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Abstract

The study presents an outlook of publication trends of eLearning research in the Indian scenario during the last ten years (2009-2018.). The data collected from the Scopus Database using the specific query statement. A total of 8181 publications in different forms (journals article, conference papers, book chapters, etc.) were being collated, tabulated and analyzed and inferences were drawn for the study. Further, annual growth rate (AGR) of papers; most prolifically authors, institutions; most cited papers; h-index; and citation status has been provided.

Keywords: Scientometrics, E-learning, Growth Rate, Computer Based Learning, Blended Learning, Web-Based Learning

1. Background

E-learning is a potentially new technological development. Definitions of eLearning around the web have different perspectives and emphasis. The term eLearning is coined by Jay Crossed in 1998. According to him:

"People just don't see it although it's right in front of them. The next big thing in education isn't e-commerce, it's e-learning. We thought we could take the instructors out of the learning process and let workers gobble up self-paced (i.e., 'don't expect help from us') lessons on their own. We were wrong. First-generation Learning was a flop" (Jay Cross, 2010)[1&2]

Wanting et al. (2000)[3] define e-learning as an acquisition of disseminated knowledge using electronic devices. It can be said that e-learning refers to the use of systems of electronic education such as a computer, internet, multimedia disks, electronic magazines, virtual newscasts, etc. Fry (2000)[4] and Wild et al. (2002)[5] describe e-learning as the delivery of training and education via networked interactivity and distribution technologies. Many authors such as Roffe, 2002[6] explores the practical and theoretical issues of learning in the context of employment and see e-learning as the use of computer and communication media. Many other authors have a similar notion of e-learning and they see e-learning as learning and communication exercises across computers and networks or for that matter any other

electronic sources (Schank[7], 2002; and Sambrook[8], 2003). Other definitions confine learning to the use of the internet; for example, e-Learning refers to the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on four fundamental criteria[9]:

    i.   It is networked;
    ii.   It is delivered to the end-user via a computer using standard;
   iii.   internet technology, and;
   iv.   It focuses on the broadest view of learning.

the term 'flexible learning' is very much popular in Australia whereas use the word 'Virtual Learning Environment (VLE), a range of software has been developed to support eLearning: a virtual learning environment (VLE) and a managed learning environment (MLE) are the terms used in the UK, but course management system (CMS) and learning management system (LMS) are used in the US.

A much broader definition of e-learning is given by the Australian Flexible Learning Framework for the National Vocational Education and Training System 2005–7[10]:

"E-learning as a component of flexible learning describes a wide set of applications and processes which use any available electronic media in the pursuit of vocational education and training. It includes computer-based learning, web-based learning, virtual classrooms, and digital collaboration."

There are several works carried out on the impact of eLearning to the academic performance, learning outcome and creativity. There are clear demonstrations that eLearning has played a very significant role and presented a new pedagogy of learning. Mahammad, et al., 2016[11] in their study on the impact of E-learning on Students, academic performance opined that e-learning is very much effective for knowledge acquisition and creativity among students. A similar study was conducted by Mahmoodi, 2015[12] reveals that the use of E-learning in the physiology teaching-learning process both improves nursing students' learning and increases their creativity. E-learning has a significant impact on students' creativity at large. There is plethora of literature published in the domain of eLearning demonstrated the significance and relevance of the topic for the cutting edge learning.

The study examined and presents a scientometric study of publications in the domain of eLearning to know the research trends and scientific productivity. The study is limited to the research in the domain of "E-Learning" research publication and the time period is limited to a 2009-2018 year. The study also limited to the publications which were contributed by Indian authors.

2. Related Work

In recent years, a few studies were undertaken on scientometrics or bibliometrics analysis of worldwide output on eLearning research covering various periods and various aspects of the subject in their research analysis. As eLearning is comparative a new tool and pedagogy of learning which is often facilitated by technologies, the literature in the eLearning domain are

scattered across various disciplines. Maurer, Hermann, and Muhammad Salman Khan (2010)[13] presented scientometrics studies on e-learning research from five Social Science Citation Index (SSCI) journals. They classified in 14 main research areas based on 150 concepts clusters and discussed research areas, most prolific researchers, leading institutions and nations in detail using internally developed visualization tools.Chen, Liang-Chu, and Yen-Hsuan Lien(2011)[14] presented author co-citation analysis to examine the intellectual structure of e-learning. The results show that Taiwanese authors are more focus on business training, while international authors focus on a users' psychological reaction to learning context. The study further gave an intellectual analysis of e-learning practices from 1996 to 2009, and possible impact and influence of eLearning of these techniques on modern education. Hung, Jui-long(2012)[15] examined the trends of e-learning research from 2000 to 2008 using text mining and bibliometric techniques. The author retrieved a total of 689 refereed journal articles and proceedings from the Science Citation Index/Social Science Citation Index database in the period from 2000 to 2008.There are 15 groups/cluster were identified based on abstract analysis and results are presented in the form of subject areas, prolific countries and prolific journals. Santosh A Navalur, R.Balasubramani P.Ashok Kumar(2012)[16] presented a scientometrics study of global research publication in the field of eLearning which includes year-wise growth-wise growth, Exponential growth rate, author wise contribution, share of top scholarly journals, share of international collaborative papers and major collaborative partner countries, global publications' share, and patterns of research communication in most productive journals. Hsu, Yu-Chang, Jui-Long Hung, and Yu-Hui Ching(2013)[17] presented a comprehensive scientometrics study on educational technology research based on six journals included in the Social Science Citation Index in the field of Educational Technology (EDTECH). They have identified a total of 19 clusters of research areas, and these clusters were further analyzed in terms of productivity by country and by journal. The findings of the analysis reveal that educational technologies are a contemporary research area with rising trends, stable status, and low attention. Cheng, Bo, Minhong Wang, Anders I. Mørch, Nian-Shing Chen, and J. Michael Spector(2014)[18] in their study Research on e-learning in the workplace during 2000-2012 presented a bibliometric analysis of 324 articles on workplace e-learning published in academic journals and conference proceedings.The results identify six research themes in the field, which are further categorized into four dimensions related to the e-learning impact. Tibaná-Herrera, Gerardo, María Teresa Fernández-Bajón, and Félix de Moya-Anegón(2018)[19] in their study found that the scientific production in E-learning has an "average annual growth rate of 16%, which along with the 3.9% annual increase in the number of virtual students worldwide". The study further reveals that E-learning is on the decline since the growth offered by the Social Sciences is not enough to counteract the decline in the contribution of Computer Science.

3. Methodology

The Scopus database is used to retrieve data of published literature in the domain of e-learning. eLearning is an umbrella term and covers a wide spectrum of key terms such as eLearning, Web-

Based Learning, Online Learning, and Blended Learning. A search query was formulated with these key terms using the Boolean Search Operator AND and OR and a limit search of YEAR and COUNTRY. The following search query was formulated and applied to the Scopus database:

(TITLE-ABS-KEY (e AND learning) OR TITLE-ABS-KEY (online AND learning) OR TITLE-ABS-KEY (computer AND based AND learning) OR TITLE-ABS-KEY (web AND based AND learning) OR TITLE-ABS-KEY (blended AND learning) AND AFFILCOUNTRY (India)) AND PUBYEAR > 2008 AND PUBYEAR < 2019

The search produced a total of 8218 articles contributed by Indian Authors. The researcher went through the abstract and affiliation details (limited to Indian Institutions) to remove irrelevant and repeated records. Finally, we have selected 8181 articles for data analysis. The irrelevant records were those studies used 'learning' as a keyword but were relevant to the e-learning and its allied arena. Some of the authors who were associated with Indian Institutions earlier but now moved to abroad. The publications during their stay and affiliated to Institutions abroad were also eliminated.

4. Data Analysis and Results
4.1 Growth Pattern of eLearning research publication

The growth pattern of eLearning research was depicted in figure1. The growth trends in terms of research publication in various forms continuously grown from 238 to 2052 i.e. a total of 1814 publications from 2009 to 2017.The Annual Growth Rate(AGR) has fallen during 2016-2017(5 publication/0.39%) whereas the highest AGR was observed during 2017-2018(773 publication/60.04%). The following formula was adopted to calculate the AGR:

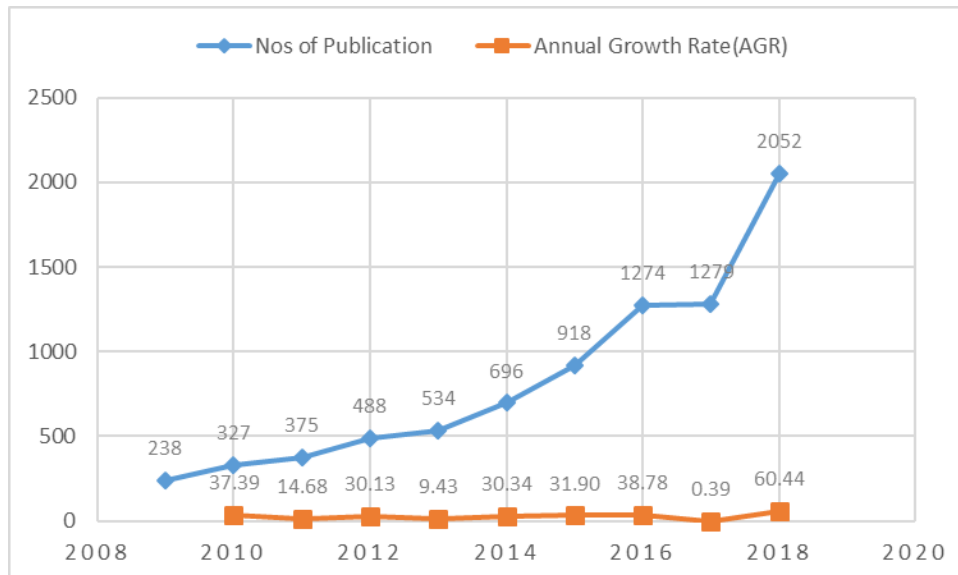$$AGR = \frac{EndValue - FirstValue}{FirstValue} \times 100$$

Figure 1: Growth of eLearning research publication

4.2 Citation Growth

4

The potential impact of a paper can be measured in several ways. One of the effective ways is citation. Figure 2 reflects the Annual Growth Rate (AGR) of number of citations. It has been observed that during year 2009 to 2018, there has been increasing citation growth that was observed with the citation count 59 to 16623. However, as per AGR is concerned the lowest has 1.95% during 2014-15 and highest AGR has been observed during 2017-2018 with 118.01% growth.
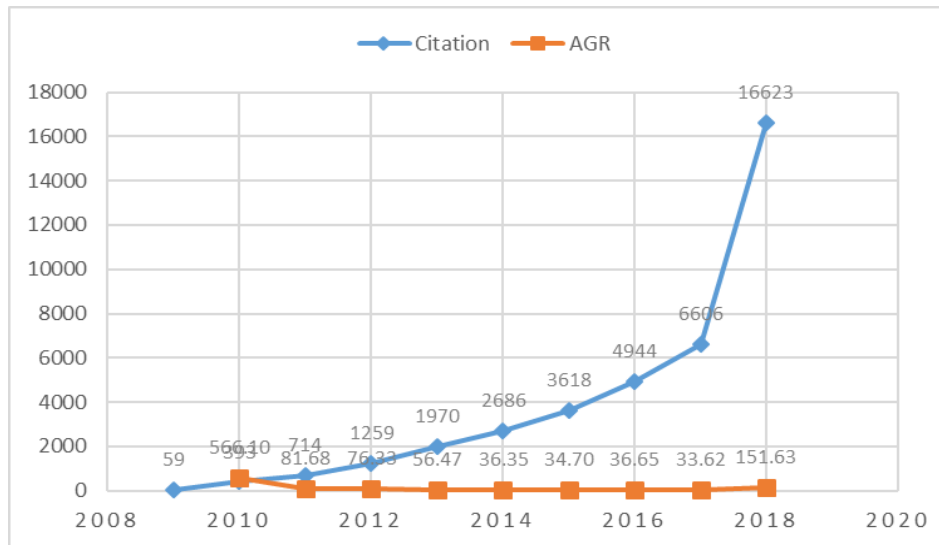

Figure 2: Annual Growth Rate pattern of citation

4.3 Top 15 Prolific Authors

The top 15 author's contribution to the domain of E-learning clearly revealed that their productivity in terms of scientific publications varied from 38 to 19 contributions. The most productive author was Achuthan, K from Amrita University, Kollam with 38 research papers and a total h-index was 9 with total citation 306, followed by Soman, K.P from Amrita School of Engineering, Coimbatore with (35 publication; 16 h-index; 1717 citation) and Diwakar, S. from Amrita Vishwa Vidyapeetham, Coimbatore with (34 publications; 12 h-index; 602 citations) respectively. It means that authors associated with Amrita University located at different campus of India is contributed highest number of papers.

Out of the 8181 documents considered for the h-index, 70 have been cited at least 70 time i.e. h-index was 70. As per h-index is concerned the highest number of h-index is Konar, A from Jadavpur University, Kolkata, highest number of h-index 29 with highest citations of 5024; followed by Jawahar, C.V. from International Institute of Information Technology, Hyderabad with h-index 28 and citation 3310. The whole data of scientometric profile of the authors has been shown in table 1 and figure 3.

Table .1: Scientometric profile of top 15 Authors

Sr. No	Author Name	Affiliation	No. of Publications	h-index	Total Citation
1.	Achuthan, K.	Amrita University, Amritapuri Campus, Kollam, India	38	9	306

|					
2.	Soman, K.P.	Amrita School of Engineering, Coimbatore, India	35	16	1717
3.	Diwakar, S.	Amrita Vishwa Vidyapeetham, Coimbatore, India	34	12	602
4.	Sureka, A.	Ashoka University, Sonepat, India	31	12	640
5.	Jawahar, C.V.	International Institute of Information Technology, Hyderabad	29	28	3310
6.	Malhotra, R.	Delhi Technological University, New Delhi, India	29	17	1029
7.	Nair, B.	Amrita Vishwa Vidyapeetham, Coimbatore, India	29	20	1511
8.	Murthy, S.	Indian Institute of Technology Bombay, Mumbai, India	28	10	581
9.	Bijlani, K.	Amrita University, Amritapuri Campus, Kollam, India	26	7	167
10.	Konar, A.	Jadavpur University, Kolkata, India	24	29	5054
11.	Nedungadi, P.	Amrita University, Amritapuri Campus, Kollam, India	24	10	328
12.	Iyer, S.	Indian Institute of Technology, Bombay, Mumbai, India	22	13	874
13.	Raman, R.	Amrita School of Business, Coimbatore, India	22	9	273
14.	Vinayakumar, R.	Amrita School of Engineering, Coimbatore, India	20	8	233
15.	Kulkarni, P.	iKnowlation Research Laboratory Pvt. Ltd, Pune, India	19	8	264
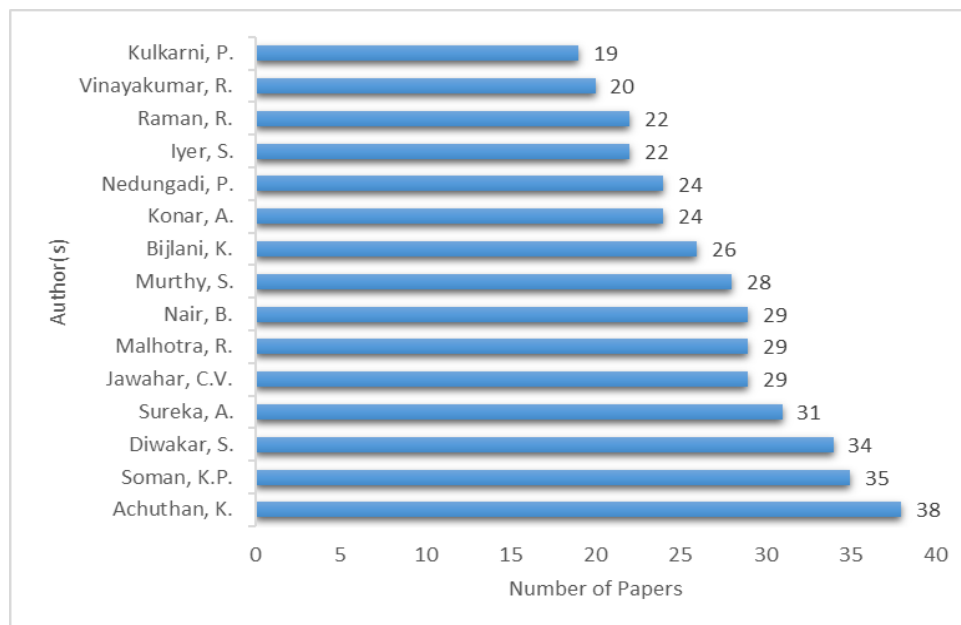
Figure 3: Authors contributions in number of publications

4.4 Document type publications in E-Learning research

The below figure 3 depicts the document type publications in eLearning research publications in India during the period of 10 years i.e. (2009-2018). On the observations of a particular figure, it has been found that the maximum 58% of documents were published in Conference

paper, followed by Article with 35.59% of publications were published while the minimum 0.02% of documents were published as Short Survey. A negligible 0.01 % of the documents were put as 'Retracted' publication. The overall data of document type publications in eLearning research was shown in below figure 3.
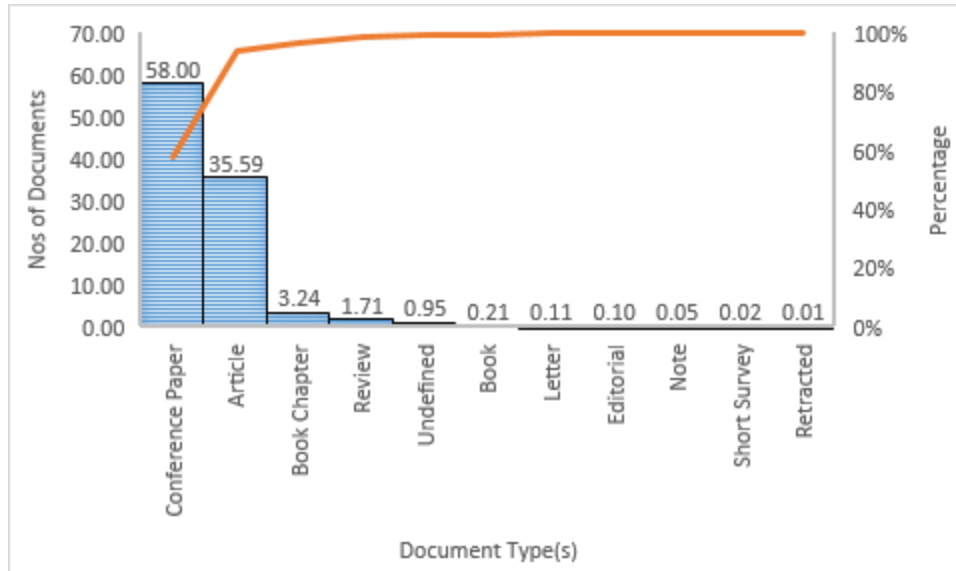

Figure 4: Document type publications in eLearning research

4.5 Profile of top 15 source title in E-Learning research

Profile of top 15 source titles in eLearning literature during the period (2009-2018) is extracted from the Scopus Database. It has been observed that the maximum 294 publications were published in "Advances In Intelligent Systems And Computing"; followed by "Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics"(273) and "ACM International Conference Proceeding Series" with a total publication of 254. Figure 5 presents the top 15 source title in increasing order of the publications from the marked period of study.
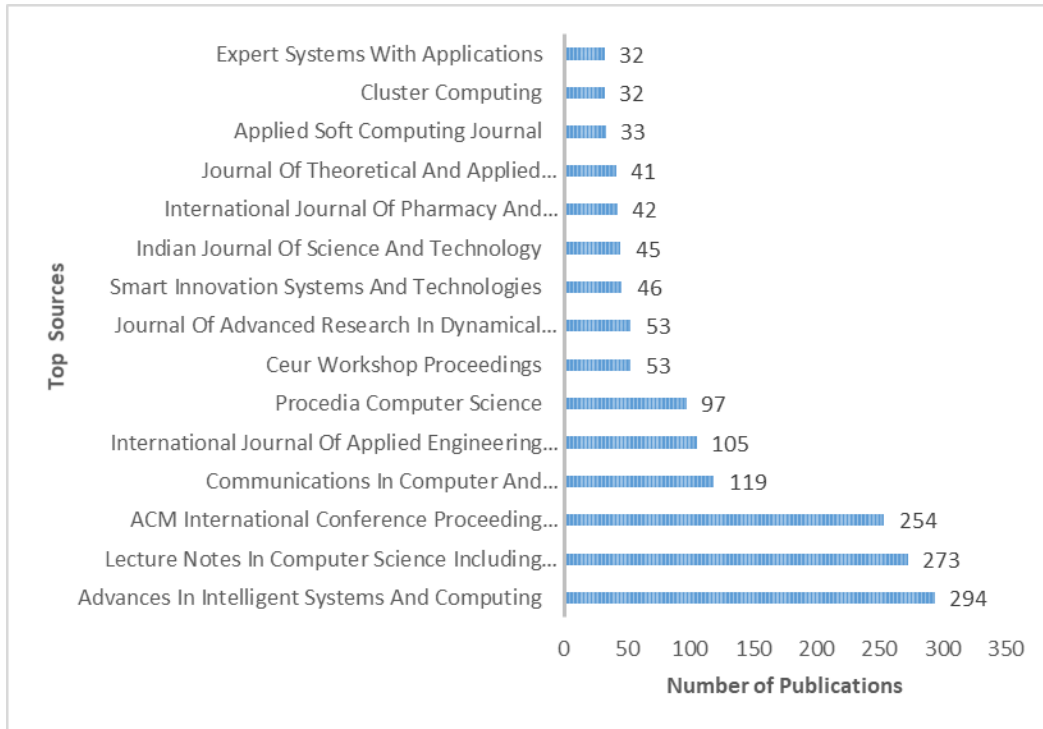
Figure 5: Top 10 source title in eLearning research

4.6 Top 15 significant subject area /domain in eLearning research publications

A scientometric profile of the top 15 significant keywords has been identified from the resultant data. It has been observed and records that the highest number of 71.53% documents published in computer science domain followed by engineering (31.26%) and social sciences(15.16%).It may clearly infer from this data that eLearning is facilitated by technologies. Therefore, most of the literature published are scattered in the domain of computer science and engineering. In the observation of figure 6, it has been listed in the decreasing order of the frequency of their occurrence in the research papers.
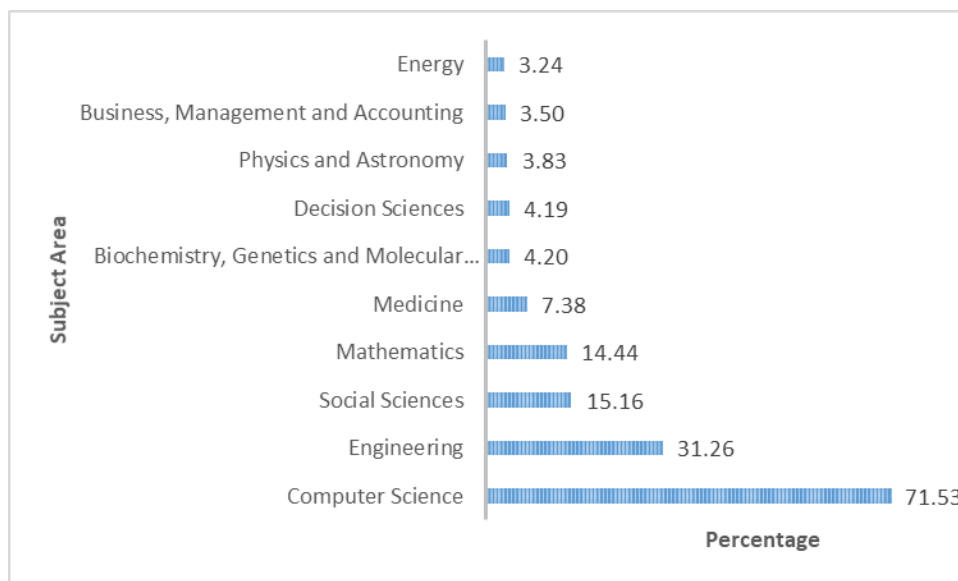
4.7 Top 15 organization name in eLearning research

A scientometric analysis of the top 10 most productive organizations in eLearning from India depicts that their publications varied from 95 to 206 publications. A total of 155 Indian organizations have been identified from the literature, the top 15 organizations were listed in figure 7 in the decreasing order of the publications of their occurrence in the publications during the period of study i.e. 2009 to 2018.
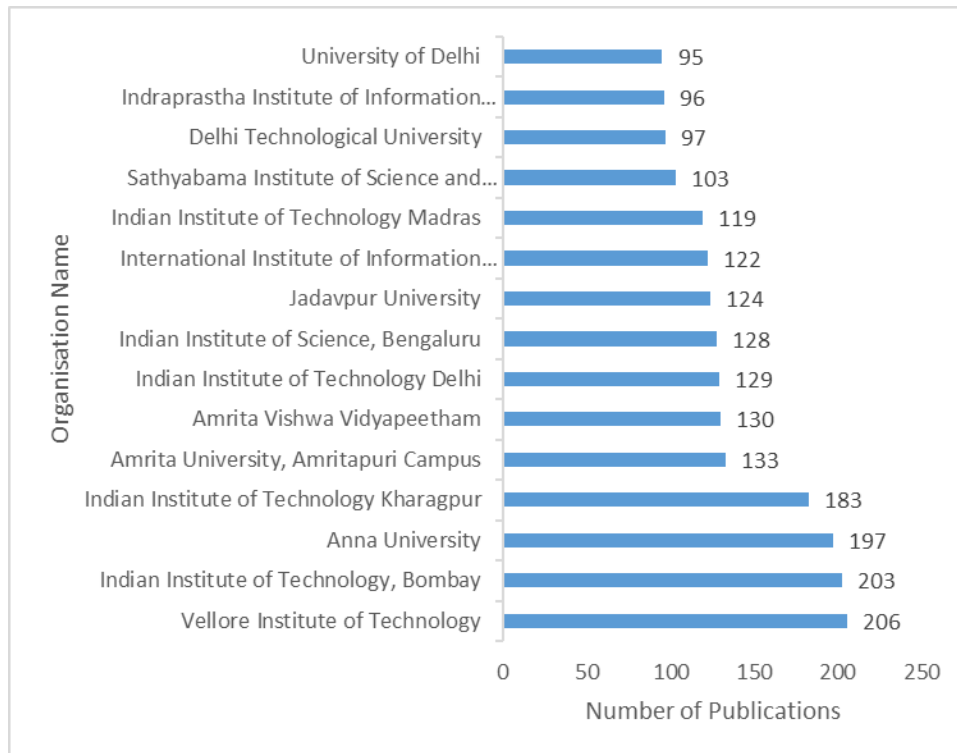

Figure 7: Scientometric profile of top 15 organization name in eLearning research

4.8 Profile of top 15 funding agencies

Profile of top 15 funding agencies in artificial intelligence from India during the period (2009-2018). A total of 160 funding agencies have been found on the Scopus database in which a top 10 funding agencies has been listed in figure 8. The maximum of 39 publications was produced under the funding agency "University Grants Commission"; followed by "Department of Science and Technology, Ministry of Science and Technology" with 36 publications. However, there were 36 publications were grant support by "National Science Foundation". The overall data of the top 15 funding agencies have been given in figure 8.
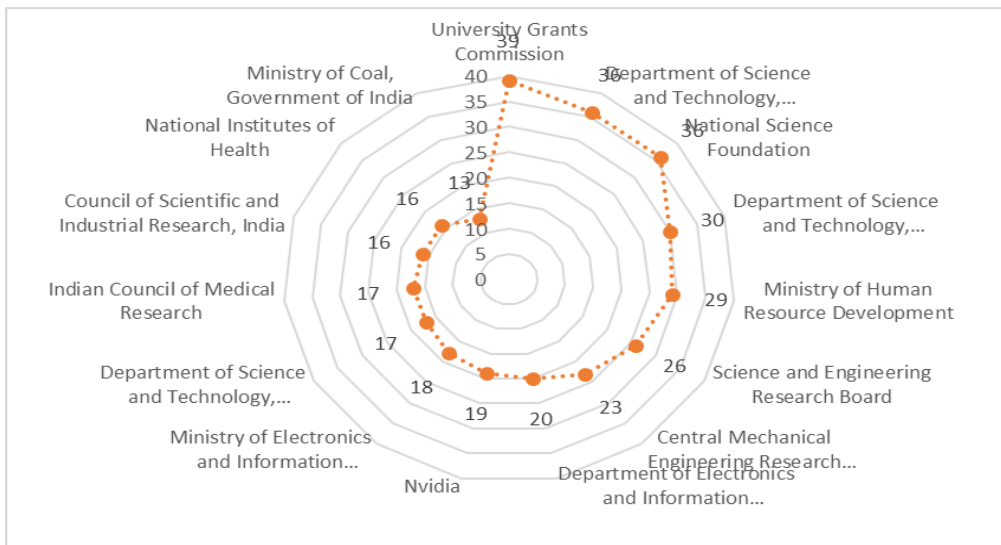
Figure 8: Profile of top 10 funding agencies

5. Conclusions

The study presented an insight of eLearning Research in India especially in terms of research publication mapping. A scientometric study has been performed using 8181 documents in field of eLearning from 2009 to 2018 retrieved through Scopus Database and found relevant for the study. The analysis determined the trends of contributions in the field over the years, most prolific researchers and leading institutions and source titles.

Based on the inference of analyzed data, the growth trends in terms of research publication in eLearning scattered in various forms continuously grown from 238 to 2052 i.e. a total of 1814 publications are reported from 2009 to 2017.The Annual Growth Rate(AGR) has fallen during 2016-2017(5 publication/0.39%) whereas the highest AGR was observed during 2017-2018(773 publication/60.04%).Further, as citation AGR is concerned the lowest has 1.95% during 2014-15 and highest AGR has been observed during 2017-2018 with 118.01% growth. Achuthan, K from Amrita University, Kollam found the most prolific author whereas 'Advances in Intelligent Systems and Computing' found the journal having highest number of publications. It is also found that, the highest number of 71.53% documents published in computer science domain which proves that eLearning is highly dependents on technology deployment. Vellore Institute of Technology was most productive affiliating institutions whereas University Grants Commission is stood first as Funding Agency.

Since eLearning is a multidisciplinary area of research, there is always a possibility that some literature from other domain retrieved which may not be associated with eLearning. The study is further, based on the Indian Research contributions, therefore the research paper of other Indian languages might go missed in retrieval due to limitation of the Database.

The results in this study will help the educators, researchers, policymakers, and technocrats in the field of eLearning to understand research patter of eLearning and to identify different research trends over the last ten years from 2009-2018.

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