

Chapter

7

Analyzing Publishing Trends in E-Learning and Library: A Scientometric Analysis

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Abstract :

The study aims to trace the research trends in e-learning along with library since the inception of the term in literature, as per available scholarly publications indexed in the Web of Science (WoS), A total of 1235 publications was found in Web of Science. In current study describe the topic of e-learning along with libraries details and reveals trends in authorship pattern and author's collaborative research, most productive authors with their affiliation keyword analysis and highly cited publications to get overview of research progress across all publications on the subject represented in the web of science database. There are 2.47 authors on average per article. "Education" is most significant keyword used in 45 records. VosViewer and Bibliometrix R software were used for data analysis

Key Words: E-learning, Library, Electronic learning, Mobile learning, Scientometric, Web of Science

1. Introduction :

E-Learning, or electronic learning, is the delivery of learning and training through digital resources. In the context of education and training, the term "e-learning" refers to the use of information and communications technology that is connected via a network. This approach of instruction and education is also sometimes referred to as the "flipped classroom" method. Online learning, virtual learning, distributed learning, web-based learning,

and network-based learning are all examples of this kind of education. At its core, each of these terms refers to educational procedures that make use of information and communications technology in order to facilitate asynchronous as well as synchronous learning and teaching activities. E-learning would include all educational activities that are carried out by individuals or groups working online or offline, and either synchronously or asynchronously via networked or standalone computers and other electronic devices such as mobile or tablets. This makes it easy for users to learn anytime, anywhere, with few, if any, restrictions (Pandya and Boricha 2019). "E-learning is the product of digital technology that turns traditional courses into virtual courses. The concept of an online course is the use of virtual environments to replace a part of the physical classrooms (Edumadze, J.K.E. (2019)). Another most concise definition is "E-Learning is learning which is enhanced, supported, mediated or assessed by the use of electronic media" (Tan, P. (2013).) Most of the universities around the world are moving towards e-learning Munezero, M. (2016) This approach to teaching and learning has taken root in the developing countries as well (Jaiyeoba, O.O. and Iloanya. (2019) & Tarhini, A. H. (2015)).

Today's libraries need support to meet the additional demands that come with online learners. This support could take the form of the purchase of new online resources, an increase in staffing to meet the increased demand for virtual reference services or interlibrary loan/document delivery services, or the development of online learning objects as well as instructional design and tech skills among the staff (CMCCONNELL 2012). Since the main insightful paper in electronic-learning, or e-learning, showed up in 1235, and as indicated, by Social Science Citation Index (SSCI) database investigations of the conceivable outcomes of e-learning have seen an overwhelming advancement, particularly over the most recent fifteen years attributable to the Information and Communication Technology (ICT) (Chiang, Kuo, & Yang, 2010).

2. Review of Literature :

Mashroofa (2019) analysed eighty-four research papers from WOS and three hundred twenty-four from SCOPUS. USA and Taiwan accounted for the highest number of publications, National Central University and China Agricultural University are the most productive organizations. With High Citation, Computer and Education is highly occurrence keyword. Iskandar, A. (2021) Focused on e-Learning field in Indonesia, most publications were published in the field of e-learning in the Journal of Physics Conference Series, the productive writer of the publication was Santoso, H.B, Contribution in e-Learning increased in 2018-2020. Gupta, B. M (2020) found that Carnegie Mellon University, USA is the most productive organizations in the world for e-learning publication. Das, S. (2021) observed 2010 is the highest citation

accepting year, USA and UK is the highest citation in e-learning, mobile learning and online learning were the most commonly used keywords in articles of e-learning. Gupta, N. (2018) examined USA ranked with highest publication and noted that India is still lagging behind 9 countries with reflect that there is less research on e-learning and its impact on education so more research will be carried out on e-learning for better understanding about the impact of e-learning with multidimensional education system in India. Shettar, Irranna M. (2022) analysed 1119 database published between 2001 to 2020 from SCOPUS and found Anadolu Universities (Turkey) are the prominent institutions in the field of Open Education, 96 country contributed in the field of Open Education. Cheng, B. (2014) focused on e-learning in healthcare sector and identify six research themes in the field of e-learning.

3. Objectives of the Study :

- i. To investigate type of Publications
- ii. To explore Author Productivity Pattern and Applicability of Lotka's Law
- iii. To Explore most productive author in research on 'e-learning' and 'library'
- iv. To explore top 10 highly cited Journal
- v. International Collaboration
- vi. To investigate co-authorship of authors and Countries.
- vii. Highly occurring Key words

4. Methodology :

This study is a scientometric analysis of published documents in the field of e-learning in libraries. The data is collected from the Web of Science (WOS) database, which is a comprehensive database of the word's output in different subject disciplines. The query for the term 'e-learning' and 'Library' yielded 1235 result since the inception and first document found with keyword e-learning and library in 2001, so data is from 2001 to 2022. The data were collected on 20th December 2022. The "Bibliometrix", R package used to perform various quantitative analyses on the extracted plain text format file of Web of Science for publications and citations data and visualize word clouds. VOSviewer was used to demonstrate the collaboration-mapping analysis and three-field plots (Authors, Country, and Affiliation) visualized through Sankey diagram.

5. Data Analysis and Discussion :

Type of Publication :

The main information about the data of 1235 publications published during 2001-2022 are shown in the below Table 1. The mentioned publications

published in 678 sources like journal, Books, etc. The average citation per document is 7.798 and average age of document is 9.02 The annual growth rate is 20%.

Table 1: Major Information About Data

Description	Result
Timespan	2001:2022
Sources (Journals, Books, etc)	678
Documents	1235
Annual Growth Rate %	20
Document Average Age	9.02
Average citations per doc	7.798

The published publications categorized into the articles, book chapters, proceeding papers, editorial materials, letters, notes, reviews, meeting abstract, poetry, corrections etc. are mentioned below in the Table 2.

Table 2: Type of Documents

Document Types	Result	Document Types	Result
article	503	editorial material; book chapter	6
article; book chapter	53	meeting abstract	4
article; proceedings paper	31	news item	1
book	1	proceedings paper	504
book review	37	review	68
editorial material	16	review; book chapter	1

Author Productivity pattern and Applicability of Lotka’s Law : Authors

Productivity and publications containing Bibliometrics aspects, have been extracted through Bibliometrix R package. The co-authorship network diagram was generated as shown to represent the collaborative works by two or more authors on publications. As shown below in the Table 3, there are total number of 3029 authors published the 1225 publications during 2001-2022. Author of single-authored documents is 287. The authors collaboration of single-authored documents is 308, co-authors per documents is 2.92 and international co-authorships indexed as 15.1%.

Co authorship is a significant contribution of joint work by the two or more authors on some topic. Therefore, co-authorship networks can be

viewed as social networks enclosed researchers that reflect collaboration among them. In Bibliometrix R package researchers are represented by nodes in co-authorship networks. Each vertex (node) represents author and edge (line) represents collaborative publication(s) written by those connected authors are shown below in the Figure 1.

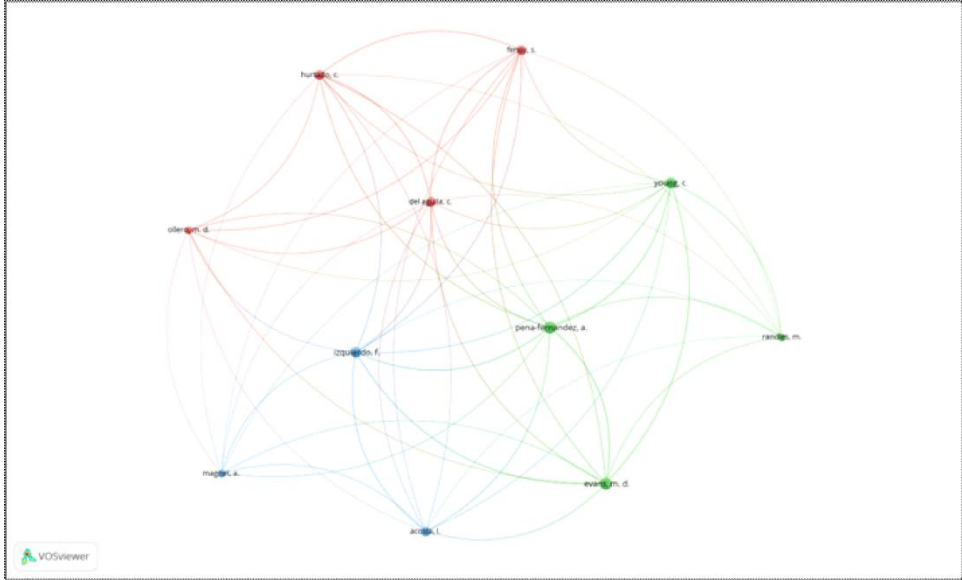


Figure 1: Co-authorship Network

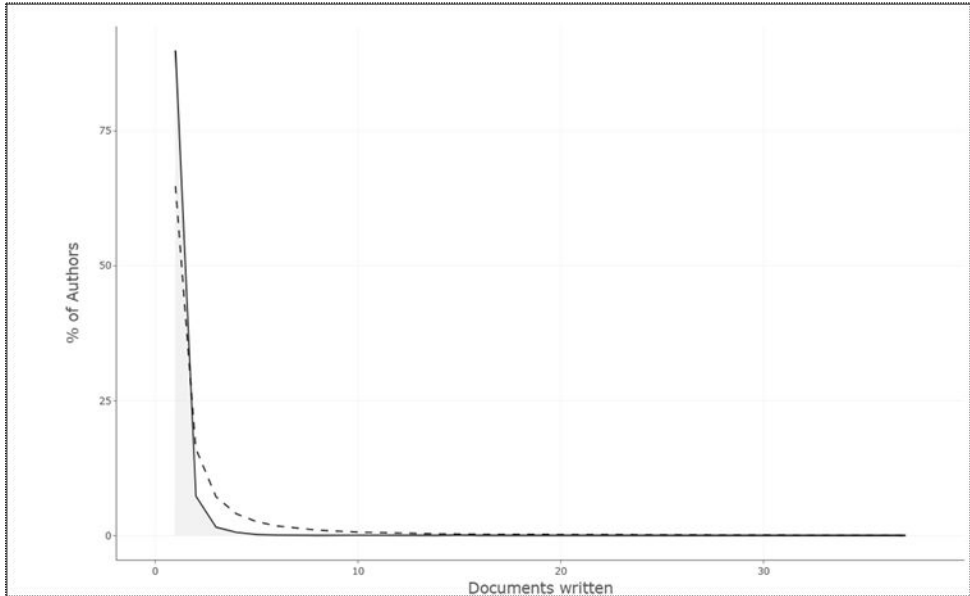
Lotka's Law describes the frequency of publications by authors in each discipline. This research observed the suitability of the Lotka's Law for the publications of academicians and researchers in various disciplines. The frequency of publications by authors extracted from the Bibliometrix R package as shown below in the Table 3 and Figure 2. It can be observed that the maximum 308410 authors' published article and their proportion ratio noted as 0.619 followed by 82275 authors and their proportion ratio is 0.165 and so on.

Table 3: Author's Productivity through Lotka's Law

Document Written	No. of Authors	Proportion of Authors
1	2757	0.9
2	222	0.072
3	46	0.015
4	18	0.006
5	6	0.002
6	3	0.001
8	1	0
9	2	0.001
10	2	0.001
14	1	0
15	3	0.001
16	1	0
37	1	0

Table 4: Most Productive Authors

Authors	Articles	Articles Fractionalized
CHEN CM	37	17.33
JAIN LC	16	3.50
BUDIMAC Z	15	3.00
IVANOVIC M	15	3.00
VESIN B	15	3.00
KLASNJA-MILICEVIC A	14	2.80
GEURTS PATM	10	2.50
ROOSENDAAL HE	10	2.50
HILF ER	9	2.25
ZALEWSKA-KUREK K	9	2.25

Figure 2: Author's Productivity through Lotka's Law

The ten most productive authors calculated based on the number of publications, publications fractionalization extracted from the Bibliometrix R package as shown in Table 4. It observed that the author named CHEN CM is on 1st rank in terms of the number of publications (37), 2nd rank in terms of article fractionalized (3.50) is Jain LC. BudimacZ on 3rd rank in terms of the articles fractionalized (3.00) and Ivanovic M&Vesin B is on the 4th rank in terms of articles (15) and so on.

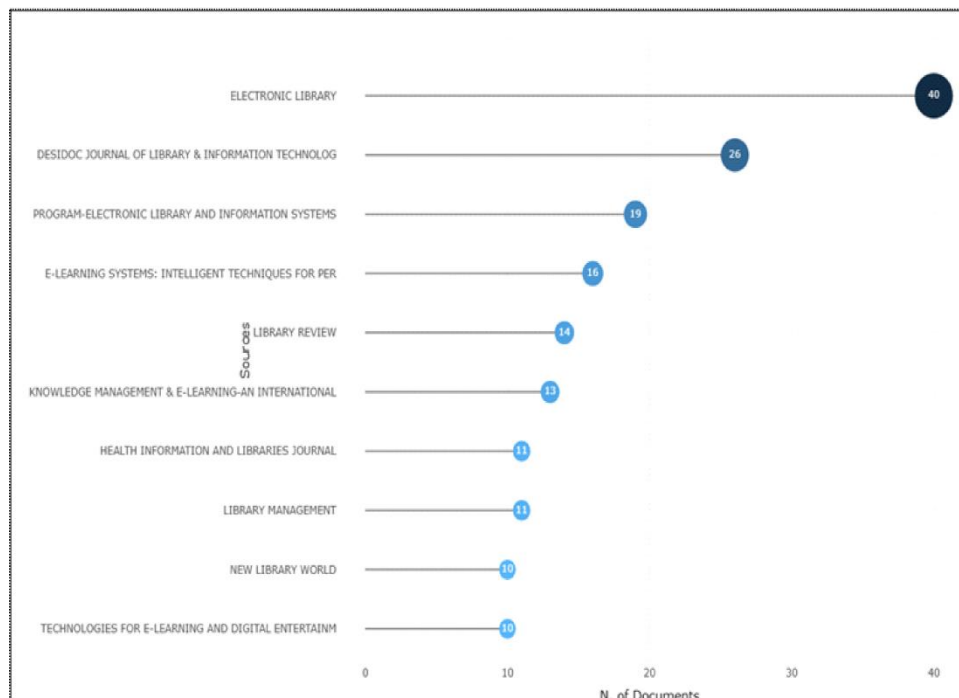
Top 10 Journals on E-learning and Libraries Topic :

The Table 5 shows top Ten (10) Journals which published maximum number of documents from all over the world. Amongst them, Journal of Electronic Library published maximum number of works and ranked first with 40 publications followed by DESIDOC journal of library & information technology which ranked second with 26 publications, Program-electronic library and information systems ranked third with 19 publications, E-learning systems: intelligent techniques for personalization (16) and so on.

Table 5: Top 10 Journals of E-learning and Libraries Topic

Sr. No	Sources	Articles
1	Electronic library	40
2	DESIDOC journal of library & information technology	26
3	Program-electronic library and information systems	19
4	E-learning systems: intelligent techniques for personalization	16
5	Library review	14
6	Knowledge management & e-learning-an international journal	13
7	Health information and libraries journal	11
8	Library management	11
9	New library world	10
10	Technologies for e-learning and digital entertainment, proceedings	10

Figure 3 :Top 10 Journals of E-learning and Libraries Topic



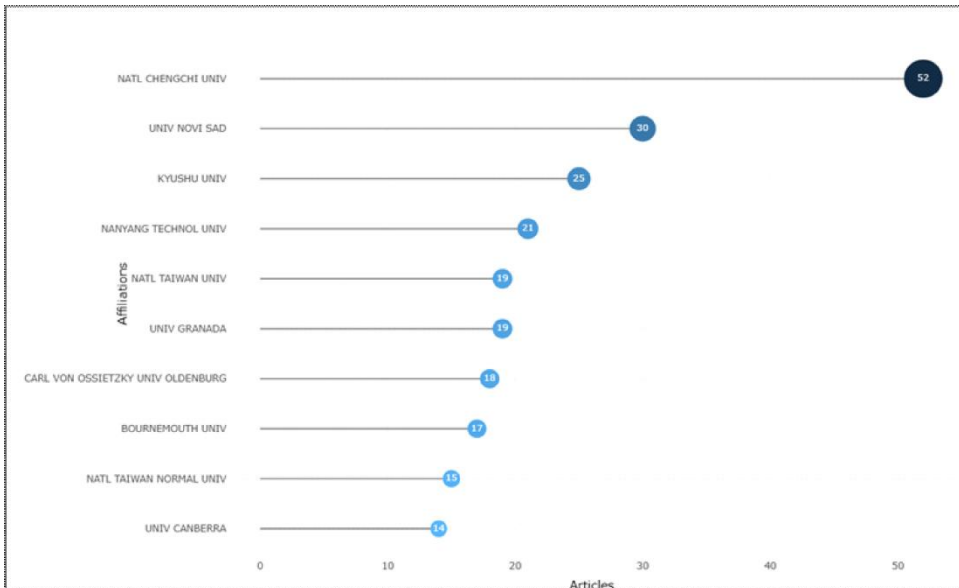
Top 10 Relevant Institutions :

Institution-wise distribution of publications published during the Year 2001-2022. NationalChengchi University contributed highest 52 publications, University of Novi Sad comes to thesecond position contributing 30 publications, and KYUSHU UNIVERSITY in the third positioncontributing 25 articles followed by Nanyang Technological University contributing 21publications and so on.

Table 6: Top 10 Relevant Institutions

Affiliation	Articles
NationalChengchi University	52
University of Novi Sad	30
KYUSHU UNIVERSITY	25
Nanyang Technological University	21
National Taiwan University	19
University of Granada	19
Carl von Ossietzky University of Oldenburg	18
Bournemouth University	17
National Taiwan Normal University	15
University of Canberra	14

Figure 4:Table 6: Top 10 Relevant Institutions



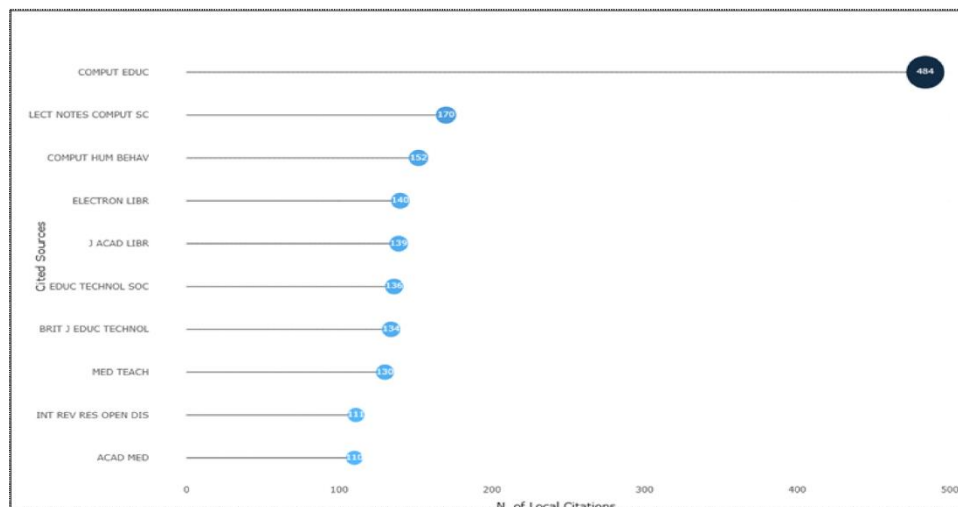
Top 10 Highly Cited Journal :

As per table 7 and Figure 4, the top 10 highly cited journal during the year 2001-2022. Computers & Education have been contributed highest article 484, Lecture Notes in Computer Science comes to the second position contributing 170 articles, and Computers in Human Behaviour in the third position contributing 152 articles followed by Electronic Library contributing 140 articles, The Journal of Academic Librarianship contributing 139 articles and soon.

Table 7: Top 10 highly Cited Journals

Sources	Articles
Computers & Education	484
Lecture Notes in Computer Science	170
Computers in Human Behaviour	152
Electronic Library	140
The Journal of Academic Librarianship	139
Educational Technology & Society	136
British Journal of Educational Technology	134
Medical Teacher	130
International Review of Research in Open and Distance Learning	111
Journal of the Association of American Medical Colleges	110

Figure 5: Top 10 Highly Cited Journals



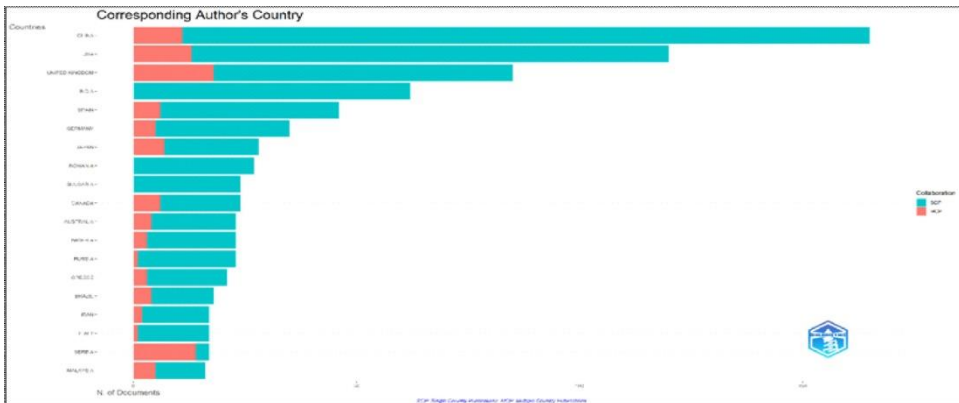
International Collaboration :

Fast research requirements during COVID -19 situation encouraged collaboration and funding. Collected data from Web of Science, evaluated through Bibliometrix R and found that highest collaboration done by the USA authors followed by China, UK, Italy, India, Germany, Canada, Australia, Iran and France. International collaboration by authors from the same country publications and it is denoted as SCP, it means such publications represent intra-country collaboration. The multiple country publications (MCP) mean authors belong to different countries and publications represent inter-country collaboration. USA contributed 32436 highest publications firstly and France contributed 3601 publications and secured the 10th place as shown in Table 8. The software tool VoSviewer is used to demonstrate the country collaboration-mapping network. Figure 5 depicts the network intends to show many countries are associated together for publications.

Table 8: Most Relevant Countries by Corresponding Authors

Country	Articles	SCP	MCP	Freq	MCP_Ratio
CHINA	165	154	11	0.134	0.067
USA	120	107	13	0.097	0.108
UNITED KINGDOM	85	67	18	0.069	0.212
INDIA	62	62	0	0.05	0
SPAIN	46	40	6	0.037	0.13
GERMANY	35	30	5	0.028	0.143
JAPAN	28	21	7	0.023	0.25
ROMANIA	27	27	0	0.022	0
BULGARIA	24	24	0	0.019	0

Figure 6: Country Collaboration



out of which covered 503 research articles. It has been observed that 308 research articles contributed by single authors whereas 3063 were contributed research which conveyed that the emergence of research invited more collaboration. It has been observed that the author named CHEN CM is on 1st rank in terms of the number of publications (37). It has been also observed that 'Electronic Library' and 'DESIDOC Journal of Library & Information Technology' were the preferred choice to publish research in this area. Leading countries contributing to this area of research are, China, USA, UK, India, Spain, Germany, Japan, Romania and Bulgaria. National Chengchi University, University of Novi Sad, Kyushu University, Nanyang Technological University, National Taiwan University, University of Granada, Carl von Ossietzky University of Oldenburg, Bournemouth University, National Taiwan Normal University, University of Canberra are top contributed organizations. Word Cloud visualized as most frequently used terms in the journal and three field plots visualized the interactions among the most relevant author, county and affiliation.

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