

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Library Philosophy and Practice (e-journal)

Libraries at University of Nebraska-Lincoln

2021

Assessing the World Research Output on Electronic Information Resources (EIRs): A Scientometric Analysis

Ravi Ranjan Kumar

Banaras Hindu University, ravi.ranjan4@bhu.ac.in

H N Prasad

Banaras Hindu University, hnprasad.bhu@gmail.com

Follow this and additional works at: <https://digitalcommons.unl.edu/libphilprac>



Part of the [Library and Information Science Commons](#)

Kumar, Ravi Ranjan and Prasad, H N, "Assessing the World Research Output on Electronic Information Resources (EIRs): A Scientometric Analysis" (2021). *Library Philosophy and Practice (e-journal)*. 6373. <https://digitalcommons.unl.edu/libphilprac/6373>

Assessing the World Research Output on Electronic Information Resources (EIRs): A Scientometric Analysis

Ravi Ranjan Kumar

(Research Scholar)

Department of Library & Information Science

Banaras Hindu University, Varanasi

Email: ravibhu19@gmail.com

Prof. (Dr.) H. N. Prasad

Department of Library & Information Science

Banaras Hindu University, Varanasi

Email: hnprasad.bhu@gmail.com

Abstract

The present study depicts the growth of literature on electronic resources. In this regard, 2274 publications were collected from the Web of Science database from 1989 to 2018. The study attempts to measure year-wise and five-year block-wise distribution of publications using relative growth rate and doubling time, collaborative index, collaborative co-efficiency, and degree of collaboration. The highest number of publications, i.e., 472, was published in the 6th block 2014-2018. The sole author-produced 56.42% (1283) of the total publications, and double authors posted 19.48% (443). Authors from the USA have contributed the maximum number of publications compared to the other countries, and India stood 16th ranking in terms of productivity in this study period. The most prolific author authors Barker P, Korat O, and Tenopir C, contributed the highest 12 (0.53%) publications in e-resources literature, followed by Huang YM with 11 (0.48%) publications. Collaboration Index ranges from 1.53 (first block) to 2.72 (sixth block) with an average of 1.95 per joint authored paper, which implies the research team falls between 1 and 2 in the e-resources literature. Pennsylvania Commonwealth System of Higher Education PCSHE is a positively contributed institution with 40 publications, followed by the University of London (UK) with 33 publications.

Keywords: E-resources, Research Output, RGR, Doubling time, Collaborative Index, Degree of Collaboration, and Relative Citation Impact.

1. INTRODUCTION

Significant developments in correspondence innovations formed the 20th century. The rise and utilization of information technology is the century's most huge improvement influencing scholarly communication. The utilization of PCs to information processing has carried a few products and services to the scenes. Consequently, the academic community has undergone tremendous changes during these years, assuming new dimensions influenced by technology-driven applications. Libraries have seen an extraordinary transformation in their assortment advancement and their service structures in recent years. Accordingly, Libraries utilize innovation to improve scholarly information management to strengthen and speed access to academic publications. Over the last several years, a significant transformation has been noticed in collection development policies and practices.

The digitization of information in paper media has acquired a new concept altogether in human life, which has marked the beginning of the "information era." An electronic resource is characterized as a resource that requires computer access or any electronic item that conveys an assortment of information, be it alluding to full content bases, electronic diaries, picture assortments, other mixed media items, and mathematical, graphical, or time-based, as a commercially available title that has been published with an aim to being marketed. These may be delivered on CD ROM, on tape, via the Internet, and so on. These are more useful due to inherent capabilities for manipulation and searching; providing information access is cheaper than acquiring information resources, savings in storage and maintenance, etc. Sometimes, the electronic form is the only alternative. The developments in scientific publishing and publishers' pricing policies posed new challenges and opportunities for academic libraries to purchase and manage the serials within their restricted budget.

In the early period, sages and researchers bestowed instruction orally; they were expected to introduce themselves before teaching themselves. Talks and talks of the sage were the principal wellspring of instruction in the social orders. After the introduction of alphabets writing developed on Palm leaves and barks of trees, and many ancient scholars used to write their thoughts or ideas. Writing on leaves and barks was very difficult, and scholars faced many problems to bring their thoughts or ideas on the sphere.

After Gutenberg's creation of printing supplanted the oral education process of the ancients, So, too, has Charles Babbage's invention of computers replaced paper with the paper-less world. The communication mode has changed from the oral to the written to the printed and

now to the electronic. The Internet has completely changed the way of storing, processing, and retrieving information; it has also affected teaching and learning. The increasing popularity of electronic resources among the user community has led the research in the field. Since the emergence of this new form of information resources, many scholars, academicians, and institutions have tried to define e-resources in their own words. Lee and Boyle (2004) defined e-resources as “any cohesive publication in digital form that is being marketed” or any electronic product that delivers a collection of data, be it numerical, graphical, text, or time based, as a commercially available resource” and includes “full-text databases, electronic journals, image collection, multimedia products, collection of numerical data”. Electronic resources are resources in which information is stored electronically and which are accessible through electronic systems and networks (Harisadan & Khan, 2009). According to the International Federation of Library and Information Institution (IFLA, 2012), “electronic resources refer to those materials that require computer access, whether, through a personal computer, mainframe, or handheld mobile device, they may either be accessed remotely via the Internet or locally. Some of the most frequently encountered types of e-resources are E-journals, E-books, Full-text databases, Indexing and Abstracting databases, Reference databases, Numerical and Statistical databases, E-image, E-audio/visual resources”. Today electronic assets are essential assets of educational foundations, R&D establishments, and other learning organizations.

Today electronic resources are indispensable resources of academic institutions, R&D institutions, and other learning institutions. Tripathi and Kumar (2014) claimed that the gaining popularity of web-based intellectual resources in other sectors has also making e-resources popular in academic libraries gradually. The clients' inclination towards e-resources has because they need to get to help from the own places, get to resources whenever, they need to simple access of sources, and so forth.

etc.

2. Background of the study

Several empirical and survey-based studies have been done on the e-resources. The previous research focused on user's perceptions towards e-resources, awareness, and use of e-resources, use statistics, and management of e-resources in academic and research libraries. The different forms of e-resources and their benefits over the print resources are also discussed in published articles. The infrastructure facilities and problems felt during

accessing e-resources are highlighted. The licensing policy and subscription charge of e-resources are major areas in the past research. However, the present study is carried out with the aims of scientometrics analysis of e-resources. Scientometrics study is the quantitative aspect of scientific activities. It involves the analysis of scientific activities, scientific publications by using various tools techniques, such as the growth of literature, the format of publications, authorship pattern, most contributed authors, and intuitions in the subject area. Algu and Thanuskodi (2019) explored the research output on digital literacy from the period of 1992 to 2011. The data regarding “digital literacy” extracted from the Web of Science database and the Histcite software also used by them for analyzing the retrieved data. Naushad Ali et al. (2018) analyzed the research paper on “Knowledge Sharing” using the Science Citation Index Expanded (SCI-Expanded) and Social Science Citation Index (SSCI). This study revealed that the publication trends of knowledge sharing were increasing annually from 1990 to 2016. The two leading journals on the topic were “Journal of Knowledge Management” and “Knowledge Management Research and practice”. Ahmad et al. (2017) attempted to reveal the literature on “digital library” in the field of library and information science from 2002 to 2015. A total of 4206 documents were accounted for “digital library, digital libraries, electronic library, and virtual library” in the Web of Science database. The article found that 2016 was the most productive year; in terms of the citation received the year 2002 and 2003 were the least cited years. The total citations of digital library documents were 19,872 and the average citations per publication were 4.72 noticed. Gupta et al. (2016) examined world rabies research output through the Scopus database. The study found that the publications of rabies research were increased by 5.87 percent per annum. Most of the publications on rabies research appeared in the form of articles (63.42%) followed by review papers (16.99%), conference papers (4.31%), notes (2.60%), etc. Ram (2011) accessed the research output on “Artemisia” using the PubMed database. Artemisia is an herb used for the treatment of Malaria globally. The study revealed that the majority of papers have been published in the English language (89.22%) whereas the second-highest number of papers were published in the Chinese language (7.95%).

3. OBJECTIVE OF THE STUDY

1. To gauge five years block-wise growth of e-resources literature during 1989-2018;
2. To measure the Relative Growth Rate and Doubling time of e-resources literature and depict the five years block-wise citation impact of e-resources literature;
3. To identify the authorship trend of e-resources literature;
4. To find the publication culture of e-resources and their citation impact;
5. To find out the language-wise distribution of e-resources literature;
6. To identify the top 10 most productive countries and journals which lead e-resources research;

7. To determine the top 10 most productive authors and institutions on the topic.

4. METHODS AND STATISTICAL TOOLS

The primary data on e-resources were extracted from the Web of Science (WoS) Core Collection from March to April 2019. All search string which is related to electronic resources in the basic search of WoS was used. The search strategy employed for the present data was as follows: Title= “electronic resource*,” “e-resource*, “electronic journal*”, “e-journal*”, “electronic book*”, “e-book*”, “electronic information resource*”, “e- information resource*”; Publication Year= 1989-2019; Document Type= All. In Web of Science ‘star’ (*) string is used for accessing a plural form of a search term. After applying all tools and techniques there were 2274 records found on electronic resources in different types of documents. These records were saved and imported into MS Excel 2007 to organize, analyze and generate the tables and graphs for the final study.

4.1 Statistical methods

Collaborative Index (CI)

Collaborative index (CI) presents the mean number of authors per joint paper. Lawani introduced the collaborative index in 1980. In this index, single-authored papers are omitted which is equal to one always. The mean number of authors per joint authored paper CI value Zero-weight to single-authored paper. Which is calculated using the following formula?

$$CI = \frac{\sum_{j=1}^A jf_j}{N}$$

Where f_j is the number of J authored papers published in the discipline during a certain period

N is the total number of research papers published in the discipline during a certain period of time

Collaborative Coefficient (CC)

Ajiferuke(1988) suggested the notion of Collaborative coefficient (CC) and was used by Karki and Garg(1997) to measure the extent and strength of collaboration among the researchers in India in the Bibliometric discipline. It can be expressed mathematically as:

$$CC = 1 - \frac{\sum_{j=1}^k \left(\frac{1}{j}\right) f_j}{N}$$

Where, f_j is the number of J authored papers published in the discipline during a certain period N is the total number of research papers published in the discipline during a certain period of time and k is the greatest number of authors per paper in a discipline.

According to Ajiferuke, CC tends to zero as single-authored papers dominate and to 1-1/j as j-authored papers dominate. This implies that the higher value of CC, the higher probability of multi or mega-authored papers.

Relative Citation Index (RCI)

RCI is used to measure the influence and visibility of a nation's research from a global perspective. Relative citation impact can be defined as the average citations of a country's papers in the field divided by the world average in the corresponding field during the same period. The formula to calculate RCI suggested by Yi, Qi and Wu are:

$$RCI = (c_{ij}/p_{ij}) / (w_{cj}/w_{pj})$$

RCI =1 denotes that any country's citation rate is equal to world citation rate; RCI<1 indicates that a country's citation rate is less than the world citation rate and also implies that the research efforts are higher than its impact; and RCI>1 indicates that the rate of citation of a country is higher than the world's citation rate and also implies high-impact research of that country.

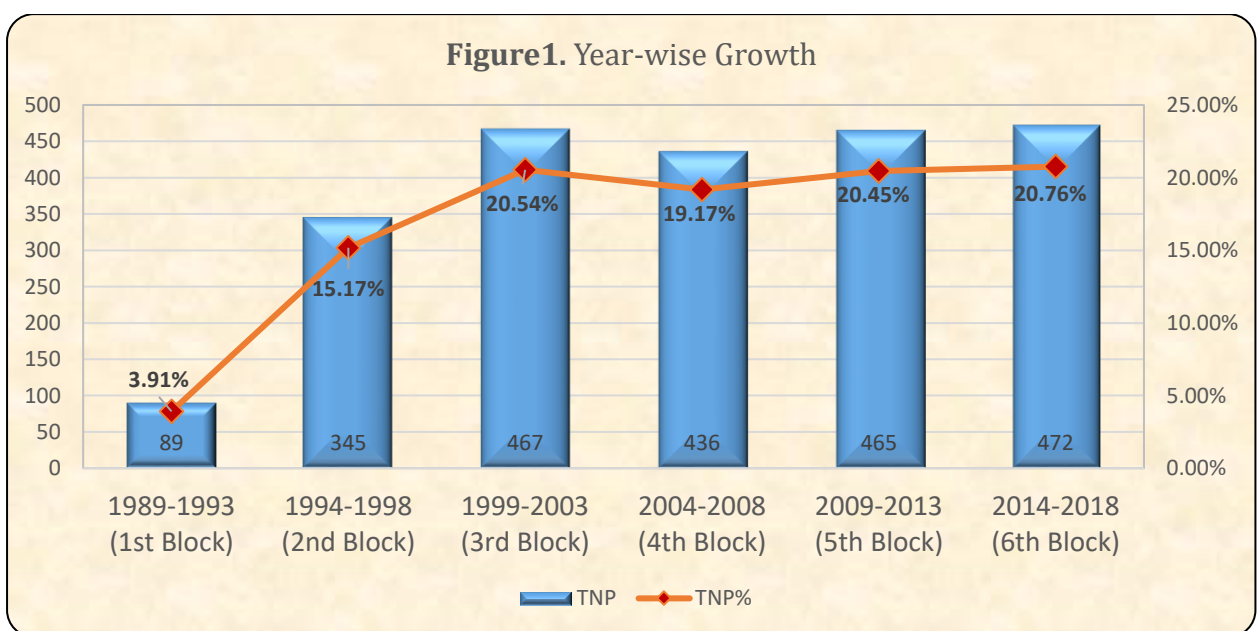
5. ANALYSIS AND INTERPRETATIONS

5.1 YEAR-WISE GROWTH OF E-RESOURCES

Table 1 presents that the publication of 30 years was divided into six blocks of five years. It was seen that the growth of literature was very low (3.91%) in the first block and high (20.76%) in the sixth block. After the first block, there was constant growth of literature was observed.

Table 1. Year-wise growth of publications					
BLOCK	TNP	TNP%	CUM.	CUM.%	Annual Graph
1989-1993 (1st Block)	89	3.91	89	3.91	
1994-1998 (2nd Block)	345	15.17	434	19.09	
1999-2003 (3rd Block)	467	20.54	901	39.62	
2004-2008 (4th Block)	436	19.17	1337	58.80	
2009-2013 (5th Block)	465	20.45	1802	79.24	
2014-2018 (6th Block)	472	20.76	2274	100.00	
TOTAL	2274	100			

It was observed from the annual graph of table 1 that 1993 was the highest productive year in block 1 with 30 (1.32%) publications, 1996 was the most prolific years in block 2 with 82 (3.61%) publications, 2000 was the most prolific years in block 3 with 113 (4.97%) publications, 2005 in block 4 with 93 (4.09%) publications, 2013 was the most prolific year in block 5 with 110 (4.84%) publications and 2014 was a most productive year with 116 (5.10%) publications. Finally is found that highest 5.10% (116) publications were published in 2014 and lowest 0.13% (3) publication was published in 1989.



5.2 RELATIVE GROWTH RATE AND DOUBLING TIME

Relative growth rate (RGR)

The Relative Growth Rate (RGR) is the increase in the 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, 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 an interval can be calculated from the following equation-

$$1-2^R = \log_e W_2 - \log_e W_1 / T_2 - T_1$$

Where,

$1-2^R$ = mean relative growth rate over the specific period of the interval;

$\log_e W_1$ = log of the initial number of articles;

$\log_e W_2$ = log of the final number of articles after a specific period of the interval;

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

Doubling time (Dt.)

There exists a direct equivalence between the relative growth rate and the doubling time. If the number of articles or pages of a subject doubles during a given period then the difference between the logarithms of numbers at the beginning and end of this period must be the logarithm of the number 2. If a natural logarithm is used this difference has a value of 0.693. Thus the corresponding doubling time for each specific period of interval and both articles and pages can be calculated by the formula.

$$\text{Doubling time DT} = 0.693/R$$

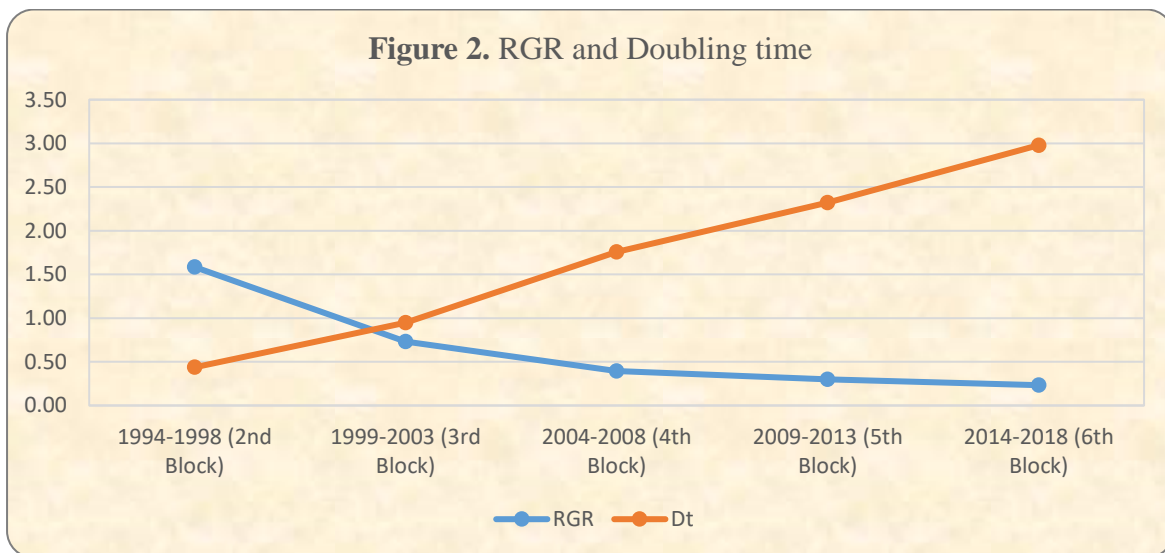
Therefore, doubling time for articles $DT(a) = 0.693/1-2^R$ ($aa^{-1} \text{year}^{-1}$)

The RGR was calculated for the publications against six blocks of five years blocks. The Doubling Time (Dt) against each five years blocks of the study was also determined. The values of RGR and Dt for publications are represented in Table 2.

Table 2. Relative Growth Rate and Doubling time						
BLOCK	TNP	CUMULATIVE	W1	W2	RGR	Dt
1989-1993	89	89	0	4.49	--	--

(1st Block)						
1994-1998 (2nd Block)	345	434	4.49	6.07	1.58	0.44
1999-2003 (3rd Block)	467	901	6.07	6.80	0.73	0.95
2004-2008 (4th Block)	436	1337	6.80	7.20	0.39	1.76
2009-2013 (5th Block)	465	1802	7.20	7.50	0.30	2.32
2014-2018 (6th Block)	472	2274	7.50	7.73	0.23	2.98
Total	2274				0.65*	1.69*

Figure 2 shows that RGR was decreasing consistently. It is confined to the fact that the literature's growth is not in exponential ratio and the arithmetic ratio in the explosion on the e-resources literature was not taken place during the study period. While doubling time (DT) has increased when calculated year wise. The Doubling Time increases from 0.44 in the first block to 2.98 in the sixth block. However, the doubling time is increasing and showing an exponential growth rate.



5.3 BLOCK-WISE CITATION IMPACT OF E-RESOURCES

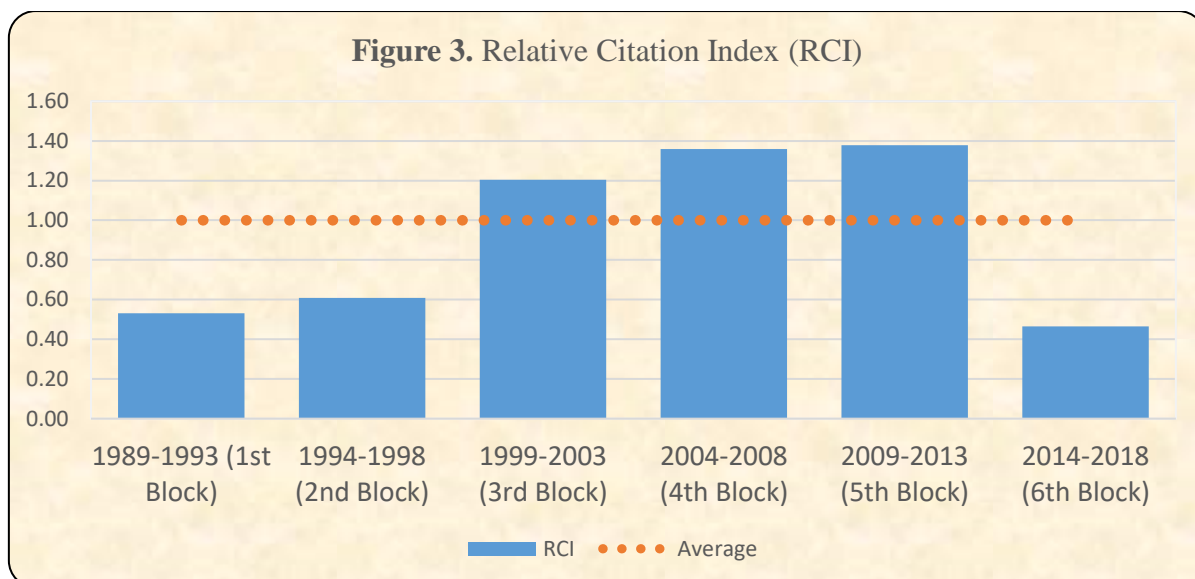
Table 3 presents the citation impact of e-resources literature. 14566 total citations received by 2274 publications with 6.41 Citations per paper. In the first block, 89 publications achieved 2.08% (303) of

total citations, the second block achieved 9.24% (1346), and third block 24.75% (3605), fourth block 26.07% (3797), fifth block 28.20% (4108) and 9.66% (1407) citations were received in the last block.

Table 3. Year-wise growth of publications						
BLOCK	TNP	TNP%	Citation	Citation%	CPP	RCI
1989-1993 (1st Block)	89	3.91	303	2.08	3.40	0.53
1994-1998 (2nd Block)	345	15.17	1346	9.24	3.90	0.61
1999-2003 (3rd Block)	467	20.54	3605	24.75	7.72	1.20
2004-2008 (4th Block)	436	19.17	3797	26.07	8.71	1.36
2009-2013 (5th Block)	465	20.45	4108	28.20	8.83	1.38
2014-2018 (6th Block)	472	20.76	1407	9.66	2.98	0.47
Total	2274	100.00	14566	100.00	6.41	1.00

The highest 8.83 citations per paper (CPP) was in the 5th block followed by 8.71 CPP in the 4th block, 7.72 CPP in the 3rd block, 3.90 CPP in the 2nd block, 3.40 CPP in 1st block and lowest CPP was in the last block.

Figure 3 presents that the RCI value of the 3rd block, 4th block, and 5th block was more than the average value that indicates that more effective papers were published and accepted by scholarly societies during these periods.



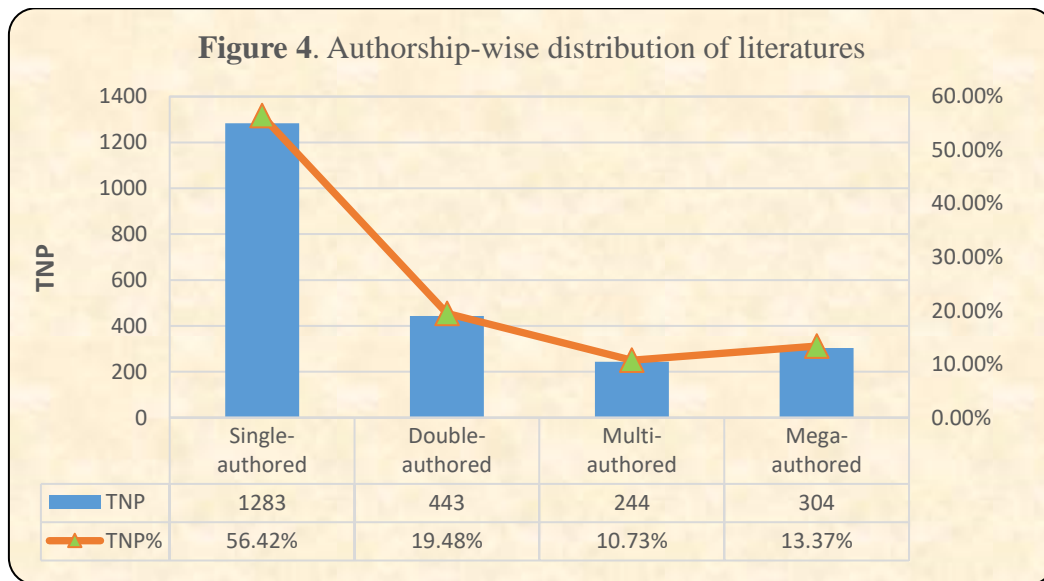
5.4 AUTHORSHIP MEASURES

Table 4 and figure 4 show that the highest 56.42% (1283) of total e-resource literature was published by the sole author followed by 19.48% (443) literature published by two authors, 13.37% (304) were mega-authored literature and 10.73% were multi-authored literature. Figure 4 indicates that the single authorship trend of e-resources literature was dominated over double, multi, and mega-authored trends.

Table 4. Authorship trend									
Block	Single-authored	Double-authored	Multi-authored	Mega-authored	TNP	TNA	CI	DC	CC
1989-1993 (1st Block)	70	7	8	4	89	136	1.53	0.21	0.14
1994-1998 (2nd Block)	256	55	17	17	345	519	1.50	0.26	0.15
1999-2003 (3rd Block)	334	69	30	34	467	762	1.63	0.28	0.17
2004-2008 (4th Block)	255	99	37	45	436	826	1.89	0.42	0.25
2009-2013 (5th Block)	209	92	73	91	465	1140	2.45	0.55	0.36

2014-2018 (6th Block)	159	121	79	113	472	1282	2.72	0.66	0.43
Total	1283 (56.42%)	443 (19.48%)	244 (10.73%)	304 (13.37%)	2274	4665	1.95*	0.40*	0.25*

Table 4 presents that the Collaborative index was increasing from 1.53 to 2.72 with a 1.95 mean CI. Some fluctuations have been seen during the study period. The mean value for the degree of collaboration was 0.40, which indicated that sole works were more prolific. With 0.25 CC mean value indicated the dominance of single-authored work in e-resources.



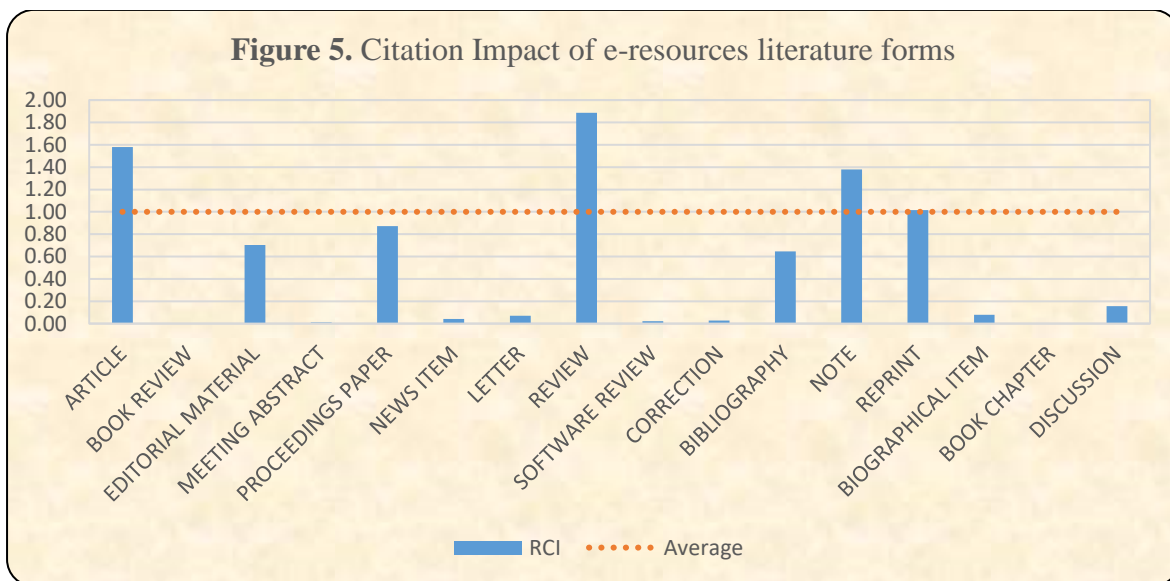
5.5 PUBLICATION CULTURE OF E-RESOURCES AND THEIR CITATION IMPACT

Table 5 presents that the highest 53.34% of total e-resources literature was published in article form followed by book review 14.51%, editorial material 11.30%, meeting abstract 6.73%, proceedings papers, news items, a letter published 3% and remaining in other forms.

FORM	TNP	TNP%	TNC	TNC%	ACP	RCI
Article	1213	53.34	12270	84.24	10.12	1.58
Book Review	330	14.51	11	0.08	0.03	0.01
Editorial Material	257	11.30	1159	7.96	4.51	0.70
Meeting Abstract	153	6.73	9	0.06	0.06	0.01

Proceedings Paper	88	3.87	491	3.37	5.58	0.87
News Item	76	3.34	20	0.14	0.26	0.04
Letter	73	3.21	33	0.23	0.45	0.07
Review	38	1.67	459	3.15	12.08	1.89
Software Review	14	0.62	2	0.01	0.14	0.02
Correction	11	0.48	2	0.01	0.18	0.03
Bibliography	7	0.31	29	0.20	4.14	0.65
Note	6	0.26	53	0.36	8.83	1.38
Reprint	4	0.18	26	0.18	6.5	1.01
Biographical Item	2	0.09	1	0.01	0.5	0.08
Book Chapter	1	0.04		0.00	0	0.00
Discussion	1	0.04	1	0.01	1	0.16
Total	2274		14566			

Figure 5 depicts the citation impact publication culture in e-resource literature, indicating that citation impact of article, Review, note, and a reprint was more than average RCI and remained less than average values.



5.6 Language-wise distribution of e-resource literature

Table 6 showed the highest 2158 (94.90%) publications were published in the English language, followed by German with 39 (1.72%) publications, Spanish with 37 (1.63%), and remained publications language were less than 1%

Table 6. Form of Publications				
LANGUAGE	TNP	TNP%	CUM.	CUM.%
English	2158	94.90	2158	94.90
German	39	1.72	2197	96.61
Spanish	37	1.63	2234	98.24
French	12	0.53	2246	98.77
Russian	7	0.31	2253	99.08
Italian	6	0.26	2259	99.34
Portuguese	6	0.26	2265	99.60
Japanese	5	0.22	2270	99.82
Czech	3	0.13	2273	99.96
Hungarian	1	0.04	2274	100.00
TOTAL	2274			

5.7 TOP TEN PRODUCTIVE COUNTRIES

Table 7 reveals that 72.52% (1649) of total publications were produced by these 10 countries and 80.17% (11677 citations) of total citations received by these ten countries.

It has been seen that the USA was the most prolific country with 943 (41.47%) publication and also received the highest 6252 (42.92%) citations, followed by England with 255 (11.21%) publications and 1805 (12.39%) citations, Taiwan with 78 (3.43%) publications & 762 (5.23%) citations, Canada & Spain produced 3% publications, India & Germany produced 2% publications, and Australia, China & South Korea produced 1% publications.

Table 7. Top 10 most prolific countries				
COUNTRIES	TNP	TNP%	Citation	Citation%
USA	943	41.47	6252	42.92
England	255	11.21	1805	12.39
Taiwan	78	3.43	762	5.23
Canada	76	3.34	513	3.52
Spain	74	3.25	563	3.87
India	56	2.46	726	4.98
Germany	51	2.24	298	2.05
Australia	44	1.94	95	0.65

Peoples R. China	43	1.89	279	1.92
South Korea	29	1.28	384	2.64
Total	1649	72.52	11677	80.17

5.8 TOP 10 MOST PRODUCTIVE JOURNALS

Table 8 presents that journal ELECTRONIC LIBRARY produced the highest 131(5.75%) publications in e-resources literature, followed by SERIALS REVIEW with 73(3.21%) publications, JOURNAL OF ACADEMIC LIBRARIANSHIP with 71(3.12%) publications, LIBRARY COLLECTIONS ACQUISITIONS TECHNICAL SERVICES & PROGRAM ELECTRONIC LIBRARY AND INFORMATION SYSTEMS with 65(2.86%) publications, LIBRARY JOURNAL with 52(2.29%) publications, COLLEGE RESEARCH LIBRARIES with 50(2.20%) publications, ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY with 48(2.11%) publications.

Table 8. Most productive journals				
Source Titles	TNP	TNP%	TNC	TNC%
ELECTRONIC LIBRARY	131	5.76	769	5.28
SERIALS REVIEW	73	3.21	252	1.73
JOURNAL OF ACADEMIC LIBRARIANSHIP	71	3.12	631	4.33
LIBRARY COLLECTIONS ACQUISITIONS TECHNICAL SERVICES	65	2.86	487	3.34
PROGRAM ELECTRONIC LIBRARY AND INFORMATION SYSTEMS	65	2.86	260	1.78
LIBRARY JOURNAL	52	2.29	40	0.27
COLLEGE RESEARCH LIBRARIES	50	2.20	584	4.01
ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY	48	2.11	1	0.01
LIBRARY RESOURCES TECHNICAL SERVICES	46	2.02	237	1.63
LEARNED PUBLISHING	45	1.98	195	1.34

5.9 Top prolific authors

Table 8 reveals that authors Barker P, Korat O, and Tenopir C contributed the highest 12 (0.53%) publications in e-resources literature, followed by Huang YM with 11 (0.48%) publications, Mcknight C and Shamir A with 10 (0.44%) publications, Nicholas D with 9 (0.40%) publications, and Maceviciute E. Rowley J and Sylvia M were at the bottom with 8 (0.35%) publications.

Table 9. Most productive authors				
Authors	TNP	TNP%	TNC	TNC%
BARKER P	12	0.53	59	0.41
KORAT O	12	0.53	421	2.89
TENOPIR C	12	0.53	325	2.23
HUANG YM	11	0.48	191	1.31
MCKNIGHT C	10	0.44	148	1.02
SHAMIR A	10	0.44	349	2.40
NICHOLAS D	9	0.40	296	2.03
MACEVICIUTE E	8	0.35	4	0.03
ROWLEY J	8	0.35	171	1.17
SYLVIA M	8	0.35	0	0.00

5.10 Top prolific institutes

Table 10 depicts that institute PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION PCSHE produced the highest 40 (1.76%) publications in e-resources literature, followed by UNIVERSITY OF LONDON with 33 (1.45%) publications, the UNIVERSITY OF NORTH CAROLINA with 31 (1.36%) publications, INDIANA UNIVERSITY SYSTEM & UNIVERSITY OF ILLINOIS SYSTEM with 24 (1.06%) publications, STATE UNIVERSITY SYSTEM OF FLORIDA, UNIVERSITY OF CALIFORNIA SYSTEM and UNIVERSITY OF TENNESSEE SYSTEM with 23 (1.01%) publications, UNIVERSITY COLLEGE LONDON with 22 (0.97%) publications, the UNIVERSITY OF TENNESSEE KNOXVILLE with 21 (0.92%) publications.

Table 10. Most prolific institutes				
Institutes	TNP	TNP%	TNC	TNC%
PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION PCSHE	40	1.76	384	2.64
UNIVERSITY OF LONDON	33	1.45	202	1.39
UNIVERSITY OF NORTH CAROLINA	31	1.36	101	0.69
INDIANA UNIVERSITY SYSTEM	24	1.06	67	0.46
UNIVERSITY OF ILLINOIS SYSTEM	24	1.06	123	0.84
STATE UNIVERSITY SYSTEM OF FLORIDA	23	1.01	434	2.98
UNIVERSITY OF CALIFORNIA SYSTEM	23	1.01	789	5.42

UNIVERSITY OF TENNESSEE SYSTEM	23	1.01	565	3.88
UNIVERSITY COLLEGE LONDON	22	0.97	456	3.13
UNIVERSITY OF TENNESSEE KNOXVILLE	21	0.92	231	1.59

6. CONCLUSION

We can conclude that this study aims to analyze the number of contributions made by the researchers on e-resources published on the Web of Science database during 1989–2018. The analysis showed that 2274 publications were published on e-resources. The paper has observed a gradual growth in the number of publications in the field under study, and recent years have produced a good number of publications compared to the olden days. The single most prevalent form of publication is the Journal articles, in which 53.34 % of the total literature is published. This study shows that the e-resource researcher's preferred medium of communication is journal articles. The majority of research publications published were found in the English language. And author affiliations prove that countries like the USA, UK, and Taiwan are actively engaged in research in the field. The highly preferred source titles to publish the publications by the authors were identified. It found that Electronic Library top the list with the highest number of publications, 131 (5.76 %). It is followed by SERIALS REVIEW with 73(3.21%) publications, JOURNAL OF ACADEMIC LIBRARIANSHIP occupy the third position with 71(3.12%) publications. Many researchers and scientists are pursuing their research in the field of e-resources, giving hope that more literature would be published on the subject from all the countries in the world.

The potential conflict of interest

There are no conflicts of interest among authors. The co-author has seen the final manuscript and agreed with the submission to the journal. The manuscript has not been published elsewhere.

Resources involving human participants and animals

There is no involvement of humans or animals in the present study and no need of any consent.

Consent

There is no need for any consent. All source of information is duly acknowledged.

Reference

Ahmad K, Ming Z N and Rafi M, 2017. Accessing the digital library research output: Bibliometric analysis from 2002 to 2006. *The Electronic Library*, Vol. 36, No. 4, pp. 396-704. Accessed from <https://www.emeraldinsight.com/doi/pdfplus/10.1108/EL-02-2017-0036>

Ajiferuke I, Burrell Q and Tague J, 1998. Collaborative coefficient: A single measure of the degree of collaboration in research. *Scientometrics*, Vol. 14, No. 5-6, pp. 421-33.

Algu A and Thanuskodi S, 2019. Bibliometric analysis of digital Literacy research output: A global perspective. *Library Philosophy and Practice*, 2019. Available at <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=5501&context=libphilprac>

Gupta R, Dhawan S M and Gupta B, 2016. World rabies research output: A scientometric assessment of publication output during 2006-2015. *J. Scientometric Res.*, Vol. 5, No. 3, pp. 220-229.

Harisadan S and Khan M, 2007. Impact and use of e-resources by social scientists in National Social Science Documentation Centre (NASSDOC). *The Electronic Library*, Vol. 27, No. 1, pp. 117-133.

International Federation of Library Associations and Institutions (2012). *Key Issue for e-Resources Collection Development: A Guide for Libraries*. Retrieved on May 2019

Karki M M S and Garg K C, 1997. Bibliometrics of Alkaloid Chemistry research in India. *Journal of Chemical Information and Computer Science*, Vol. 37, No. 2, pp. 157-161.

Lee, S D and Boyle, F (2004), *Building and Electronic Resources Collection: A Practical Guide*, 2nd ed., Facet Publishing, London, p. 5.

Naushad Ali P M, Malik B A and Ali R, 2018. Bibliometric analysis of literature on knowledge sharing. *Annals of Library and Information Studies*, Vol. 64, No. 4, pp. 217-227.

Patra S K and Chan P, 2006. Library and information science research in India: A bibliometric study. *Annals of Library and Information Studies*, Vol. 53, No. 4, pp. 219-223.

Ram, 2011. Research output on Artemisa (*Artemisia annua*): a bibliometric study. *Annals of Library and Information Studies*, Vol. 58, No. 3, pp. 237-248.

Singh J K, 2014. A scientometric analysis of Indian Journal of Pure and Applied Physics (2006-2010): A study based on the web of science. *Research Journal of Library Science*, Vol. 2, No. 1, pp. 7-12.

Singh, P and Borthaur, A, 2018. A review on biodegradation and photocatalytic degradation of organic pollutants: A bibliometric and comparative analysis. *Journal of Cleaner Production*. Retrieved from <https://doi.org/10.1016/j.jclepro.2018.05.289>

Tripathi M and Kumar S, 2014. Use of online resources at Jawaharlal Nehru University: a quantitative study. *Program: electronic library and information system*, Vol. 48, No. 3, pp. 272-292.

Vijayakumar M and Kolle S R, 2017. Indian contribution in information science and library science during 1991-2015: A bibliometric analysis. *DESIDOC Journal of Library and Information Technology*, Vol. 37, No. 6, pp. 387-395. DOI: 10.14429/djlit.37.11005.