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A Quick Perusal to Open Educational Resources (OERs) Presence for the Past One Decade through Bibliometric Lens with Special Reference to SpringerLink

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Abstract
The concept of Open Educational Resources (OER) is a topic of growing interest for researchers as a powerful contribution to improving the quality and openness of the education system. The goal of this particular research is to review the literature on the concept of 'Open Educational Resources (OER)' through bibliometric lens, published by SpringerLink for the past one decade. The study provides a detailed concept and definition of open educational resources and review of related literature. The bibliographic details were retrieved from SpringerLink database (https://link,springer.com) by using keywords such as 'open educational resources,' 'OER'. The bibliographical details of 1824 literatures published were recorded in MS-Excel 2019 sheet. The paper shows that during the period of 2011-2020, different categories of literature were published and Chapter has occupied the most literature published by Springer Link. The present paper also reveals the year-wise growth, authorship pattern, author productivity, most productive journals, highest contributed institutions and geographical distribution of the research output. The Annual Growth Rate (AGR), Compound Annual Growth Rate (CAGR), Relative Growth Rate (RGR), Doubling Time of literature followed by the indicators such as degree of collaboration; collaborative index and collaboration coefficient have been calculated and presented.

Keywords: Open Educational Resources; OER; Degree of Collaboration (DC); Annual Growth Rate (AGR); Relative Growth Rate (RGR); Doubling Time (DT); and Collaboration Coefficient (CC).

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1. Introduction

The basic idea of Open Movement is that knowledge is a public good (Mulder, 2013) that can be freely disseminated and shared on the Web for the benefit of all who wish to use it. Thus, technology in general and the web in particular can provide opportunities for the use, reuse, revise and redistribution of knowledge. The OER movement is inspired by the open source software model, which points out that resources should be freely accessible for educational purposes (Pawlowski & Bick, 2012). OER cited every educational resource(s) in authorisation to access, use, reuse, modify, share and re-share with others throughout the world. The term was used for the first time in a meeting of developing world nations at 'UNESCO Forum' in 2002. In the forum, OER were defined as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes". In convenience globally the OER movement is making an education at ease of accessing by all at anytime and anywhere according to their needs and use. The William and Flora Hewlett Foundation, the instrumental founder of this movement define OERs as "teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property licence that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials or techniques used to support access to knowledge" (The William and Flora Hewlett Foundation, 2015).

D.E. Atkins & others (2007) has also tried to define OER as "Teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or repurposing by others". In addition, OER largely pitch in teaching and learning materials in educational domain, as it is free there is a massive boundless approach from educators, learners and the researchers across the global. E-resources however require to be used under certain legal frames. The activities involved in OER can be understood with 5R activities (Wiley, np) proposed by David Wiley as following (Kumar, Buragohain & Deka, 2019):

(i) **Retain** - The authority to create, design and manage the content copies such as downloading, duplicity, storage, and managing;

(ii) **Reuse** - The authority to make diversify use of content in class, on web page, in a video lecture or in study group etc.;

(iii) **Revise** - The authority to assimilate, change or alter the dimension of the content according to the convenience for example translating the content in to own language;

(iv) **Remix** - The authority to shape a new diagram by combining the different materials both the original and incorporating new elements; and

(v) **Redistribute** - The authority to disseminate the original copies of the individual creation, revision, or intermixing the other elements. (e.g., give a copy of the content to a friend)

2. Previous Studies on Concept

Numerous studies have been conducted on open educational resources (OER) by the researchers but the field is still open and more research is needed to make the concept to reach academicians. Bossu and Tynan (2011) proponent that OER likely probable in other among things as well, like integrating web 2.0 applications in learning environments and support sustain in between of non-formal, informal and formal education. Kumar et al. (2021) did a bibliometric study on literature published by SprinerLink on Media Literacy for the time period 2011-2020. The literature published on media literacy is increasing with passing years. Kumar, Baishya and Deka (2021) in their paper discussed the issues and problems of open educational resources experienced by social scientists of higher educational institutions in India. In the paper, some recommendations are given to improve the OER practice among academicians. Kumar and Singh (2019) discussed the use and practice of OERs in social science discipline in University of Delhi. In their study they found that majority of the students in social science discipline are aware about the concept of open educational resources. Kumar, Singh & Ranjan (2018) in their bibliometric study measured the research output of Indian Institute of Technology (IITs) by using web of science database. Kumar (2017) conducted a bibliometric study of the literature published by Emerald on the concept of consortia. Das (2011) discuss the inception of OER and the expansion development of OER in Indian scenario. Further, the author also illustrates the role of libraries to access OER. Kumar (2017) says that OER concept is attainable as ICT developed effectively. Also, the author discussed about the basics of OER, meaning, advantages & barriers and some of its initiatives taken in India. In addition, recommendations have been made by the author in order to improve and practice of OER in India. Kumar (2018) discusses the Open access concept is procuring significance in education across the globe with a given rise to the concept of OER and valued by the scholars and academicians in the world. The author further discusses about the concept of OER and their benefits with the objectives to create awareness among social scientist about OER available in social science discipline. Kumar, Buragohain, and Deka (2019) in their paper of analysing the concept of OER, with the objectives to generalized further in terms of making use of it and practiced among scholars/academicians. And to upgrade promote of OER, recommended by the author(s). Schön & Ebner (2019) in their article examined the current role of OER in the field of adult education in the German-speaking region, particularly in Germany, Austria and Switzerland. Zhang et al. (2020) did a study on accessibility of open educational resources and practices

for learners with disabilities. OER and OEP contain several relevant features, such as reusability, that have prompted researchers to consider using OER and OEP to meet the needs of students with disabilities in order to increase their accessibility and e-inclusion capabilities in educational settings. The authors have given recommendations as well to increase the accessibility of OER and make the design of OER more accessible to students with functional diversity.

3. Study Objectives

Looking at the emerging field of research and its importance for the development of literature over the past decade, it was decided to perform a bibliometric analysis of scientific output in this particular field. The main objectives of the study are to:

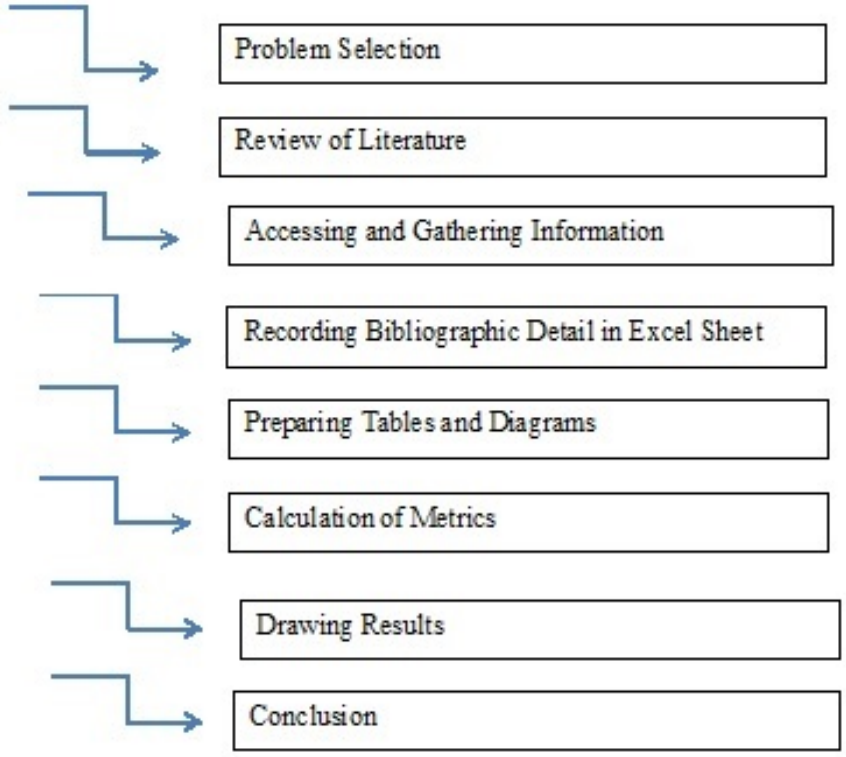
1. Look into the growth of literature, followed by category and year-wise distribution on 'Open Educational Resources' published by SpringerLink during 2011-2020;
2. Determine the annual growth rate (AGR), compound annual growth rate (CAGR), relative growth rate (RGR) and doubling time (DT) of the publications;
3. Study authorship pattern and authors productivity of literature followed by the degree of collaboration, collaborative index (CI) and Collaboration Coefficient (CC);
4. Study the citation, altmetric, download and access pattern of literature published by SpringerLink; and
5. Find out the most prominent journals, publisher-wise, country-wise distribution of literature and the most productive institutions.

4. Scope and Methodology of the Study

The present study is to put an eye upon the literature published by SpringerLink on open educational resources over the past one decade through bibliometric lens. In this study, the attempt is being made to review the literature published in on "open educational resources" during the period of 2011-2020 through bibliometric lens by applying its metrics. The retrieved bibliographic details and literature published were collected from SpringerLink database (https://link.springer.com). All the required bibliographical data were retrieved by using advanced search technique with keywords such as 'open educational resources', 'OER' etc. In addition, wherever the term 'Open Educational Resources' or OER appeared in title or keywords were selected for the study. Then after the bibliographical details of literature published were recorded in

MS-Excel 2019 sheet for the analysis and interpretation of data. These gathers data were filtered, analysed and presented in different tables as shown below in analysis and interpretation part. In analysis part, the Annual Growth Rate (AGR), Cumulative Growth Rate (CGR), Compound Annual Growth Rate (CAGR), Relative Growth Rate (RGR), Doubling Time (DT) of literature followed by the indicators such as degree of collaboration; collaboration coefficient; and collaborative index have also been calculated and presented. In brief, the methodology for better understanding has been presented through diagram below:

Methodology



5. Data Analysis & Interpretation

For the purposes of analysis and interpretation of the study, data was collected entirely from Springer's database over the past decade, from 2011 to 2020. The entire data were review on the basis of some categories like category wise distribution of literature, year-wise pattern, ranking of journal, author's pattern, country-wise distribution and likewise**.** The application software, that is, MS-

Excel 2019, is used to analyse the data and represent this data in the form of tables accompanied by graphs, diagram. The analysis of the data and its interpretation are shown in the following manners:

Categorise-wise Distribution of Literature

Table 1: Categorise-wise Distribution of Literature Published

S.N.	Categories of Literature	Literature (no.)	Cumulative No. of Literature	%	Cumulative Percentage	Rank
1	Chapter	714	714	39.14	39.14	1
2	Article	390	1104	21.38	60.38	3
3	Conference Paper	451	1555	24.73	85.25	2
4	Reference Work Entry	185	1740	10.14	95.39	4
5	Book	84	1824	4.61	100	5
	Total	**1824**				

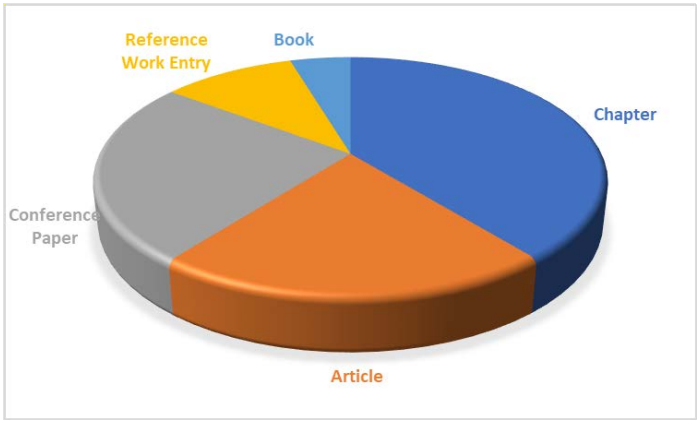


Fig. 1: Categorise-wise Distribution of Literature Published

The Table 1 and Fig. 1 represents categorise-wise distribution of literature published in the SpringerLink database with a total of 1824 number of literatures. It can be observed that the major source of publications covered by SpringerLink databases on open educational resources is Chapter with 714 (39.14%) publications followed by Conference paper with 451 (24.73%) publications. Journal articles ranks the third position with 390 (21.38%) publications. Reference work entry and book has 185 (10.14%) and 84 (4.61%)

publications respectively in their respective category. The results indicate that most of the research outputs on the topic during the research period are published in chapter form.

Year-wise Literature

Table 2: Year-wise Literature Published

Year	Literature (in no.)	Cumulative growth of Literature	Percentage	Cumulative %	Rank
2011	41	41	2.25	2.25	10
2012	53	94	2.91	5.16	9
2013	105	199	5.76	10.92	8
2014	120	319	6.58	17.50	7
2015	144	463	7.89	25.39	6
2016	197	660	10.80	36.19	5
2017	218	878	11.95	48.14	4
2018	301	1179	16.51	64.65	2
2019	259	1438	14.19	78.84	3
2020	386	1824	21.16	100	1
	Total	**1824**			

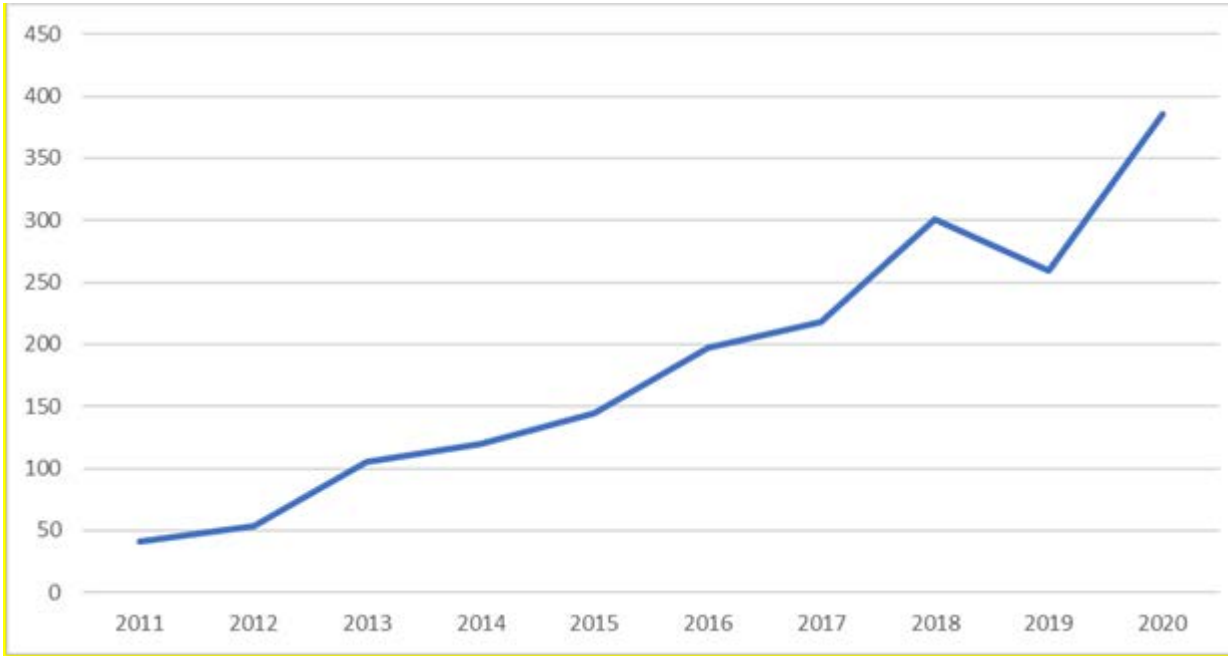


Fig. 2: Year-wise Literature Published

The table 2 and Fig. 2 represent year-wise distribution of literature published in the subject of Open Educational Resources from the period of 2011 – 2020. It is observed that the highest number of publications is 386 (21.16%) published in 2020. It is followed by the year 2018 which is rank second in the list with 301 (16.51%) publications. The lowest publications of 41 (2.25%) are published in 2011.

Annual Growth Rate (AGR) of Publications

The literature annual growth occupies significant position that evaluates the total number of publications. In order to understand the importance of publications annual growth rate, a systematic technique is being applied. The formula that has been applied was used by Kumar and Kaliyaperumal, 2015 to calculate AGR for the period of 2011-2020. The formula is:

$$AGR = \frac{\text{end value - first value}}{\text{first value}} \times 100$$

Table 3: Annual Growth Rate (AGR) of Publications

Year	Literature (in no.)	Cumulative growth	AGR (Annual growth rate)
2011	41	41	-
2012	53	94	29.26
2013	105	199	98.11
2014	120	319	14.28
2015	144	463	20
2016	197	660	36.81
2017	218	878	10.65
2018	301	1179	38.07
2019	259	1438	-13.95
2020	386	1824	49.03

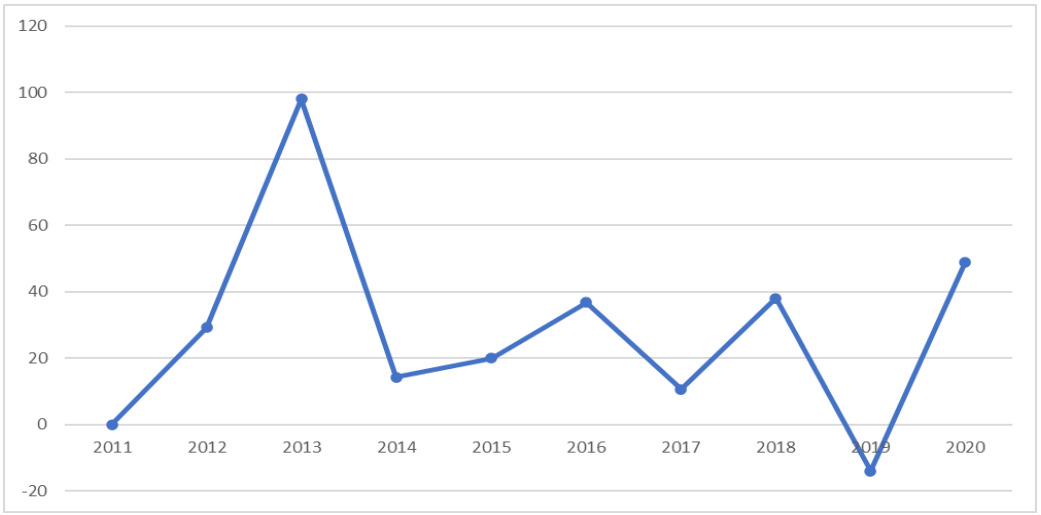


Fig. 3: Annual Growth Rate (AGR) of Publications

In Table 3 and Fig. 3, the annual growth rate of publication is being presented from 2011-2020. It is seen from the table that the year 2013 has the highest number of annual growth rate with 98.11. It is followed by 2020 with 49.03 annual growth rates. The year 2019 has the least number of annual growth rate with -13.95.

Compound Annual Growth Rate (CAGR):

Table 4: Compound Annual Growth Rate (CAGR)

Year	Literature (in no.)	Cumulative growth	CAGR
2011	41	41	-
2012	53	94	77.35
2013	105	199	37.66
2014	120	319	38.52
2015	144	463	33.91
2016	197	660	27.35
2017	218	878	26.13
2018	301	1179	21.53
2019	259	1438	23.89
2020	386	1824	18.83

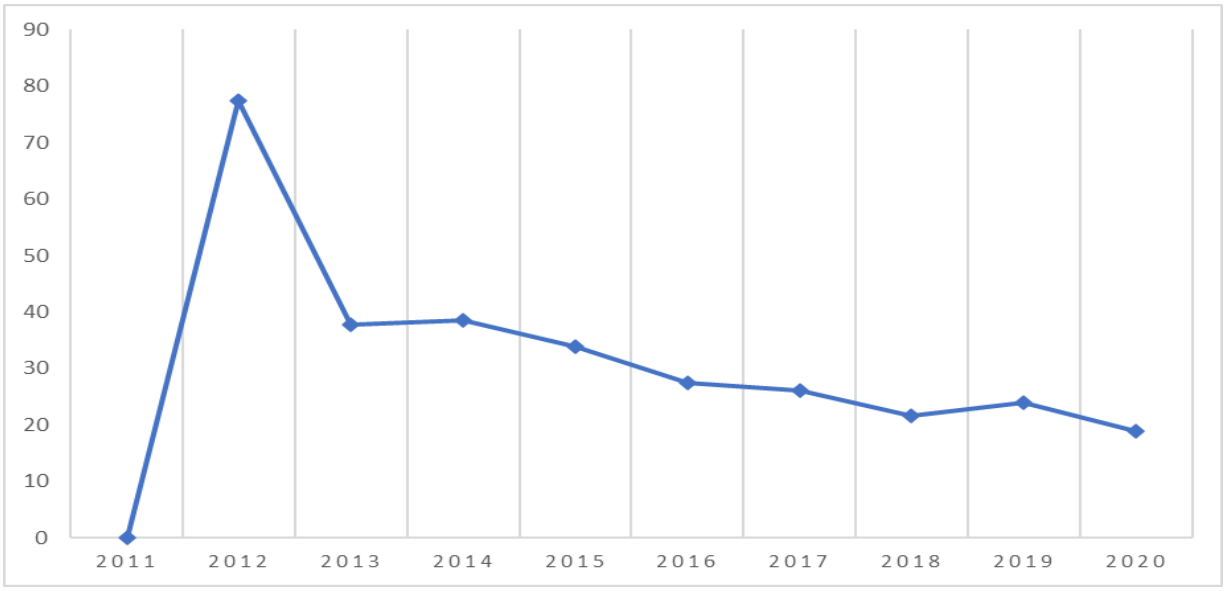


Fig. 4: Compound Annual Growth Rate (CAGR)

To understand the compound annual growth rate (CAGR) of the total publication from 2011-2020, the following formula has been used which was earlier implemented by Kumar and Kaliyaperumal in 2015:

$$CAGR = \left\{ \frac{\text{end value}}{\text{first value}} \right\}^{(1/\#\text{of years})} - 1$$

In table 4, it is observed that the compound annual growth rate is highest in 2012 with 77.35 and the year 2020 ranked the lowest among the other years. It is observed that there's a rise within the range of publication from 2011-2020 however the compound rate of growth of total publication keeps on degrading with the increasing range of year.

Relative growth rate (RGR) and Double Timing (DT)

To calculate the publications growth rate, the Mahapatra's RGR and Dt model, created by him in 1985 has been used (Mahapatra, 1985). The following formula is used to measure the relative growth rate and doubling time = $RGR = W2-W1\ /T2-T1$

Where,

• RGR denotes the growth rate over a given interval span,

• W1 denotes the loge of the interval (natural log of the initial number of contributions)

• W2 = Log (natural log of the final number of contributions)

• T1 is the initial time unit.

• T2 denotes the final time unit

. ***Table 5: Relative growth rate (RGR) and Doubling Time (DT)***

Year	**Literature (in no.)**	**Cumulative growth**	**W_1**	**W_2**	**RGR (relative growth rate)**	**DT (Doubling time)**
2011	41	41	-	3.71357	-	-
2012	53	94	3.71357	4.54329	0.82972	0.83522
2013	105	199	4.54329	5.29330	0.75001	0.92398
2014	120	319	5.29330	5.76519	0.47189	1.46856
2015	144	463	5.76519	6.13772	0.37253	1.86025
2016	197	660	6.13772	6.49223	0.35451	1.95481
2017	218	878	6.49223	6.77764	0.28541	2.42808
2018	301	1179	6.77764	7.07242	0.29478	2.35091
2019	259	1438	7.07242	7.27100	0.19858	3.48977
2020	386	1824	7.27100	7.50878	0.23778	2.91445

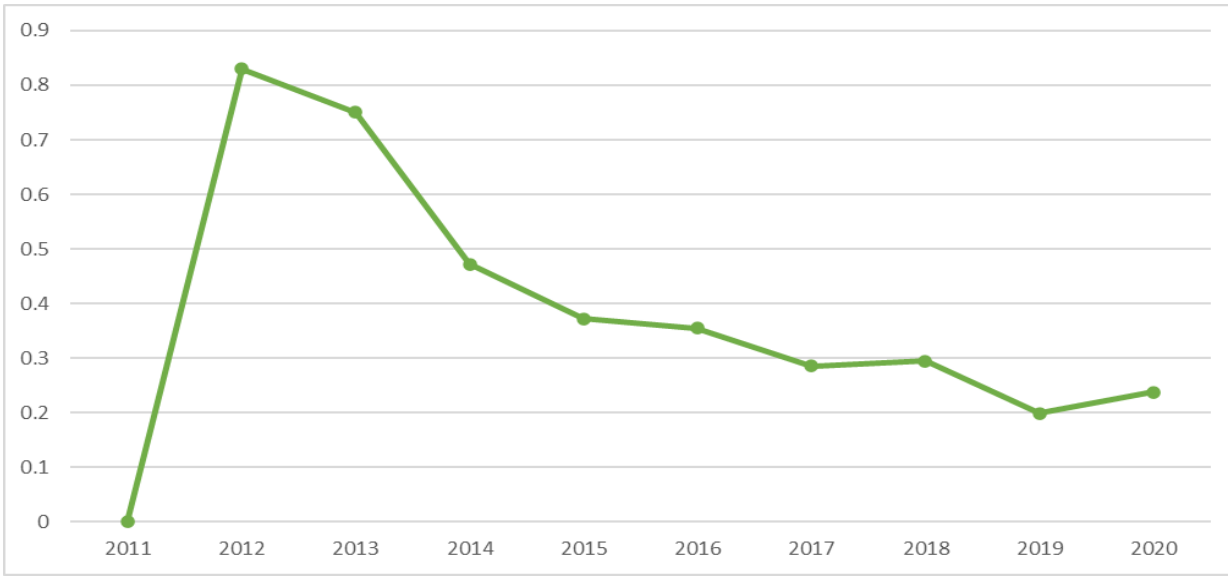


Fig. 5: Relative growth rate (RGR)

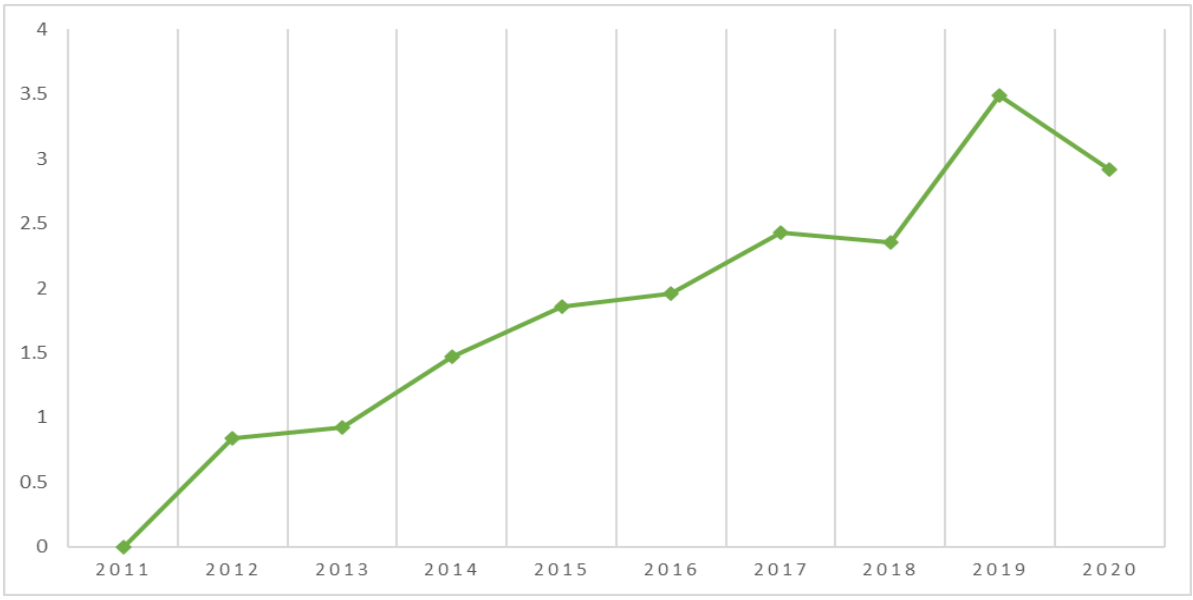


Fig. 6: Doubling Time (DT)

Table 5 represent the relative growth rate and double timing of the total number of publications from 2011-2020. From the Table 5 and Fig. 5, it is noticed that the relative growth rate (RGR) has been decreasing with the passing of the year i.e. 0.82972 in 2012 to 0.23778 in 2020. Through the publication has increase, it has been observed that there is decreasing of relative growth rate subsequently.

In table 5, the doubling time of the total growth rate of publication is given and observed that there exist a direct equivalence between the doubling time and the relative growth rate. The formula for the calculation of doubling time is: Doubling Time (DT) = 0.693/R, where R is the Relative Growth Rate.

It is noticed from the table 5, that the doubling time has enormously increased with the approaching of every cumulative year. The highest is seen in 2019 with 3.48977 and the lowest is seen in 2012 with 0.83522

Authorship Pattern

Table 6: Authorship Pattern

S.N.	Authorship Pattern	No. of Items	Percentage	Rank
1	Single Author	621	34.04	1
2	Two Authors	472	25.87	2
3	Three Authors	329	18.03	3
4	Four Authors	182	9.97	4
5	Five Authors	99	5.42	5
6	Six Authors	52	2.85	6
7	Seven Authors	25	1.37	7
8	Eight Authors	11	0.60	9
9	Nine Authors	5	0.27	10
10	Ten Authors	5	0.27	10
11	More than Ten Authors	23	1.26	8
	Total	**1824**		

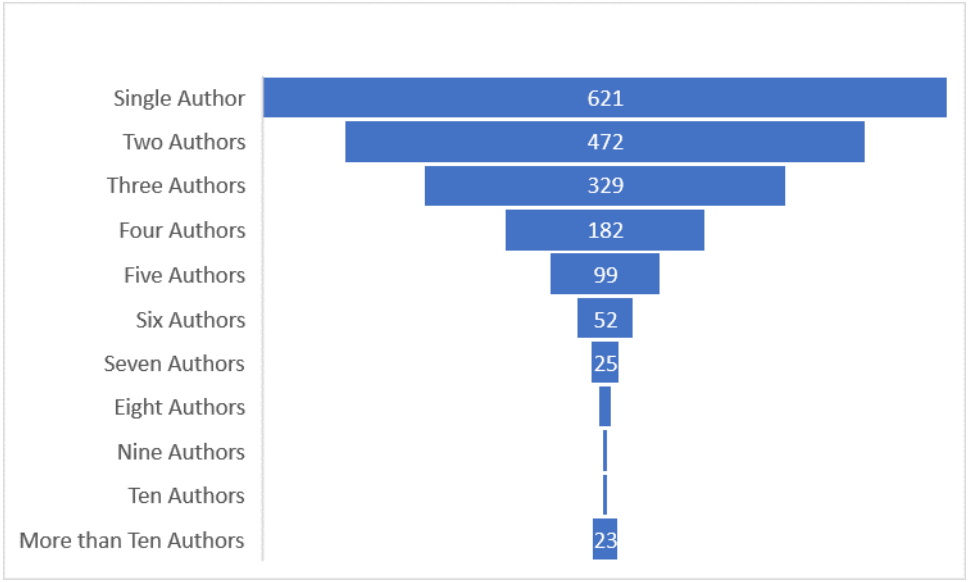


Fig. 7 - Authorship Pattern

To determine the percentage of single and multiple authors and their ranking, the authorship pattern was analysed. From the Table 7 it is observed that out of 1824 literature, maximum of 621 (34.04%) literature were produced by single author, followed by two authors 472 (25.87%), three authors 329 (18.03%) etc.

respectively. A number of 23 (1.26%) literature were produced by more than ten authors. It shows the trend of single authorship prevails among the authors of the literature published on the concept of OERs.

Co-Authorship Pattern

Table 7: Co-Authorship Pattern

Year	Total	1 (Author)	2	3	4	5	6	7	8	9	10	10<	DC	CI	CC
2011	41	13	10	10	4	2	-	-	1	-	-	1	0.68	2.63	0.42
2012	53	14	18	9	4	4	-	1	-	-	-	3	0.73	2.88	0.47
2013	105	45	27	15	9	5	1	-	-	-	-	3	0.57	2.32	0.37
2014	120	38	34	25	12	3	3	2	-	-	1	2	0.68	2.56	0.43
2015	144	49	44	25	10	10	1	3	1	-	1	-	0.65	2.41	0.42
2016	197	72	44	39	23	8	6	1	2	-	-	2	0.63	2.48	0.42
2017	218	76	49	42	22	15	8	3	-	-	-	3	0.65	2.59	0.43
2018	301	87	93	56	22	18	13	6	-	1	1	4	0.71	2.66	0.45
2019	259	78	69	57	28	13	5	2	3	1	-	3	0.69	2.60	0.44
2020	386	149	84	51	48	21	15	7	4	3	2	2	0.61	2.61	0.41
Total	**1824**	**621**	**472**	**329**	**182**	**99**	**52**	**25**	**11**	**5**	**5**	**23**	**0.65**	**2.57**	**0.43**

Degree of Collaboration (DC): The degree of collaboration is defined as the ratio between the total number of collaborative research articles and the total number of research articles during a given period of time. The following formula was suggested by Subramanyam by which he used to calculate DC.

$$C = \frac{N_m}{N_m + N_s}$$

Where,

C = Degree of collaboration.

N_m = Number of multi-authored research papers published during a year.

N_s = Number of single authored research papers in the discipline published during a year.

In table 7, the co-authorship pattern of the literatures published was discussed. The highest degree of collaboration was 0.73 in 2012 and the lowest degree of collaboration is 0.57 in 2013. The overall degree of collaboration for ten years was 0.65.

Collaborative Index (CI): This is one of the early measures of degree of collaboration derived by Lawani (1986).

$$CI = \sum = \frac{A^{1}/fi}{\quad}$$

$f \quad N$

It is a measure of mean number of authors. Although it is easily computable, it is not easily interpretable as a degree, for it has no upper limit moreover; it gives a non-zero weight to single-authored papers, which involve no collaboration. (1 1 2 2 3 3) ( ) ( ) ( ) Calculation: CI f f f L fk k N + + + + = Where, f1, f2,f3……= number of authors N = Number of publications in that year (Neelamma and Gavisiddappa, 2018).

It is observed from the table 7 that collaborative index (CI) of 2012 has the highest number of authors pattern with 2.88 which is followed by 2.66 in 2018. The least number of collaborative index was seen as 2.32 in 2013. The total cumulative index of co-Authorship pattern is 2.57.

Collaboration Coefficient (CC): the purpose of it is to remove the shortcomings pertaining to Degree of collaboration and collaborative index. The following formula given by Savanur & Srikanth (2010) is adopted for calculation:

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

Where, '*j'* denotes the authorship in an article; '*fj'* denotes the number of j authored articles; *'k'* is the greatest no. of authors per paper; and '*N'* denotes the total number of articles published in a year.

Collaborative coefficient is a number between 0 and 1, whatever the number is closer to 1 indicates more collaboration between authors.

The table 7 represents collaboration co-efficient of co-authorship pattern from the total number of publications of literature. It is observed that the year 2012 has the highest collaboration co-efficient of 0.47. It is followed by 2018 with 0.45 and 2019 with 0.44 respectively. The least number of co-efficient was found in 2013 with 0.37. The total number of collaboration co-efficient is 0.43.

Author Productivity

The formula given by Yoshikane et al. (2009) to calculate average author per paper (AAPP) and productivity per author has been used that mathematically represented as below:

Average author per paper = Number of authors/Number of papers

Productivity per author = Number of papers/Number of authors

Table 8: Author productivity

Year	Total no. of Papers	Total no. of Authors	Average Author per Paper	Productivity per Author
2011	41	107	2.61	0.38
2012	53	150	2.83	0.35
2013	105	241	2.29	0.43
2014	120	302	2.51	0.39
2015	144	347	2.41	0.41
2016	197	488	2.47	0.40
2017	218	562	2.57	0.38
2018	301	798	2.65	0.37
2019	259	671	2.59	0.38
2020	386	1005	2.60	0.38
Total	**1824**	**4671**	**2.56**	**0.39**

Table 8 portrays the average number of authors per paper and the productivity per author of research publications from 2011 to 2020 in SpringerLink. It is revealed that the average number of authors per publication is 2.56 for 1824 publications published between 2011 and 2020. The average number of authors per publication was highest in the year 2012 i.e. 2.83. The average productivity per author for the period 2011-2020 was 0.39. The productivity per author was highest in the year 2013 i.e. 0.43.

Citation Pattern

Table 9: Citation pattern

S.N	No. of Citation	No. of Items	Percentage	Rank
1	0-10	1690	92.65	1
2	11-20	75	4.12	2
3	21-30	22	1.21	4
4	Above 30	37	2.02	3
	Total	**1824**		

The Table 9 shows that 1690 (92.65%) publications had citation in between 0-10. Next followed by 75 (4.12%) publications in 11-20 citation category and also total no. of 22 (1.21%) publications had citations in between 21-30 and a 37 (2.02%) were in the above 30.

Altmetric Pattern for Journal Article

Table 10: Altmetric Pattern for Journal Article

S.N.	No. of Altmetric	No. of Items	Percentage	Rank
1	0-10	323	82.82	1
2	11-20	37	9.48	2
3	21-30	14	3.59	4
4	Above 30	16	4.11	3
	Total	**390**		

The Table 10 indicated altmetric pattern of the literature published by Springer Link in terms of number with their rank and percentage. A total number of 0-10 had the highest majority with 82.82% (323), followed by 11-20 also had a literature of 9.48% (37), and in between 21-30, a total no. of 3.59% (14) were available. Furthermore, 4.11% (16) were in the above 30.

Download Pattern:

Table 11: Download Pattern

S.N.	No. of Times Downloaded	No. of Items	Percentage	Rank
1	0-500	417	29.08	1
2	501-1000	316	22.03	3
3	1001-1500	235	16.38	4
4	1501-2000	86	5.99	5
5	Above 2000	380	26.49	2
	Total	**1434**		

The Table 11 indicated download pattern of the Chapters, Conference Papers, Book and Reference Work Entry published by Springer Link in terms of number with their rank and percentage. A total number of 417 (29.08%) literature were downloaded in between 0-500 times**.** 380 (26.49%) literatures were downloaded more than 2000 times. 316 (22.03%) literatures were downloaded in between 501-1000 times, followed by 235 (16.38%) literatures in between 1001-1500 and 86 (5.99%) literature in between 1501-2000 respectively.

Accessed Pattern for Journal Article

Table 12: Accessed Pattern for Journal Article

S.N.	No. of Times Accessed	No. of Items	Percentage	Rank
1	0-500	90	23.08	3
2	501-1000	113	28.97	1
3	1001-1500	42	10.77	4
4	1501-2000	33	8.46	5
5	Above 2000	112	28.72	2
	Total	**390**		

The Table 12 shows the accessed pattern of the journal articles published in Springer Link Database. A total number of 113 (28.97%) articles were accessed in between 501-1000 times. 112 (28.72%) articles were accessed more than 2000 times. 90 (23.08%) articles were accessed in between 0-500 times, followed by 42 (10.77%) articles in between 1001-1500 and 33(8.46%) articles in between 1501-2000 respectively.

Ranking of Journals

Table 13: Ranking of Journals with Literature (in no.) Published

S.N.	Name of the Journals	No. of Articles	Percentage	Rank
1	International Journal of Education Technology in Higher Education	48	12.31	1
2	Education and Information Technologies	36	9.23	2
3	TechTrends	35	8.97	3
4	Education Technology Research and Development	25	6.41	4
5	Smart Learning Environments	23	5.89	5
6	Journal of Computing in Higher Education	20	5.12	6
7	International Review of Education	11	2.82	7
8	ZDM	8	2.05	8
9	Journal of Computers in Education	8	2.05	8
10	Publishing Research Quarterly	8	2.05	8
11	Technology, Knowledge and Learning	7	1.79	9
12	Higher Education	6	1.54	10
13	Universal Access in the Information Society	6	1.54	10
14	BMC Medical Education	4	1.02	11
15	Postdigital Science and Education	4	1.02	11
16	Scientometrics	4	1.02	11

17	International Journal of Information Technology	4	1.02	11
18	Journal of Science Education and Technology	4	1.02	11
19	Perspectives on Medical Education	3	0.76	12
20	PROSPECTS	3	0.76	12
21	Aquaculture International	3	0.76	12
22	Business & Information Systems Engineering	3	0.76	12
23	Journal of Formative Design in Learning	3	0.76	12
24	International Journal of Technology and Design Education	3	0.76	12
25	HMD practice in business informatics	3	0.76	12
26	Bulletin of Mathematical Biology	2	0.51	13
27	Computing	2	0.51	13
28	Behaviour Analysis in Practice	2	0.51	13
29	European Geriatric Medicine	2	0.51	13
30	International Journal of STEM Education	2	0.51	13
31	Multimedia Tools and Applications	2	0.51	13
32	Requirements Engineering	2	0.51	13
33	International Journal on Interactive Design and Manufacturing	2	0.51	13
34	The American Sociologist	2	0.51	13
35	KN-Journal of Cartography and Geographic Information	2	0.51	13
36	International Journal on Digital Libraries	2	0.51	13
37	Central European Journal of Engineering	2	0.51	13
38	Technology, Innovation and Education	2	0.51	13
39	RUSC, Universities and Knowledge Society Journal	2	0.51	13
40	Journal of Academic Ethics	2	0.51	13
41	English Teaching & Learning	1	0.25	14
42	Mobile Networks and Applications	1	0.25	14
43	Asia Pacific Education Review	1	0.25	14
44	Innovative Infrastructure Solutions	1	0.25	14
45	New Zealand Journal of Educational Studies	1	0.25	14
46	BMC Family Practice	1	0.25	14
47	Journal of the Geological Society of India	1	0.25	14

48	Computer Science Spectrum	1	0.25	14
49	Supportive Care in Cancer	1	0.25	14
50	Innovative Higher Education	1	0.25	14
51	Journal of Educational Change	1	0.25	14
52	European Journal of Clinical Pharmacology	1	0.25	14
53	EURASIP Journal on Wireless Communications and Networking	1	0.25	14
54	Innovation and Education	1	0.25	14
55	Interchange	1	0.25	14
56	Journal of the Knowledge Economy	1	0.25	14
57	Resonance	1	0.25	14
58	German Journal of Exercise and Sport Research	1	0.25	14
59	The Pathologist	1	0.25	14
60	Mathematics Education Research Journal	1	0.25	14
61	Indian Journal of Clinical Biochemistry	1	0.25	14
62	Teaching Science	1	0.25	14
63	Postmedieval	1	0.25	14
64	Journal of Internet Services and Applications	1	0.25	14
65	Health Research Policy and Systems	1	0.25	14
66	Neural Computing and Applications	1	0.25	14
67	Fudan Journal of the Humanities and Social Sciences	1	0.25	14
68	Standort	1	0.25	14
69	Indian Pediatrics	1	0.25	14
70	Current Psychology	1	0.25	14
71	The Gynecologist	1	0.25	14
72	NETNOMICS: Economic Research and Electronic Networking	1	0.25	14
73	PFG-Journal of Photogrammetry, Remote Sensing and Geoinformation Science	1	0.25	14
74	Software Quality Journal	1	0.25	14
75	Empirical Software Engineering	1	0.25	14
76	Educational Research for Policy and Practice	1	0.25	14
77	Curriculum Perspectives	1	0.25	14
78	Journal of continuing education research	1	0.25	14

79	International Journal of Mental Health Systems	1	0.25	14
80	Reproductive Health	1	0.25	14
81	Health Professions Science	1	0.25	14
82	Journal of Communications and Information Networks	1	0.25	14
83	The Mathematical Intelligencer	1	0.25	14
84	Wireless Personal Communications	1	0.25	14
85	Brazilian Journal of Science and Technology	1	0.25	14
86	Journal of Intelligent Manufacturing	1	0.25	14
87	Academic Psychiatry	1	0.25	14
88	Trails	1	0.25	14
89	Language Policy	1	0.25	14
90	European Political Science	1	0.25	14
91	Research in Science Education	1	0.25	14
92	Controlling & Management Review	1	0.25	14
93	Physics of Particles and Nuclei Letters	1	0.25	14
94	International Journal for Educational Integrity	1	0.25	14
95	Journal of Mathematics Teacher Education	1	0.25	14
96	Research and Practice in Technology Enhanced Learning	1	0.25	14
97	Instructional Science	1	0.25	14
98	Frontiers of Education in China	1	0.25	14
99	Journal of Ambient Intelligence and Humanized Computing	1	0.25	14
100	Health Research Policy and Systems	1	0.25	14
101	E & I Electrical Engineering and Information Technology	1	0.25	14
102	Business informatics & management	1	0.25	14
103	Medical Science Educator	1	0.25	14
104	Personal and Ubiquitous Computing	1	0.25	14
105	World Wide Web	1	0.25	14
106	Translational Behavioral Medicine	1	0.25	14
107	Journal of Educational Research	1	0.25	14
108	Philosophy, Ethics and Humanities in Medicine	1	0.25	14
109	Science & Education	1	0.25	14

110	The European Physical Journal Special Topics	1	0.25	14
111	Computer Supported Cooperative Work (CSCW)	1	0.25	14
112	User Modeling and User Adapted Interaction	1	0.25	14
113	Information Technology and Management	1	0.25	14
114	Human Resources for Health	1	0.25	14
115	Analytical and Bioanalytical Chemistry	1	0.25	14
116	Software Quality Journal	1	0.25	14
117	Journal of the Brazilian Computer Society	1	0.25	14
118	Journal of Agricultural and Environmental Ethics	1	0.25	14
	Total	**390**		

The table 13 represent the ranking of journals with the number of literatures published by different journal in SpringerLink Database. It is found that a total number of 118 Journals have published articles on open educational resources. out of 390, 48 (12.31%) articles were published under International Journal of Education Technology in Higher Education which occupies the highest rank journal in the Springer Link followed by Education and Information Technologies with 36 (9.23%); TechTrends with 35 (8.97%); Education Technology Research and Development with 25 (6.41%) and Smart Learning Environments with 23 (5.89%) publications respectively.

Ranking of Publishers in SpringerLink Database

Table 14: Ranking of Publisher in SpringerLink Database

S. N	Name of Publishers	No. of Literature	Percentage	Rank
1	Springer, Cham	689	48.04	1
2	Springer, Singapore	216	15.06	2
3	Springer, Berlin, Heidelberg	168	11.71	3
4	Springer VS Wiesbaden	87	6.07	4
5	Springer, New York, NY	38	2.65	5
6	Palgrave Macmillan, Cham	37	2.58	6
7	Springer Gabler, Wiesbaden	30	2.09	7
8	Palgrave Macmillan, London	29	2.02	8
9	Springer Gabler, Berlin, Heidelberg	25	1.74	9
10	SensePublishers, Rotterdam	20	1.39	10
11	Springer, Dordrecht	19	1.32	11
12	Palgrave Macmillan, New York	17	1.18	12
13	Springer, Wiesbaden	13	0.91	13

14	Springer Spectrum, Wiesbaden	8	0.55	14
15	Springer Spectrum, Berlin, Heidelberg	7	0.48	15
16	Palgrave Pivot, Cham	7	0.48	15
17	Springer, London	4	0.27	16
18	J.B. Metzler, Stuttgart	3	0.20	17
19	Springer, Boston, MA	3	0.20	17
20	SensePublishers	2	0.13	18
21	Springer, Tokyo	2	0.13	18
22	Springer Vieweg, Berlin, Heidelberg	2	0.13	18
23	Palgrave Pivot, New York	2	0.13	18
24	Atlantis Press, Paris	1	0.06	19
25	Apress, Berkeley, CA	1	0.06	19
26	Palgrave Macmillan, Singapore	1	0.06	19
27	Springer, Heidelberg	1	0.06	19
28	Springer Vieweg, Wiesbaden	1	0.06	19
29	J.B. Metzler, Berlin, Heidelberg	1	0.06	19
	Total	**1434**		

The table 14 represent the ranking of publishers in the Springer link database with the number of literatures published. The author(s) considered Chapters, Conference Papers, Book and Reference Work Entry to determine the publisher distribution under the SpringerLink. The table 14 reveals that the highest ranked publisher was Springer Cham with 689 (48.04%) publication whereas 216 (15.06%) literature published by Springer, Singapore after that Springer, Berlin, Heidelberg secured third rank with 168 (11.71%) of literature.

Geographic Distribution of Literature

Table 15: Geographic Distribution of Literature

S.N	Country	No. of Literature	Percentage	Rank
1	USA	309	15.08	1
2	Germany	288	14.06	2
3	UK	186	9.08	3
4	China	124	6.05	4
5	Spain	100	4.88	5
6	Australia	77	3.75	6
7	Austria	66	3.22	7
8	India	60	2.92	8
9	Canada	59	2.88	9

10	Italy	50	2.44	10
11	Greece	47	2.29	11
12	The Netherlands	39	1.90	12
13	France	36	1.75	13
14	Switzerland	36	1.75	13
15	Russia	32	1.56	14
16	Brazil	29	1.41	15
17	South Africa	25	1.22	16
18	Portugal	23	1.12	17
19	Taiwan	23	1.12	17
20	Japan	22	1.07	18
21	Romania	20	0.97	19
22	Denmark	18	0.87	20
23	Finland	17	0.82	21
24	Mexico	17	0.82	21
25	New Zealand	17	0.82	21
26	Belgium	16	0.78	22
27	Norway	14	0.68	23
28	Ecuador	13	0.63	24
29	Estonia	12	0.58	25
30	Israel	12	0.58	25
31	Turkey	12	0.58	25
32	South Korea	11	0.53	26
33	Ireland	10	0.48	27
34	Chile	9	0.43	28
35	Colombia	9	0.43	28
36	Malaysia	9	0.43	28
37	Singapore	9	0.43	28
38	Sweden	9	0.43	28
39	Poland	9	0.43	28
40	Ukraine	9	0.43	28
41	Croatia	8	0.39	29
42	Serbia	8	0.39	29
43	Czech Republic	7	0.34	30
44	Fiji	7	0.34	30

45	Lithuania	7	0.34	30
46	Nigeria	6	0.29	31
47	Argentina	5	0.24	32
48	Bulgaria	5	0.24	32
49	Latvia	5	0.24	32
50	Malta	5	0.24	32
51	Oman	5	0.24	32
52	Thailand	5	0.24	32
53	Scotland	5	0.24	32
54	UAE	5	0.24	32
55	Cyprus	4	0.19	33
56	Luxembourg	4	0.19	33
57	Morocco	4	0.19	33
58	Pakistan	4	0.19	33
59	Philippines	4	0.19	33
60	Sri Lanka	4	0.19	33
61	Uruguay	4	0.19	33
62	Venezuela	4	0.19	33
63	Ghana	3	0.14	34
64	Hungary	3	0.14	34
65	Lebanon	3	0.14	34
66	Palestine	3	0.14	34
67	Saudi Arabia	3	0.14	34
68	Tanzania	3	0.14	34
69	Tunisia	3	0.14	34
70	Vietnam	3	0.14	34
71	Botswana	2	0.09	35
72	Burkina Faso	2	0.09	35
73	Egypt	2	0.09	35
74	Kuwait	2	0.09	35
75	Uganda	2	0.09	35
76	Zimbabwe	2	0.09	35
77	Albania	1	0.04	36
78	Bangladesh	1	0.04	36
79	Costa Rica	1	0.04	36

80	El Salvador	1	0.04	36
81	Eswatini	1	0.04	36
82	Indonesia	1	0.04	36
83	Iran	1	0.04	36
84	Jamaica	1	0.04	36
85	Kenya	1	0.04	36
86	Kyrgyzstan	1	0.04	36
87	Maldives	1	0.04	36
88	Mauritius	1	0.04	36
89	Mongolia	1	0.04	36
90	Qatar	1	0.04	36
91	Slovenia	1	0.04	36
	Total	**2049**		

The Table 16 shows that the distribution of literature of different countries by Springer Link in the field of open educational resources during 2011-2020. This table reveals that total 91 countries made contribution to the literature. It is seen from the table that the country with the greatest output in terms of research on Open educational resources is USA with 309 (15.08%) publications, followed by Germany, UK and China with a total of 288 (14.06%), 186 (9.08%) and 124 (6.05%) publications respectively.

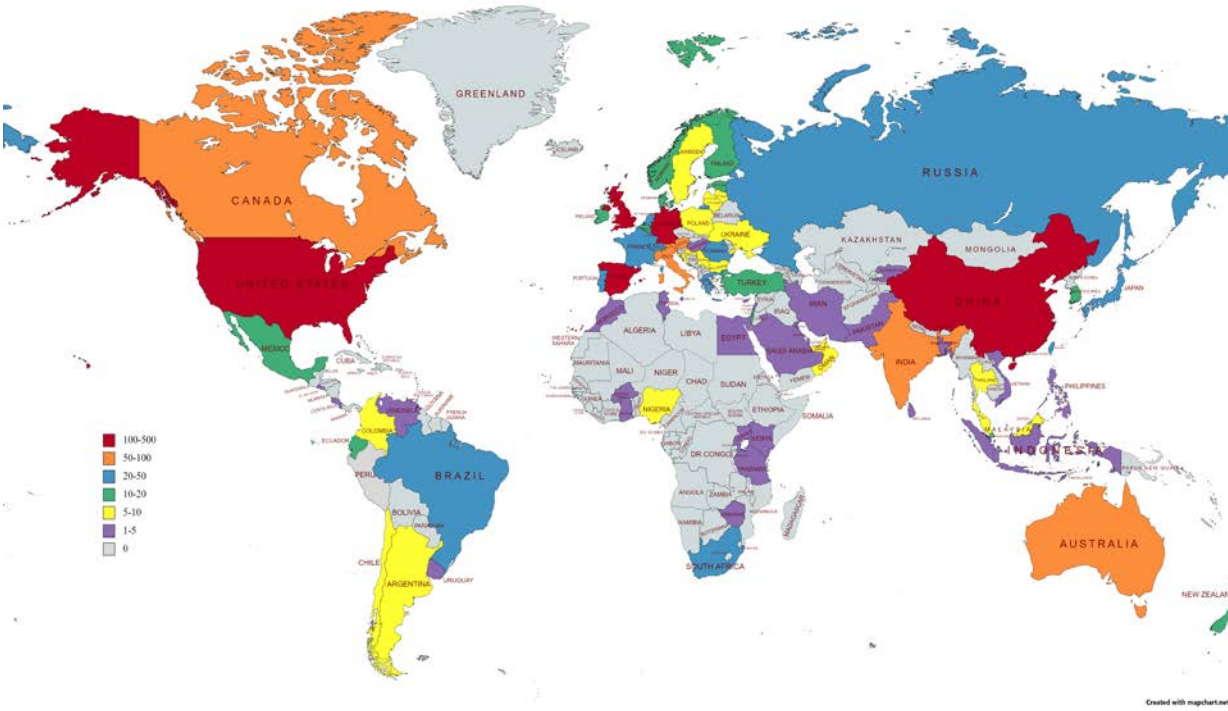


Fig. 8 - Geographic Distribution of Literature

Identification of Most Productive Institutions:

Table 17: Most Productive Institutions

S.N.	Institution	Country	No. of Publication	Rank
1	The Open University-Milton Keynes	UK	46	1
2	Beijing Normal University	China	25	2
3	The Open University of Hongkong	China	24	3
4	Open University of the Netherlands	Netherlands	21	4
5	Universidad Internacional de La Rioja (UNIR)	Spain	19	5
6	Graz University of Technology	Austria	19	5
7	Indiana University	USA	18	6
8	Brigham Young University	USA	17	7
9	University Oberta de Catalunya	Spain	16	8
10	University of Leicester	UK	13	9
11	Steinbeis University	Germany	11	10

12	Tallinn University	Estonia	11	10
13	University of Southampton	UK	11	10

Table 17 shows only top ten ranking institutions in terms of research publications on OERs. Findings revealed that The Open University-Milton Keynes, UK with 46 publications is the most productive institutions in the field of open educational resources literature followed by Beijing Normal University, China with 25 publications, The Open University of Hongkong, China with 24 publications, Open University of the Netherlands, Netherlands with 21 publications. Steinbeis University (Germany), Tallinn University (Estonia) and University of Southampton (UK) are in 10^{th} rank with 11 publications each.

6. Findings and Conclusion

The study has given the findings such as:

- It has found that the main source of publications covered by the SpringerLink database of open educational resources is chapter with 714 (39.14%) publications, followed by conference papers with 451 (24.73%) publications. Articles ranked third with 390 (21.38%) publications;
- It is observed that the maximum number of publications is 386 (21.16%) published in 2020. This is followed by 2018, taking second place on the list with 301 (16.51%) publications. The lowest number of publications was 41 (2.25%) published in 2011.
- The year 2013 has the highest annual growth rate with 98.11. This is followed by 2020 with an annual growth rate of 49.03. 2019 had the lowest annual growth rate at -13.95;
- It is observed that the compound annual growth rate is highest in 2012 with 77.35 and 2020 ranks the lowest compared to other years. It is observed that there's a rise within the range of publication from 2011-2020 however the compound rate of growth of total publication keeps on degrading with the increasing range of year;
- It is found that the relative growth rate (RGR) has decreased during the year from 0.82972 in 2012 to 0.23778 in 2020;
- It is noticed that the doubling time has enormously increase with the approaching of every cumulative year. The highest is seen in 2019 with 3.48977 and the lowest is seen in 2012 with 0.83522;
- The study revealed that out of 1824 literature, a maximum of 621 (34.04%) literature were produced by single author, followed by two authors 472 (25.87%), three authors 329 (18.03%) etc. respectively. It shows the trend of single authorship prevails among the authors of the literature published on the concept of OERs;

- In the matter of degree of collaboration among the authors, it is observed that the highest degree of collaboration was 0.73 in 2012 and the lowest degree of collaboration is 0.57 in 2013. The overall degree of collaboration for ten years was 0.65;
- It is observed that the year 2012 has highest collaborative index (CI) of authorship pattern followed by 2.66 in 2018 whereas the least collaborative index is seen in 2013 with 2.32;
- The study revealed that the year 2012 has the highest collaboration co-efficient of 0.47. It is followed by 2018 with 0.45 and 2019 with 0.44 respectively. The least number of co-efficient was found in the year 2013 with 0.37;
- The study revealed that the average number of authors per publication is 2.56 for 1824 publications published between 2011 and 2020. The average number of authors per publication was highest in the year 2012 i.e. 2.83. The average productivity per author for the period 2011-2020 was 0.39. The productivity per author was highest in the year 2013 i.e. 0.43.
- It is observed that 1690 (92.65%) publications had citation in between 0-10. Next followed by 75 (4.12%) publications in 11-20 citation category and also total no. of 22 (1.21%) publications had citations in between 21-30 and a 37 (2.02%) were in the above 30
- It is also observed that the altmetric pattern of the literature published in between 0-10 is the highest with 82.82% (323) followed by 11-20 with 9.48% (37), and in between 21-30 with 3.59% (14). Furthermore, it is also found that 4.11% (16) were in the above 30 category;
- The study revealed the download pattern of the Chapters, Conference Papers, Book and Reference Work Entry published by Springer Link. A total number of 417 (29.08%) literature were downloaded in between 0-500 times. 380 (26.49%) literatures have been downloaded more than 2000 times. 316 (22.03%) literatures were downloaded in between 501-1000 times, followed by 235 (16.38%) literatures in between 1001-1500 and 86 (5.99%) literature in between 1501-2000 respectively;
- A total number of 113 (28.97%) articles were accessed in between 501-1000 times. 112 (28.72%) articles were accessed more than 2000 times. 90 (23.08%) articles were accessed in between 0-500 times, followed by 42 (10.77%) articles in between 1001-1500 and 33(8.46%) articles in between 1501-2000 respectively;
- From the study, it is found that a total number of 118 Journals published articles on open educational resources on SpringerLink Database. out of 390, 48 (12.31%) articles were published under International Journal of

Education Technology in Higher Education which occupies the highest rank journal in the Springer Link, followed by Education and Information Technologies with 36 (9.23%) and TechTrends with 35 (8.97%) respectively. Education Technology Research and Development with 25 (6.41%) and Smart Learning Environments with 23 (5.89%) publications hold 4th and 5th rank respectively;

- The highest ranked publisher was Springer Cham with 689 (48.04%) publication whereas 216 (15.06%) literature published by Springer, Singapore after that Springer, Berlin, Heidelberg secured third rank with 168 (11.71%) of literature

- The study reveals that total 91 countries made contribution to the 1824 literatures on OERs. It is seen that the country with the greatest output in terms of research on Open educational resources is USA with 309 (15.08%) publications, followed by Germany, UK and China with a total of 288 (14.06%), 186 (9.08%) and 124 (6.05%) publications respectively; and
- The Open University-Milton Keynes, UK with 46 publications is the most productive institutions in the field of open educational resources literature in SpringerLink Database followed by Beijing Normal University, China with 25 publications and The Open University of Hongkong, China with 24 publications.

After going through the analysis of literature published on OER, it can be concluded that the concept of open educational resource has been evolving as one of the most dominant research areas. More and more researchers and academicians are taking interest in open educational resources wherein many are undertaking research and tried to build a specialized area in this particular field. The study mainly looked at different categories of literature published on 'open educational resources' in between 2011 to 2020 available in SpringerLink database. The OER concept is one of the trending topics in the 21st century as scholars, researchers and educators are conducting research and case studies on it. And the concept has attracted the attention of scholars and researchers to engage themselves in such practice. The study also provides many opportunities for students, researchers and librarians to select, acquire, organize, manage, retrieve and access documents in the field of open educational resources. In short, it can be concluded that the OER movement is need of the hour and the next decade is going to be the decade of OER in academics, especially when the world is passing through the current on-going covid-19 pandemic. So, academicians, scholars, institutions and the authorities need to be more

concerned about it and make the OER practices possible for the betterment of society.

The results of this study provide concerned researchers with an overview of OERs research around the world and an established direction for further research in this and other most relevant research areas.

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