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M, Abbas S. and Hugar, Jayaprakash G., "Growth of Indian Research in Science and Technology: A Scientometric Analysis" (2021). *Library Philosophy and Practice (e-journal)*. 5498.
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Growth of Indian Research in Science and Technology: A Scientometric Analysis

By:

Dr. S.M. Abbas and Dr. Jayaprakash G Hugar

Abstract:

This article carried out a Scientometric analysis of research publications published in various science and technology journals from 2011 to 2020 from India. Required data was retrieved from WoS database during the study period it provides information about the science and technology related publications from India. Especially, scientific data on the top research areas and distribution of publication collaborations in different dimensions of geography, authors, funding agencies, subjects and others.

It examines the year wise publications, annual distribution of publications, most prolific authors, authors and organisations productivity, etc. Analysis found that, highest research publications are published in the year 2019 with 13.16%, followed by 2020 with 12.98% and in the year 2018 with 11.51%. Research articles are published 81.51% compared to any other type of publications from all over India. 88% of the research fund is provided by the Government of India, and remaining are from the western world among the top ten funding agencies. Out of top ten journals, seven (76%) of them are originated from India, two are from United Kingdom and one journal is from United States of America. During the study period, it is observed that, a mean relative growth rate is 0.26. Notably, the doubling time for the publications has decreased from 0.35 in the first five years to 0.17 in the last five years. Publications are raised on an average of 4.72% per year. On the whole, 208 countries collaborators contributed to these publications.

Keywords: Scientometrics, Scholarly Publications, India, Funding, Doubling Time

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1. Introduction:

Research plays an important role in socio-economic development of a country. It is a process of an inquiry that collects, analyses, interprets and presents the results in a logical way. Fundamental research is also recognition of a country in the field of science and technology research and development. For example of Corona vaccine, several Indian companies put very hard efforts in finding the solution to COVID-19 and very few of them succeeded in developing the vaccine. These efforts made by the researchers put India among the few countries, who produced the vaccine at the time of pandemic situation in this World. Prime Minister of India has launched Vaccine drive from 16th January 2021 in India. There are 92 countries, who have expressed their interest in purchase of Indian vaccine for their respective country. Already, India began COVID-19 vaccine exports to Brazil and Saudi Arabia. In this way, research has become a vital ingredient for developing a nation, and it is proved by the Indian scientist. Further research encourages financial investments in country.

According to the Research and Development statistics report published in December 2020, by the Department of Science and Technology, Ministry of Science and Technology, Government of India, says that, India was ranked at 3rd, 5th and 9th position in scientific publication output during 2018 as per the National Science Foundation (NSF), SCOPUS and Science Citation Index (SCI) databases respectively. This shows, India is ranked ahead of many developed and developing nations including BRICS except China.

The Gross expenditure on R&D (GERD) in the country has been consistently increasing over the years and has nearly tripled from Rs. 39,437.77 crore in 2007- 08 to Rs. 1,13,825.03 crore in 2017-18. It is estimated to be Rs. 1,23,847.70 crore in 2018-19. Gross Expenditure on R&D (GERD) is mainly driven by the Government sector comprising of Central Government 45.4%, State Governments 6.4%, Higher Education 6.8% and Public Sector

Industry 4.6% with Private Sector Industry contributing 36.8% during 2017-18. In the year 2017-18, Public Sector R&D was led by Defence Industries followed by Fuels and Industrial Machinery while Drugs and Pharma, Transportation, Information Technology, Mechanical Engineering Industries etc dominated the Private Sector R&D. In industrial R&D, Drugs and Pharmaceuticals occupied the first place with a share of 24.3% followed by Transportation 16.4%, Information Technology 8.7%, Chemical (other than fertilizer) 7.2% and Defence Industries 6.8% respectively during the year 2017-18.

Out of the total 40,813 Doctorates in the country, 24,474 (60.0%) Doctorates were from the S&T discipline during the year 2018-19. India occupies 3rd rank in terms of number of Ph. D.'s awarded in Science and Engineering (S&E) after USA (39,710 in 2016) and China (34,440 in 2015). Number of researchers per million population in India has increased to 255 in 2017 from 218 in 2015 and 110 in 2000. Among the developed countries, Israel topped the list having with 8,342 researchers per million population in the world followed by Denmark (7,899), Sweden (7,597), Republic of Korea (7,498) and Finland (6,722) during 2017.

India's significant increase in research output is reflected in publication databases: by 50% from 90,864 in 2011 to 1,36,238 in 2016 in SCOPUS; by 36.5 % from 47,081 in 2011 to 64,267 in 2016 in SCI; and by 83.1% from 74,143 in 2011 to 1,35,788 in 2018 in NSF. During 2011-2016, India's growth rate of scientific publications as per the SCOPUS and SCI database was 8.4% and 6.4% as against the world average of 1.9% and 3.7% respectively. It was 10.7% as against the world average of 3.8% during 2008-18 as per the NSF database.

India's growth is quite aggressive at the very top end of the excellence scale. India held 4.3% of world share in top 25%, 3.6% in top 10%, 3.4 % in top 5% and 2.8% in top 1% of highly cited publications during 2016. The highly cited publications were mainly concentrated in the fields such as Engineering, Physics & Astronomy, Computer Science and Material Science. (Department of Science and Technology, Government of India, March 2020)

Academic researchers contribute the bulk of all scientific and technical articles published in India. Higher Education Institutions and Research and Development organisations play an important role in the nation building. Compulsion of NAAC and NIRF recognition for the

Universities and Colleges in India made by the Ministry of Human Resource and Development, Government of India forced the Universities and Colleges to go for the affiliation of these accreditation institutions, to get higher ranking among the other institutions. These Universities and Colleges are compelled to publish more and more articles in the journals that too in the Web of Science, Scopus indexed or UGC listed journals. Further, the UGC made compulsion to its faculty members in Universities and Colleges for the Career Advancement Scheme to publish articles in Scopus, WoS and UGC listed journals, since then the research publications in India increased tremendously. In an attempt to improve the quality of research papers in higher education once again UGC brought out a new UGC Care list in the year 2019.

The Scientific and Technological (S&T) activities play a vital role in the economic, social and physical development of a country. Scientific and Technological research needs huge investments and calls for a judicious utilization of scarce resources like finance, trained manpower, raw materials etc. Data collection and analysis pertaining to resources, devoted to S&T, therefore, assumes significant importance. The growth of S&T, its performance and impact on society and economy are indicators to assess the effectiveness of planning and policy formulation. (National Science and Technology Management Information System, 2020)

2. Statement of the Problem:

Research is being carried out in the World. India is also taking an active role in research. Indian researchers are also publishing their output in journals locally and globally. It will be very interesting to know how Indian authors are publishing their publications in area of Science and Technology, how these publications are published by year, category, type of documents, funding agency, author, journal, country, editor, language, subject, organization etc. This study has been undertaken to give a logical answers to all these questions.

2. Objectives:

The following objectives are framed to identify the Indian Researchers contributions to the World Research Literature in the science and technology field and outline of publications published in various journals, indexed in Web of Science database in last ten years from 2011 to 2020.

- 2.1 To know the publication trend in India
- 2.2 To recognise the top productive organisations and areas in S&T field in India
- 2.3 To identify the subject wise distribution of the research contributions
- 2.4 To determine the top collaborative countries with India

3. Scope of the Study

The scope of the study is limited to the research literature published by the Indian organisations and institutions only and for the period of ten years from 2011 to 2020.

4. Research Methodology

This study is an effort to understand the contributions of Indians to the world of research during the year from 2011 to 2020. The required data is retrieved from the Clarivate Web of Science database. Address search for keyword “India” was conducted and it brought out 12,75,917 publications. The search strategy string used to retrieve the main data on research output, authors, organisations and major contributing journals etc. of India is retrieved on 30th December 2020 and analysed through MS-Excel by using different tools and techniques. H-index of the journals is retrieved from the SCImago Journal and Country Rank Portal. Further, researchers identified the relative growth rate and doubling time of the study.

5. Review of Literature:

The purpose of this study is to find out Science and Technology literature published by Indians during 2011-2020. Number of scholars have expressed their views on this area. Previous works have shown increasing trend in usage of scientometric analysis as a tool to evaluate research output in different dimensions by the different organizations. Some works by the scholars are worth to mention here. They are as follows:

Kannappanavar B U and Vijaykumar (2000) reviewed the trends and developments of LIS research in India for the past fifty years, results revealed that, Karnataka university professors and Karnataka University are the most productive compared to other professionals and universities in the LIS field. (Kannappanavar & Vijayakumar , 2000)

Vijayakumar M, Satish Kumar HT and Mayank Trivedi (2018) revealed the research trends of Central Universities in India. Among the Central Universities, Central University of

Punjab published the highest number of publications and having more collaborative research with other countries also. (Vijayakumar, Satish Kumar, & Trivedi, 2018)

Azmi, Nazrul Islam & Abbas, S.M. (2018) analysed the publications in the area of Drug Abuse of India from 2001 to 2016. It was found that most of the research output in drug abuse literature published in 2016. The contribution of top author in Drug Abuse was recorded by Soloman, S.S. and medicine was the main subject on which largest number of articles published. (Azmi,Nazrul Islam & Abbas, S.M.2018)

6. Data Analysis and Interpretation:

Data collected for this study is analysed through different statistical tools and different variables. Data are interpreted through different variables for the purpose of conclusion. Different tables are formed for data interpretation. A logical conclusion is also drawn on the basis of tables.

6.1 Annual Publications Patterns:

Annual publication pattern in Science and Technology literature has been mentioned in this table. It includes annual publications, percentages and cumulative publications and its percentages.

Table No. 6.1
Year wise Publications

Publication Years	Publications	Percentage of 749487	Cumulative Publications	Cumulative Publications Percentage
2011	52744	7.03	52744	1.42
2012	56117	7.48	108861	2.94
2013	62420	8.32	171281	4.64
2014	67784	9.04	239065	6.47
2015	70952	9.46	310017	8.39
2016	76869	10.25	386886	10.48
2017	80302	10.71	467188	12.65
2018	86331	11.51	553519	14.99
2019	98652	13.16	652171	17.66
2020	97316	12.98	749487	20.30
Total	749487	99.94	3691219	99.94

Figure No. 1

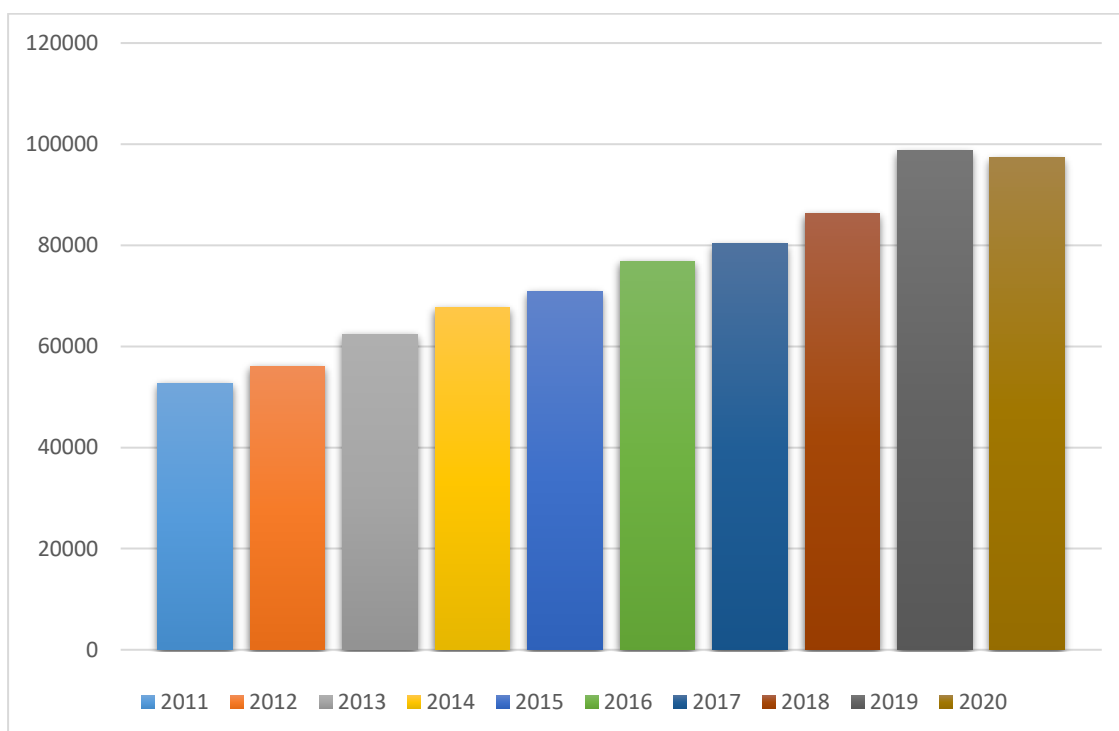


Table No. 6.1 and Figure No. 1 reveals the year wise publications of India in the Web of Science from 2011 to 2020. Highest research publications are published in the year 2019 with 13.16%, followed by 2020 with 12.98% and in the year 2018 with 11.51%. We can observe from the table that, there is a gradual hike in the number of Indian publications in Science and Technology field from the year 2011 to 2019. But, negligible (0.18%) percent of publications are decreased in the year 2020; it may be due to COVID-19 and non-accessibility to the laboratories. In contrary to this development, Social Science publications are raised due to pandemic as almost all the researchers who are dependent on secondary sources of information started working hard to publish their article in the journals. It shows that, in India all type of research is picking its peak and publications are growing gradually on yearly basis.

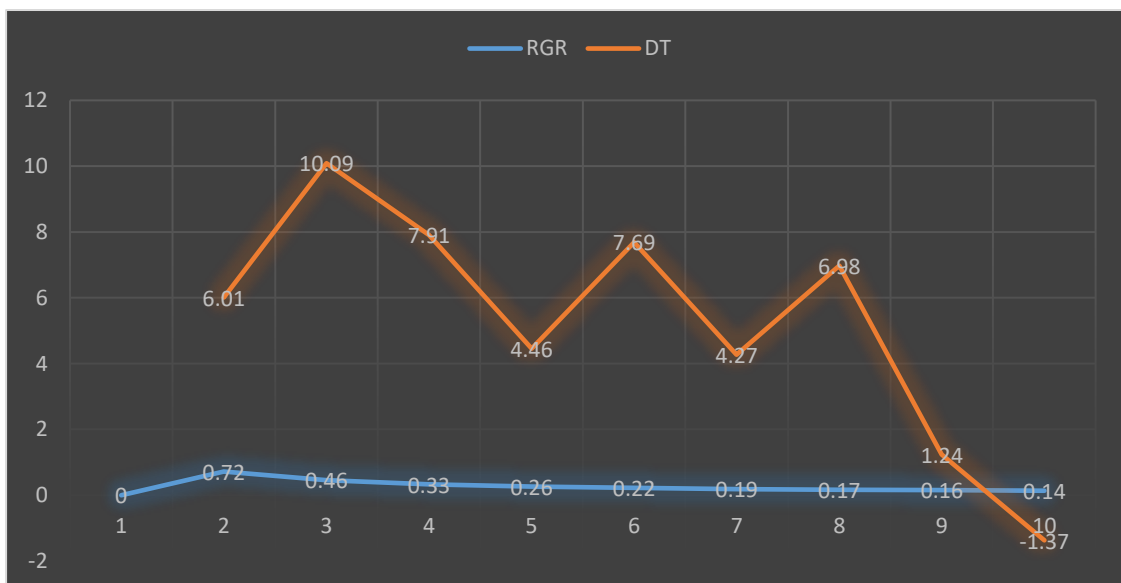
Table No. 6.2**Relative Growth Rate and Doubling Time**

Publication Years	No. of Publications	Cumulative Publications	Cumulative Publications Percentage	W1	W2	RGR	Mean of RGR	DT	Mean of DT
2011	52744	52744	1.42		10.87	-	0.		7.11
2012	56117	108861	2.94	10.87	11.59	0.72	35	6.01	
2013	62420	171281	4.64	11.59	12.05	0.46		10.09	
2014	67784	239065	6.47	12.05	12.38	0.33		7.91	
2015	70952	310017	8.39	12.38	12.64	0.26		4.46	
2016	76869	386886	10.48	12.64	12.86	0.22	0.	7.69	3.76
2017	80302	467188	12.65	12.86	13.05	0.19	17	4.27	
2018	86331	553519	14.99	13.05	13.22	0.17		6.98	
2019	98652	652171	17.66	13.22	13.38	0.16		1.24	
2020	97316	749487	20.30	13.38	13.52	0.14		-	
								1.37	
Total	749487	3691219	99.94				0.		5.43
							26		

Table 6.2 and figure 2 shows the relative growth rate of the publications from 2011 to 2020. The relative growth rate is the increase in the number of publications per year. Doubling time directly related to relative growth rate (RGR) and defined as the time required for articles to become double of the existing amount. It is also determined that if the number of articles in a subject doubles during a given period then the difference between logarithms of numbers at the beginning and at the end of this period must be logarithm of the number 2. This relative growth rate and doubling time model was developed by Mahapatra (1985). During this period of study, it indicates that RGR decreased from 0.72 to 0.14 in the years 2011 to 2020, here we have observed a mean relative growth rate of 0.26. Notably, the doubling time for the publications has decreased from 0.35 in the first five years to 0.17 in the last five years. In this study period, the mean doubling time for publications output has shown a decreasing trend. So, it is known that, during this period of study there is no noticeable growth of Science and Technology Literature in India. Further, table shows that, the mean relative growth rates of publications have shown a declining trend.

The values of Doubling Time of publications increased from 6.01 to 10.09 from the year 2011 to 2013 then decreased to 4.46 in the year 2015, further it is dipped to 1.37 in the year 2020. The average mean doubling time Dt (P) is 5.43 for the years 2011 to 2020. From 2011 to 2015, the mean doubling time is 7.11, and again it decreased to 3.76 for the year 2016 to 2020.

Figure No. 2



Further, the study acknowledged that during this study period publications are raised on an average of 4.72% per year. The average annual growth rate is useful for showing the trends in publications during the study period. It provides an idea to researcher that, in which direction a research is headed in that particular time.

6.3 Document Type of Publications:

Document type of publication in Science and Technology literature are being presented in this table. It includes top ten types of documents, number of publications and percentages.

Table No. 6.3
Document wise Publications

Type of Documents	Publications	Percentage of 1317016	% Of 1275018
Article	1073590	81.51	84.202
Meeting Abstract	60644	4.60	4.756
Review	46707	3.54	3.663
Letter	35990	2.73	2.823
Proceedings Paper	30454	2.31	2.389
Editorial Material	26696	2.02	2.094
Note	17852	1.35	1.4
Early Access	15136	1.14	1.187
Book Review	5381	0.40	0.422
Correction	4566	0.34	0.358

Table No. 6.3 discussed about the type of research documents published in various journals from India. As usual, highest number of publications is in the form of Articles i.e.- 81.51% compared to any other type of publications from all over India. Only 4.60% and 3.54% of publications are in the form of Meeting Abstract and Review's forms respectively in this study period. Furthermore it is revealed that, Letter, Proceedings of Papers and Editorial Material are published around 2%, Note, early access, book reviews and corrections are less than 2% in this period published by the Indian authors. Remaining other form of documents such as News items, Biographical Items, Book Chapter, Retracted Publications, Discussion, Retraction, Poetry, Correction Addition, Item about an individual, Reprint, Data Paper, Bibliography, Software Review, Art Exhibit Review and Fiction Creative Prose are published very negligible amount (less than 1%) of publications from India. Further, it is noted that, almost all the journal publications are in the form of Articles.

6.4 Funding Agency wise Publications:

All over the world, various funding agencies are helping the researchers to do the research in their field of study especially in the field of Science and Technology. Funding Agency of publication in Science and Technology literature has been mentioned in this table. It includes top ten funding agencies, Publications and percentages.

Table No. 6.4
Funding Agency-wise Publications

Funding Agencies	Publications	Percentage
Department Of Science Technology, India	85244	27.29
Council Of Scientific Industrial Research, India	78027	24.98
University Grants Commission, India	63405	20.30
Department Of Biotechnology, India	23031	7.37
Indian Council Of Medical Research, India	12202	3.90
Department Of Atomic Energy, India	11519	3.68
United States Department Of Health Human Services, USA	11340	3.63
National Institutes Of Health, USA	11132	3.56
National Science Foundation, USA	9810	3.14
National Natural Science Foundation Of China, China	6608	2.11

Top Ten Funding agency wise publications are shown in the Table No. 6.4. It reveals that, Department of Science and Technology (DST) funded highest 27.29% of the publications, followed by Council of Scientific and Industrial Research (CSIR) and University Grants Commission of India funded 25% and 20% respectively in this period of study. Overall, 72% of the funding for the R & D in Science and Technology field is from India, remaining 27.43% of funds are received from the United States of America's organisations such as Department of Health Human Services, National Institute of Health, National Science Foundation, and National Natural Science Foundation of China also.

After DST and CSIR, UGC is the main funding agency for the research especially in the Universities and Colleges in India. One third of the funding is provided by the above mentioned top ten funding agencies in India during the study period.

6.5 Author wise Publications:

Different subject authors write different type of articles in collaboration with different inter-disciplinary and intra-disciplinary subject collaborators. Author wise publication in Science and Technology literature has been mentioned in this table. It includes top ten authors, Publications and percentages.

Table No. 6.5
Author wise Publications

Authors	Publications	Percentage
Kumar A	23749	18.54
Kumar S	20265	15.82
Kumar R	14488	11.31
Singh S	12142	9.48
Sharma S	10333	8.06
Sharma A	10129	7.91
Das S	9765	7.62
Kumar P	9121	7.12
Kumar V	9116	7.11
Ghosh S	8937	6.97

Table No.6.5 shows the top ten author wise publications published by the different authors of various organisations during the study period. Kumar A published highest 18.54% of publications from India. Kumar S and Kumar R published 15.82% and 11.31% publications respectively. These first three authors together published more than 45% of the publications among the top ten authors. Furthermore, totally 99,975 authors contributed in publishing of these publications. And these top ten authors published 10% of the total publications during the study period.

6.6 Distribution of Publications by Source

Distribution of article publications in various journals in Science and Technology literature has been given in this table. It includes top ten titles of the Journals, Publications, Percentages, Origin of the Country and h-index.

Table No. 6.6
Journal-wise Publications

Source Titles	Publications	Percentage	Country	h-index
Current Science, IISc.	17820	22.28	India	110
Indian Journal Of Animal Sciences, ICAR	9643	12.05	India	21
RSC Advances, RSC	8133	10.16	UK	128
Indian Journal Of Agricultural Sciences, ICAR	7285	9.10	India	24
Indian Veterinary Journal, Indian Veterinary Association	7100	8.87	India	15

Journal Of The Indian Chemical Society, Indian Chemical Society	6875	8.59	India	32
Tetrahedron Letters, Elsevier	6098	7.62	UK	165
Asian Journal Of Chemistry, Chemical Publishing Company	5972	7.46	India	33
Indian Journal Of Chemistry Section B Organic and Medicinal Chemistry, Scientific Publishers of India	5843	7.30	India	45
PLoS One, Public Library of Science	5204	6.50	US	300

Top ten Journal wise publications are revealed in the Table No. 6.6 among them, highest publications are from the Indian Institute of Science publication ie:- Current Science Journal published 22.28% of the publications, followed by Indian Journal of Animal Science and Royal Society of Chemistry Advances with 12.05% and 10.16% respectively, more than 44% of the publications are published by the first three journals during the study period. It shows that, journals popularity and reach out to the respective audience of these journals. 127518 publications are published in overall 14881 journals, but these top ten journals published and contributed more than 6.27% during the study period. An average publication of these journals is 7997 during the period of study and only top three journals are having more than average publications.

It is further noted that, 76% of the publications are published in various Indian originated journals. Indian author's publications in the highest h-indexed journal (PLoS One) are very less. Among the Indian Journals, Current Science journal is having the highest h-index followed by Indian Journal of Chemistry Section B and Asian Journal of Chemistry.

Average h-index of the journals among these top ten journals is 87, in this study period only Current Science Journal of Indian Institute of Science, Royal Society of Chemistry Advances, Tetrahedron Letters of Elsevier and PLoS One of the Public Library of Science journals are having more than the average h-index.

6.7 Country wise Publications:

Scientific collaboration in all fields increasingly crosses organizational and national boundaries. Scientific collaboration has risen over the past decade. International collaboration, often compelled by reasons of cost or the issue's scope, provides intellectual cross-fertilization and ready access to work done elsewhere motivates the authors for collaboration. Publications by Indian researchers in Science and Technology literature have been presented in this table. It includes top ten names of the countries, publications and percentages.

Table No. 6.7
Country wise Publications

Countries	Publications	Percentage
India	1274522	82.12
USA	93117	5.99
England	31880	2.05
Germany	31186	2.00
South Korea	22364	1.44
Peoples R China	22328	1.43
France	21311	1.37
Japan	20506	1.32
Australia	18073	1.16
Canada	16687	1.07

Country wise contribution of publications are discussed in the Table No. 6.7. All in all 208 countries collaborators contributed to these publications. 82.12% of these publications are from the native Indian authors collaborated with each other, whereas, 6% authors are from USA, 2% authors are from England and Germany collaborated with the Indian authors. Remaining countries such as South Korea, China, France, Japan, Australia and Canada are collaborated and contributed less than 1.44% and listed in the top ten position during the study period in the field of Science and Technology. More than average number of collaborations in publishing an article took place with the countries such as USA, England and Germany.

6.8 Editor wise Publications:

It's the responsibility of the editor to ensure that a journal has sufficient number of quality articles on a particular topic and publish the journal in time on a specific periodicity. Editors of publications in Science and Technology literature have been mentioned in this table. It includes top ten editors, publications and percentages.

Table No. 6.8
Editor wise Publications

Editors	Publications	Percentage of 777
Dhar GM	114	14.67
Rao TSR	114	14.67
Das SK	75	9.65
Chaturvedi DK	74	9.52
Murch GE	74	9.52
Biswas S	69	8.88
Bandyopadhyay S	65	8.36
Pal SK	65	8.36
Sparks DL	65	8.36
Prasanna VK	62	7.97

Top Ten Editors during the study period is depicted in the Table No. 6.8. 2718 editors, edited these different journals on various subjects. Dhar G M and Rao TSR edited 14.67% publications and got 1st place among the top ten editors, Das S K with 9.65% got 2nd place followed by Chaturvedi DK and Murch G E edited 9.52% of the publications, these top three editors edited around 40% of the publications, it shows their competence in the field of Science and Technology. Remaining editors also published less than 9% of the publications during the study period.

6.9 Language wise Publications:

Language is important to publish the articles in different journals. If you publish in regional language, you may get noticed only with that language people. But if you publish in the universal language English you will get noticed by all over the world. Publications according to the different languages in Science and Technology literature have been presented in this table 6.9. It includes top ten languages, Publications and percentages.

Table No. 6.9
Language wise Publications

Languages	Publications	Percentage
English	1274435	99.95
German	162	0.01
French	121	0.009
Spanish	81	0.006
Portuguese	48	0.003
Russian	48	0.003
Chinese	31	0.002
Croatian	18	0.0014
Unspecified	15	0.0011
Turkish	14	0.0010

To communicate with any journal, language is important. Table No.6.9 shows language wise publications. During the study period, publications are published in 26 different languages of the world. But among them 99.95% of the publications are published in the Universal language English followed by German and French languages with very meagre percentage of 1. Remaining languages in top ten position are Spanish, Portuguese, Russian, Chinese, Croatian and Turkish languages.

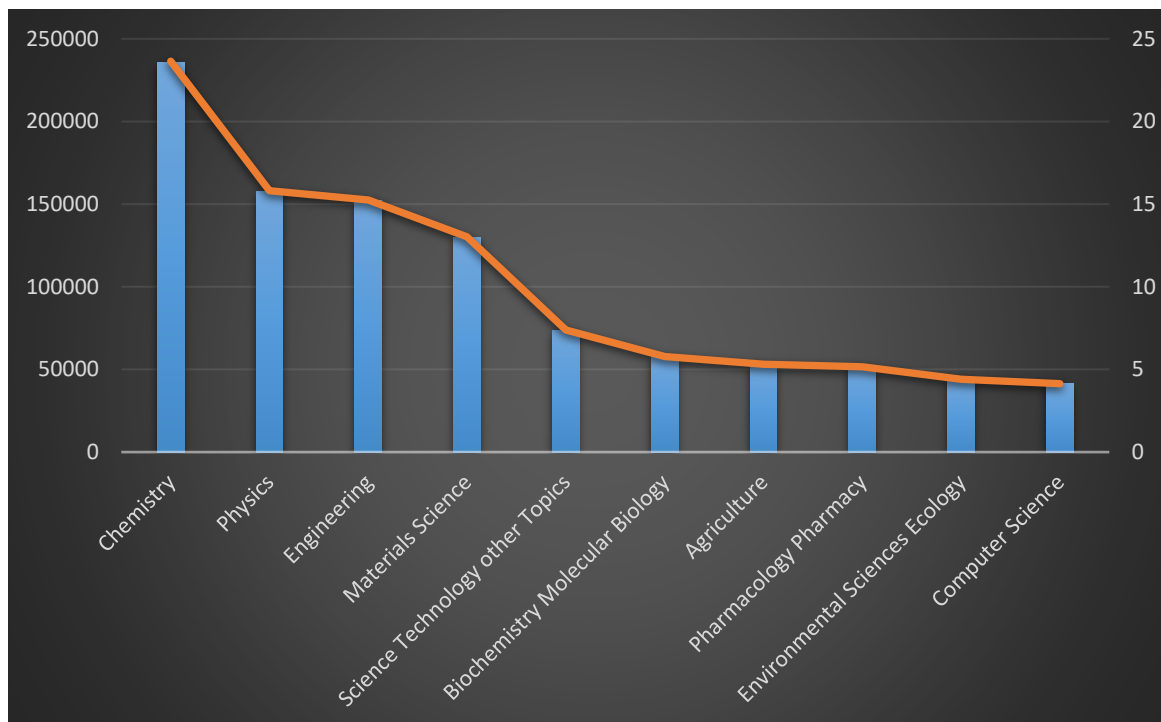
6.10 Subject wise Publications

Publications relating to different subjects in Science and Technology literature published by Indian authors have been depicted in this table. It includes top ten subjects, publications and percentages.

Table No. 6.10
Subject wise Publications

Research Areas	Publications	Percentage
Chemistry	235788	23.65
Physics	157614	15.81
Engineering	152026	15.25
Materials Science	129858	13.02
Science Technology other Topics	73681	7.39
Biochemistry Molecular Biology	57767	5.79
Agriculture	52979	5.31
Pharmacology Pharmacy	51590	5.17
Environmental Sciences Ecology	44002	4.41
Computer Science	41346	4.14

Figure No. 2



Top Ten Subject wise publications are shown in Table No. 6.10 and figure no. 2 these publications are divided into 152 subjects. Among them Chemistry subject publications are highest with 23.65%, followed by Physics, Engineering and Materials Science subjects with 15.81%, 15.25% and 13.02% respectively. These four subjects together they have published more than 67% of publications in during period of study. It is interesting to note that, Computer Science which is the fast growing field is listed in the tenth position with only 4% publications. Overall, 78% of the publications are belonged to the above top ten subjects' categories during the study period.

6.11 Organisation wise Publications

A number of research organizations/institutions are engaged in Science and Technology. The top ten institutions have been mentioned in this table. It includes organizations, publications and percentages.

Table No. 6.11**Organisation wise Publications**

Organizations	Publications	Percentage
Indian Institute of Technology	101851	32.90
Indian Institute of Science	38407	12.40
Bhabha Atomic Research Centre	26431	8.53
All India Institute of Medical Science	26210	8.46
University of Delhi	23368	7.54
Banaras Hindu University	22353	7.22
CSIR	20150	6.50
National Institute of Technology	18385	5.93
Jadavpur University	16751	5.41
Tata Institute of Fundamental Research	15647	5.05

Table No. 6.11 indicates that, organisations wise contribution to the Indian Research in Science and Technology Literature. It is well known fact that, India's premier institute Indian Institute of Technology (all the IITs together) is in forefront in the publications of Research articles from India with almost 33% publications, followed by Indian Institute of Science (IISc) and Bhabha Atomic Research Centre (BARC) with 12.40% and 8.53% respectively. There is a huge difference in between the first, second and third contributing organisation in this period of study. About 1, 00,000 organisations have made contributions to the Research publications in India. It is very interesting to note here that, University of Delhi, Banaras Hindu University, Jadhavpur Universities are also listed among the top ten contributing organisation, even though their primary work is teaching and research unless like research and development organisations. During the study period, these top ten organisations published more than 1/3rd of the total publications. Only Indian Institute of Technology group and Indian Institute of Science organisations published more than average number of publications during the study period.

7. Findings and Conclusion:

This is a study regarding the scientometric analysis of Science and Technology literature published by the Indian authors from 2011 to 2020. It is observed from the study that there is a gradual increase of Indian publications in Science and Technology literature.

Further, it is found that the publications on the subject of Chemistry is the highest followed by Physics, Engineering and Materials Science. The result also indicated that most

of the papers are published in the form of journal articles. A large number of the Indian authors in the area of Science and Technology submit their manuscripts to top ten Indian journals for publishing their research output.

Among the funding agencies, the result reveals that Department of Science and Technology (DST), Government of India, is on the top of Pyramid as it arranges the funds for different research projects followed by Council of Scientific and Industrial Research (CSIR). Overall, 88% of the research fund is provided by the Government of India, and remaining is from the western world among the top ten funding agencies. About a quarter of total funds are being provided by Department of Health Human Services, U.S.A., National Institute of Health, National Science Foundation and National Foundation of China.

It is found from the study that, Kumar A. was the topmost author followed by Kumar S. and Kumar R. among the top ten productive authors of India in the area of Science and Technology literature. Maximum number of Indian authors published their articles in 'Current Science' journal published by the Indian Institute of Science, Bangalore followed by the Indian Journal of Animal Sciences, Indian Council of Agricultural Research and Royal Society of Chemistry Advances. Out of top ten journals, seven (76%) of them are originated from India, two are from United Kingdom and one journal is from United States of America. The Indian author's contribution in the publications of Science and Technology literature is significant. Due to these efforts, India stand on top in research followed by U.S.A. Almost all the publications under the study are published in English language followed by German language, which represents a very low or negligible percentage. Publications on diversified subjects are published in Science and Technology literature. India's premier institute Indian Institute of Technology (all the IITs together) is in forefront in the publications of research articles from India, followed by Indian Institute of Science and Bhabha Atomic Research Centre with second and third rank respectively.

Works Cited

1. Alhaider, I., Mueen Ahmed, K. K., & Gupta, B. M. (2015). Pharmaceutical Research in Kingdom of Saudi Arabia: A Scientometric Analysis during 2001 - 2010. *Saudi Pharmaceutical Journal (SPJ)*, 23(3), 215-222.
2. Azmi, N. I., & Abbas, S. M. (2018). Bibliometric Study of Publications on Drug Abuse in India from 2001 to 2016. *Library Progress (International)*, 38(1), 81-88.
3. Department of Science and Technology. (2020). *Research and Statistics at a Glance - 2019*. Delhi: Government of India.
4. Department of Science and Technology, Government of India. (March 2020). *Research and Statistics at a Glance 2019-20*. New Delhi: Department of Science and Technology.
5. Gorjiara, T., & Baldock, C. (2014). Nanoscience and Nanotechnology Research Publications: A Comparison between Australia and the Rest of the World. *Scientometrics*, 100, 121-148.
6. Kannappanavar, B., & Vijayakumar, M. (2000). Fifty Years of LIS Research in India: Trends and Developments. *SRELS Journal of Information Management*, 37(4), 267-278.
7. Mahapatra, M. (1985). Validity of the Theory of Exponential Growth of Scientific Literature. *Fifteenth IASLIC Conference*, (pp. 61-70). Bangalore.
8. National Science and Technology Management Information System. (2020, March). *Publications: Regular Publications*. Retrieved April 19, 2021, from Department of Science and Technology, Government of India: <http://www.nstmis-dst.org/RegularPublication.aspx>
9. SCImago Institutions Rankings. (2021). *SCImago Journal and Country Ranking*. Retrieved December 2021, from SJR: <http://www.scimagojr.com/journalrank.php>
10. Vijayakumar, M., Sathish Kumar, H.T., & Trivedi, M. (2018). Study on Research Trends in Central Universities in India. *5th International Symposium on Emerging Trends and Technologies in Libraries and Information Services* (pp. 297-304). IEEE.
11. Web of Knowledge. (2021). *Web of Science*. Retrieved December 2021, from webofknowledge.com