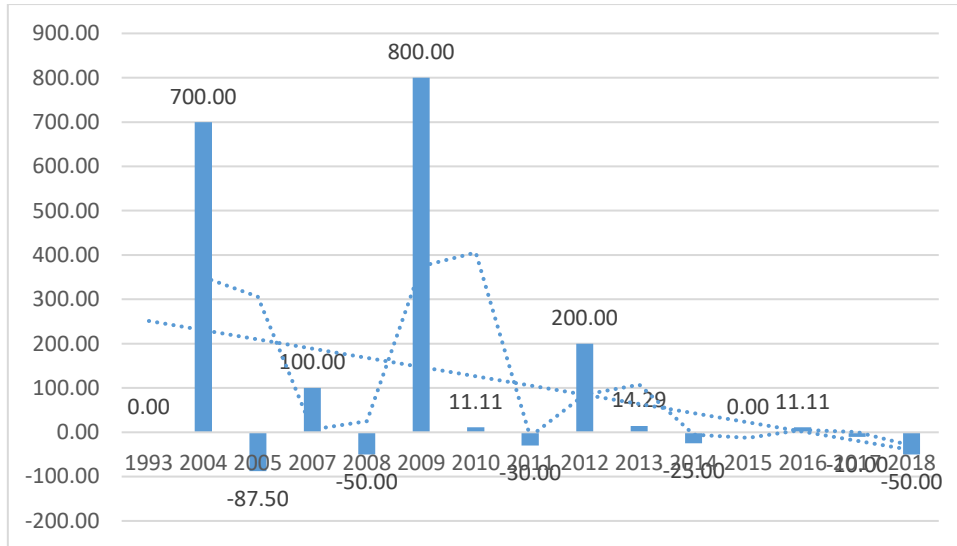


Figure-3: Annual growth rate of publications on e-resources research

Compound annual growth rate

Table and figure 4 present compound annual growth rate of publication, which shows that a variation in compound annual growth rate and it is because of not consistency on research on e-resources during the study period. It is found that year 2004 (0.173) and 2009 (0.129) growth rate is very high but in the year 2005(-14.782) and 2008(-0.042) growth rate is very low. “The compound annual growth rate is calculated by taking the n^{th} root of the total percentage growth rate, where n is the number of years in the period of study”. The compound annual growth rate was calculated by the following formula available on the website (<https://www.investopedia.com/terms/c/cagr.asp>):

$$\text{CAGR} = [(\text{EndingValue} / \text{BeginningValue})^{1/n} - 1]$$

Table-4: Compound annual growth rate on e-resource research

Year	No. of Publication	Cumulative Frequency	CAGR	CAGR (%)
1993	1	1	0	0
2004	8	9	0.173	17.346
2005	1	10	-0.148	-14.782
2007	2	12	0.044	4.427
2008	1	13	-0.039	-3.599
2009	9	22	0.129	12.983
2010	10	32	0.005	0.556
2011	7	39	-0.018	-1.768
2012	21	60	0.054	5.371
2013	24	84	0.006	0.609
2014	18	102	-0.012	-1.243
2015	18	120	0	0
2016	20	140	0.004	0.422
2017	18	158	-0.004	-0.404
2018	9	167	-0.025	-2.534
Total	167			0

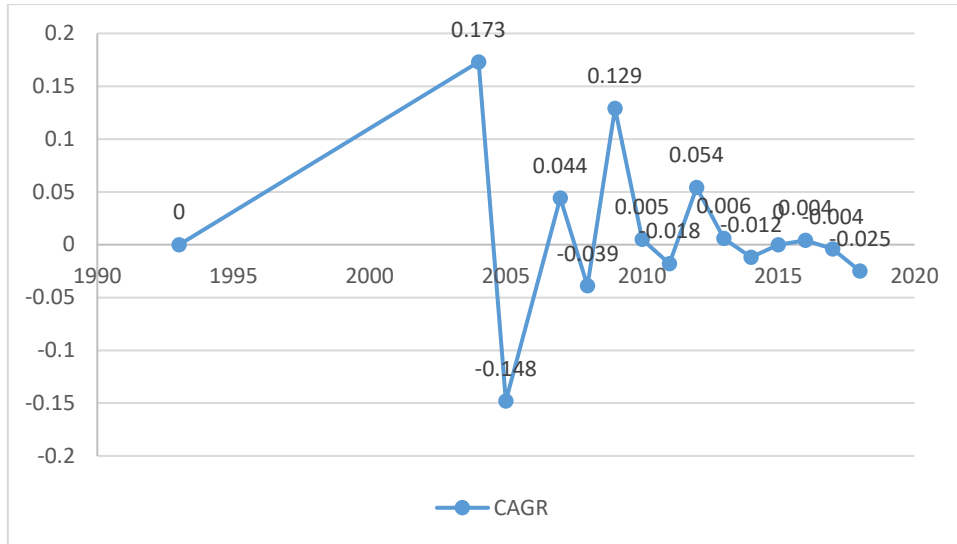


Figure-4: Compound annual growth rate on e-resources research

Relative growth rate and doubling time

Table and figure 5 shows the relative growth rate and doubling time of articles published in the title e-resources during the period of study. “The growth rate of publications has been calculated on the basis of RGR and Dt model, which is developed by Mahapatra in 1985”.^[8] By the observation of the table it can be notice that relative growth rate of publications in the study period is decreasing from 2.197 in 2004 to 0.055 in 2018 and the corresponding doubling time was fluctuating for different years.

The relative growth rate is calculated using following formula:

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

Where,

- RGR** = Growth Rate over the specific period of the interval,
- W1** = Log_e (natural log of the initial number of contributions)
- W2** = Log_e (natural log of the final number of contributions)
- T1** = the unit of initial time
- T2** = the unit of final time

Doubling time

The doubling time is a period which required for an amount to double. The doubling time calculated directly from the relative growth rate of publications. From the there is a direct equivalence between 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 end of the period must be in the logarithms of the number 2. If one uses a natural logarithm, this difference has a value of 0.693 (Beaie and Acol, 2009).

The Doubling time calculated using following formula:

$$DoublingTime(Dt) = \frac{0.693}{R}$$

Table-5: Relative growth rate and doubling time of publication

Year	No. of Publication	Cumulative Sum	W1	W2	RGR	Dt
1993	1	1	0	0	0	0
2004	8	9	0	2.197	2.197	0.315
2005	1	10	2.197	2.303	0.106	6.538
2007	2	12	2.303	2.485	0.182	3.808
2008	1	13	2.485	2.565	0.08	8.662
2009	9	22	2.565	3.091	0.526	1.317
2010	10	32	3.091	3.466	0.375	1.848
2011	7	39	3.466	3.664	0.198	3.500
2012	21	60	3.664	4.094	0.43	1.612
2013	24	84	4.094	4.431	0.337	2.056
2014	18	102	4.431	4.625	0.194	3.572
2015	18	120	4.625	4.787	0.162	4.278
2016	20	140	4.787	4.942	0.155	4.471
2017	18	158	4.942	5.063	0.121	5.727
2018	9	167	5.063	5.118	0.055	12.600
Total	167	969				

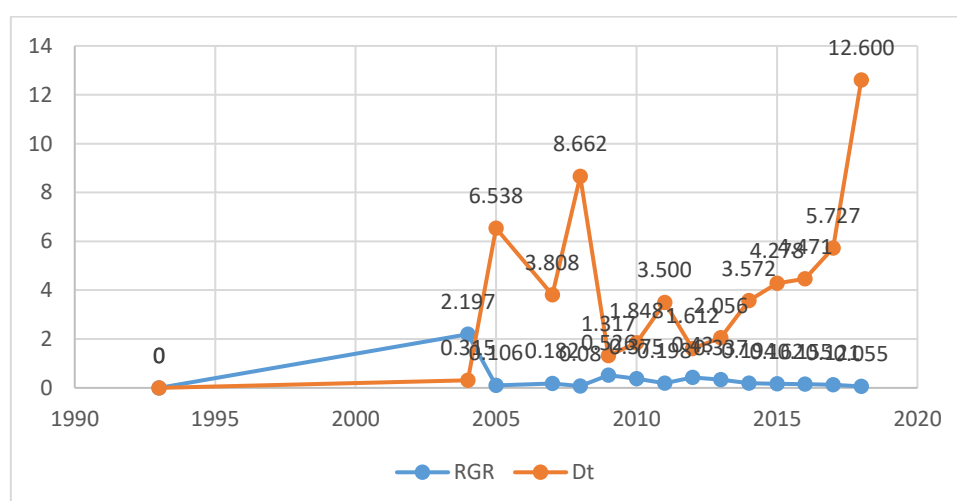


Figure-5: Relative growth rate and doubling time of publication on e- resources research

Most productive authors

Table 6 describe the most prolific authors based on the title e-resources research during the study period (1993-2018). From the observation it found that the highest 6 publications were contributed by R. K. Bhardwaj, followed by N. A. Bhat and M. Tripathi with 5 publications and S.A. Ganaie and V. K. J. Jeevan with 4 publications was most productive author, while twelve authors are published equivalent articles which are 3 and three authors are contributing equivalent articles which are 2.

Table-6: Most productive authors (top 20)

Author name	No. of publication
R. K. Bhardwaj	6
N.A. Bhat	5
M. Tripathi	5

S.A. Ganaie	4
V.K.J. Jeevan	4
J. Arora	3
P. Chand	3
S.K. Chauhan	3
D.K. Gupta	3
D. Jotwani	3
B. Kaur	3
K.C. Panda	3
N.K. Patra	3
M.K. Sinha	3
V.J. Suseela	3
D.K. Swain	3
S. Thanuskodi	3
S. Ahmad	2
P. Babbar	2
S. Bhatt	2

Source title, keyword and affiliation name

Table 7 shows the top 10 source title, keywords and affiliation name during the period of study 1993-2018 on the title e-resources research. From the observation of table it found that the top source title in e-resources research publication is DESIDOC Journal of Library and Information Technology with 31 publications, followed by Electronic Library with 12 publications and Annals of Library and Information Studies & Library Philosophy and Practice with 11 publications. It also found that two source title 2015 4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS) 2015 proceedings and Digital Information Exchange Pathways to Build Global Information Society published 6 publications and three source title Challenges Of Academic Library, Management in Developing Countries, Current Science published 4 publications during the study period.

From the observation of table 7 it found that the top keyword on e-resources research is e-resources with 52 keywords, followed by keyword India with 36 keywords and keyword Electronic Resources with 19 keywords. It also found that the keyword Academic Libraries & Information Services having same 13 keywords.

From the observation of respected table for affiliation of e-resources research it found that the top affiliation is University of Delhi with 12 publications, followed by University of Kashmir with 8 publications and Jawaharlal Nehru University with 6 publications. It also found that Information and Library Network Centre India & Indira Gandhi National Open University contributed 5 research articles on e-resources research during the period of study and similarly five affiliations contribute 4 research articles on e-resources research during the study period.

Table-7: Source title, keyword and affiliation name (top 10)

Source title	No. of Publications	Keyword	No. of Keyword	Affiliation	No. of Contribution
Desidoc Journal Of Library And Information Technology	31	E-resources	52	University of Delhi	12
Electronic Library	12	India	36	University of Kashmir	8

Annals Of Library And Information Studies	11	Electronic Resources	19	Jawaharlal Nehru University	6
Library Philosophy And Practice	11	Internet	17	Information and Library Network Centre India	5
2015 4th International Symposium On Emerging Trends And Technologies In Libraries And Information Services Ettlis 2015 Proceedings	6	Digital Libraries	15	Indira Gandhi National Open University	5
Digital Information Exchange Pathways To Build Global Information Society	6	E-journals	14	Indian Institute of Technology, Bombay	4
Program	5	Academic Libraries	13	Defence Research and Development Organisation India	4
Challenges Of Academic Library Management In Developing Countries	4	Information Services	13	Manipal Academy of Higher Education	4
Collection Building	4	Libraries	12	Alagappa University	4
Current Science	4	Electronic Publishing	10	Assam University	4

Major findings

The major findings of the study are:

1. There are total 167 publications published on the title e-resources on Scopus during the study period (1993-2018).
2. The highest number of publications is in the year 2013 with 24(14.37%) publication followed by 2012 with 21(12.57%) publications.
3. Fluctuation was found in annual growth rate during the period of study. The highest AGR is in the year 2009 with 800.
4. It is found that a variation in compound annual growth rate. In the year 2004(0.173) CAGR is very high but in the year 2005(-0.148) CAGR is very low during the study.
5. It was found that the leading source title is DESIDOC Journal of Library and Information Technology with 31 publications, leading keyword is e-resources with 52 keywords and leading institution is University of Delhi with 12 contribution.
6. It found that the single most prevalent type of publications was journal articles, in which 115(68.86%) of the total publications was published.
7. The ranking of authors have prominent in scientometric study. It is lighted that the R.K. Bhardwaj has top rank in the list by contributing 6 publications, followed by N.A. Bhat and M. Tripathi scored second rank in the list with 5 publications.

Conclusion

Scientometric is a unique set of techniques for different purposes such as determination of different scientific indicators, analysing of scientific output, monitoring and evaluating of information resources, etc. The benefits of e-resources have drawn attention of the library users to a great magnitude. Users are deeply reliant on e-resources for their essential information and to keep up-to-date in their subject area.

In conclusion it may be stated that e-resources is still a young field in India but annual growth rate is very high and low. E-resources publication output is not very strong in terms of quality or quantity of publications in Indian scenario. During the period of study (1993-2018) only 167 publications are available on Scopus database which is very low.

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