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THE IMPACT OF RESEARCH PRODUCTIVITY OF TRIPURA UNIVERSITY: A STUDY BASED ON SCOPUS DATABASE

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Abstract

The impact of Research Productivity at Tripura University during 2007-2020 is analysed in this study. It is tried to find out the various factors such as: measure the growth and impact of research productivity, most productive authors from the university, publication sources, source dynamics and types of documents published by researchers, distribution of research output in various subject categories, institutional and country-wise collaboration and funding sources. A total of 1158 documents records, including 239 open access articles, were retrieved from Scopus database and downloaded in the CSV excel format for analysis by using bibliometrix package- An R-tool developed by Aria & Cuccurullo and MS-Excel. The growth of publication is found increasing on a yearly basis, and the average citations per year is 8.09. It is found that 'Materials Today: Proceedings' is the most preferred source of publications while most of the research are published as articles. The most of publications are in the Chemistry discipline followed by Physics & Astronomy and Engineering. The DST, India, is the highest funding source for Tripura University.

Keywords: Research Productivity; Citation Impact; Tripura University; Scopus; Bibliometrix- R tool.

1. INTRODUCTION

Research Productivity is the main key component to measure the research contribution of any university from an academic perspective. The higher education system in India has practised measuring all the universities annually and released the NIRF Ranking of the educational institutions. Research published in the universities is playing the decision-changing role in insight into all the other parameters of the NIRF Ranking framework. Thus it is very

important to mesurment the impact of research among the society. Now a days, there are various online tools available to mesurment the impact of research. Among which Web of Science, Scopus are very well know online tools. This mesurment not only give us a clear picture of the impact but also help us to find our stranght and weekness. There are lots of studies have been conducted to know the impact of research in various field. But very less study has been conducted to know the impact of research spcecially by collecting the data from Scopus. Scopus is such a online tool, which comprises Science and Social Science including Arts in its database. Thus this study is understaken to know the impact of the research productivity among faculty members of Tripura University (a central university), Tripura , India. Tripura University, as a state university was started its journey in 1987 and it is converted to a central university in 2007 under the Act of Tripura University Act, 2006, by the Parliament. The university is accredited with a 'B' grade by the National Assessment and Accreditation Council (NAAC)1. At present, the number of affiliated Colleges is 52, among which there are 4 Polytechnic Institutes, 19 Professional Degree Colleges, 27 General Degree Colleges and 2 Technical Colleges. A total number of 41 Doctoral Programmes (PhD), 60 Postgraduate Programmes (P.G), 6 Postgraduate Diploma Programmes and 7 Undergraduate Programmes (U.G) are offered in the 44 departments of Tripura University. One hundred seventy-five faculty members, including professors, associate professors, assistant professors, and 393 research scholars in Tripura University (2021)2. Data has been collected for this study form Scopus Database.

2. REVIEW OF LITERATURE

Many research studies have been conducted to measure the research productivity of the universities and other academic institutions using bibliometrics or scientometric indicators in India and abroad. A few studies related to the present study have been enumerated as follows: Bapte and Gedam (2018)3 conduct a scientometric profile of Sant Gadge Baba Amravati university during 1996-2017 from the Scopus online database. The study evaluated the total research output of 1130 publications with the 10.65 average citations per paper, and the highly productive block was 2007 to 2017 with a total of 83.98 per cent publications. The highest H-index (17) was in the year 2009, and 20.08 per cent of documents were produced with international collaboration, the highest collaboration with Brazil (69) and the USA (21). A maximum of 370 papers was written by two authors, while 315 papers were written by three authors received more citations (4444). The maximum 89.17 percentage citations were received through a collaborative authorship pattern, and the average degree of collaboration was 0.96, while the average modified collaborative coefficient was 0.62. The journal articles

were the most preferred publication source, and the most productive author was Mahendra Rai (209), while Alka P. Yadav (17) received more citations 3073.

Another scientometric study was examined by Aswathy and Gopikuttan (2013)4 ; they have found that the productivity pattern of universities in Kerala. Further it was found that there was no statistically significant difference between productivity and experience while multi authorship dominated among university teachers. Professors having more experience had a high degree of collaboration and more collaborative papers. Multi-authored papers are more than single-authored in all three universities, namely the University of Kerala, Mahatma Gandhi University and the University of Calicut.

Verma and Das (2020)5 analysed the authorship and collaboration pattern of research output published by researchers of Tripura University during 2010-2019 based on the Web of Science database and found that 513 papers were published while 2017 and 2019 were the most productive year with 84 publications. Bhattacharjee, D and Hussain, S.A. were the most influential author with 68 and 62 publications, and the most preferred sources were journals articles (88.46). Jadavpur University, with 48 publications, was the highest collaboration with Tripura University.

Baskaran (2013)6 investigated a study on the research productivity of Alagappa University from 1999-2011 by using the data from Web of Science and found that the growth of the research productivity was significantly increased, and the relative growth rate was fluctuating. Multi-authored articles were more from a total of 776 published articles. The degree of collaboration fluctuated and the mean was observed 0.96 from 1999-2011.

Bhattacharjee (2020)7 analysed the publication output of the scholars' community of Tripura University during 2007-2018 based on the Web of Science database. The study identified that 554 publications were received, and the most productive year was 2017, with 102 publications. 90.07 percentage authors were preferred journals articles, and the most productive author was Bhattacharjee, D and Hussain, S.A. The most prolific journal was current science, and chemistry was the dominating subject area.

Cancino, C.A (2017)8 et al. conducted a bibliometric study on leading universities on innovation research using the web of science to identify the universities that are most productive and influential in innovation research. The U.S. universities were most compelling because they account for the most publications with many citations and a high H-index. In contrast, universities from U.K. and Netherlands were most involved in publishing in journals that specialise in innovation research.

Pandya (2021)9 et al. analysed the research productivity of newly established central universities in India using the Scopus database during 2010-2019. They found that the considerable growth in scholarly publication and the Central University of Rajasthan was contributed the highest number of 765 articles among the 12 universities. The highest m-Index(2.80) was received by Scientific Reports journal, and the highest g- Index(24) was acquired by RSC Advances Journal. The most productive author was Singh M (98 articles) from Central University of Gujarat and Raza K (51 articles) from the Central University of Rajasthan.

Through the literature survey, it is found that few studies have been carried out to measure the research productivity of Tripura University using the Web of Science database, while there is no attempt to measure the productivity using the Scopus database.

3. SCOPE AND LIMITATION OF THE STUDY

The present study is based on the literature published by the researchers of Tripura University in the Scopus database. It is found that few scientometric studies have been conducted using the Web of Science database, while there is no study conducted using the Scopus database. The scope is limited to 14 years during 2007-2020 as Tripura University was converted to a Central University in 2007. The present study focuses on the productivity of Tripura University from the year of being converted to a central university. The scope is further limited to the scholarly literature of Tripura University published in the Scopus database based on selected scientometric parameters.

4. OBJECTIVE OF THE STUDY

The main objective of this study is to analyse the research productivity of Tripura University based on bibliometric & scientometric parameters. The objectives of the study are:

- To measure the growth and impact of research productivity of Tripura University during 2007-2020
- To identify the most productive authors from the university
- To find out the top ten publication sources, source dynamics and types of documents published by researchers of T.U.
- To examine the distribution of research output in various subject categories and thematic evolution of the author's assigned keywords.
- To analyse the top ten institutional and country-wise collaboration of Tripura University
- To find out the top ten funding sources among the faculties members of T.U.

5. METHODOLOGY

The data on the research publications by Tripura University was exported from the Scopus database for the fourteen years 2007-2020. The bibliographic information was retrieved from an online database, Scopus[10] using affiliation I.D. (AF-ID "Tripura University" 60018446) on 12th October 2021. A total of 1504 document records were retrieved from the year 1988. After limiting this search result to 2007-2020, the total 1158 documents records, including 239 open access articles, were retrieved and downloaded in the CSV excel format for further analysis of the scientometric parameters with bibliometrix package.

6. DATA ANALYSIS

The utmost care has been taken during the analysis of the dataset. The authenticity of retrieved data was observed in the MS-Excel and then analysed the dataset using bibliometrix package- An R-tool developed by Aria & Cuccurullo(2017)[11].

6.1 Impact of Research Productivity

The year-wise research productivity of Tripura University is given in Figure-1. The researchers published a total of 1158 articles during the study, and it may be noted that the year 2020 is the most productive year, with a maximum of 176 articles published.

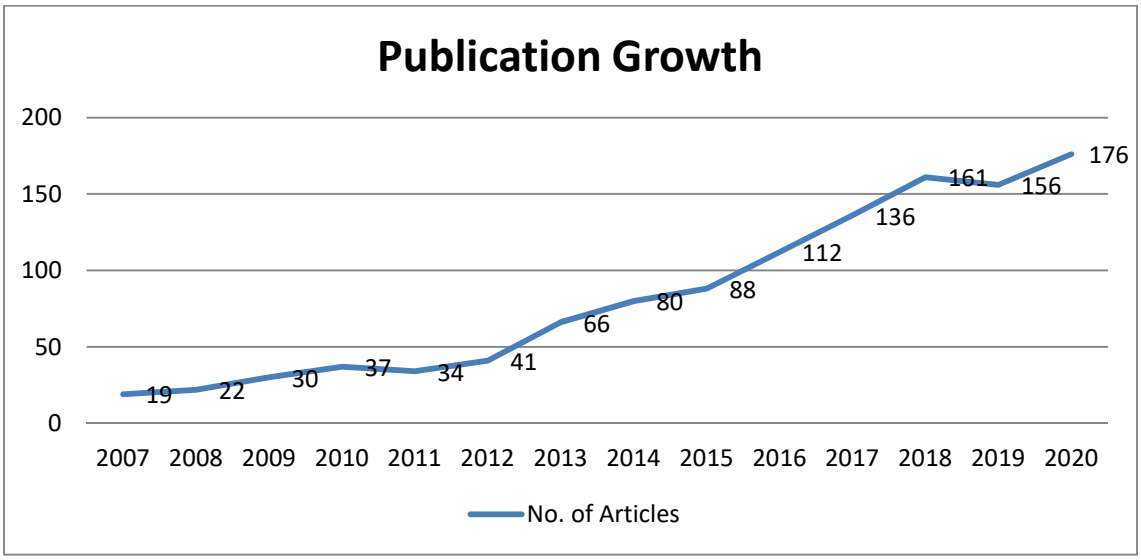

Figure-1: Year-wise distribution of Research Productivity

The growth of research publications has been constant and progressively increasing over the years (Table-1). The highest annual growth rate of 60.98 % was in 2013, while the lowest (-3.11%) occurred in 2019. The maximum citations (606) are received in 2020 against a total of 2473 during the study. The highest mean citation per article and mean total citations per year were received in 2007 and 2020, respectively. The comprehensive references used in 1158 published articles is 44978. The average citations per document are 8.09%, and the average citations per year per document is 1.53%.

Table-1: Publication Growth and Citation Metrics

Year	No. of Articles	Annual Growth Rate (in%)	No. of Citation Received (per Year)	Mean Citation per Article	Mean Total Citations per Year	Citable Years
2007	19	0	38	27.73	1.98	14
2008	22	15.79	23	13.86	1.06	13
2009	30	36.36	26	10.53	0.87	12
2010	37	23.33	37	11.10	1.00	11
2011	34	-8.11	26	07.64	0.76	10
2012	41	20.59	33	07.19	0.79	9
2013	66	60.98	69	08.40	1.05	8
2014	80	21.21	86	07.51	1.07	7
2015	88	10.00	121	08.21	1.36	6
2016	112	27.27	295	13.15	2.63	5
2017	136	21.43	367	10.80	2.70	4
2018	161	18.38	334	06.22	2.07	3
2019	156	-3.11	412	05.28	2.64	2
2020	176	12.82	606	03.44	3.44	1

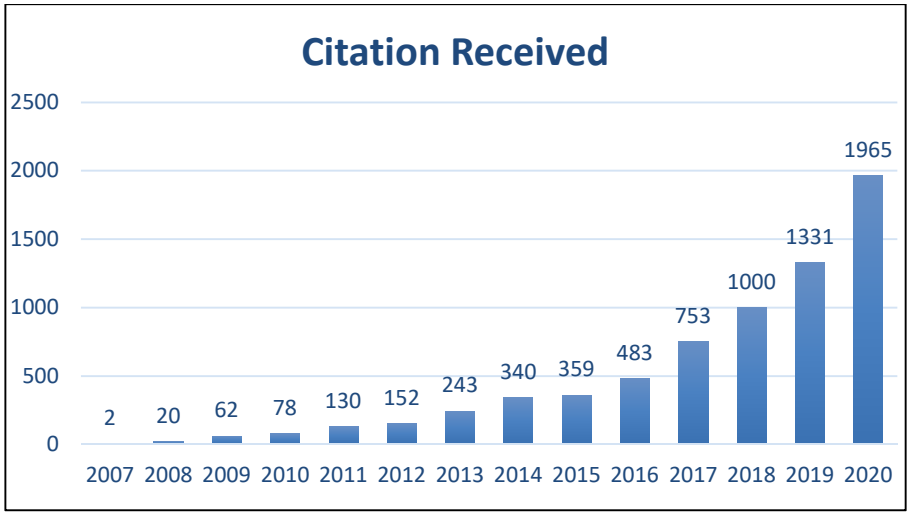

Figure-2: Year-wise distribution of Citations received

6.2 Top Ten Most Productive Authors

Table 2 indicates that Bhattacharjee, D from the Department of Physics is the most productive author with 132 publications. Hussain, S.A. (89 articles) from the physics department and Bhowmik, M.K.(73 articles) from the Computer Science department are the university's second and third most productive authors. Bhattacharjee, D. is the highest contributor with 20.18 % among all the top ten authors and received 1072 citations during the study period. Dinda, B. has the highest citations of 1408 and Bhattacharjee, S. is the second with 1136 citations in his credit. The second highest h-index 16 was occupied by Hussain, S.A., Dinda, B., and Bhattacharjee, S. It has been found that Dinda, B. has the highest g-index (37) followed by Bhattacharjee, S. (33), and Debnath, S. (28) and the physics department is the most productive department of Tripura University.

Table-2: Top Ten Most Productive Authors and Author's Metrics

Authors	No. of Articles	% within Top Ten	Total Citations	h-Index	g-Index	m-Index
Bhattacharjee, D.	132	20.18	1072	17	24	1.133
Hussain, S.A.	89	13.61	799	16	23	1.067
Bhowmik, M.K.	73	11.16	382	12	15	0.857
Debnath, S.	68	10.40	862	13	28	0.867
De, B.K.	57	8.72	336	10	15	0.714
Guha, A.	57	8.72	481	12	19	0.8
Dinda, B.	48	7.34	1408	16	37	1.067
Tripathy, B.C.	45	6.88	256	8	12	0.889
Bhattacharjee, S.	43	6.57	1136	16	33	1.6
Nath, R.K.	42	6.42	265	7	14	0.467

6.3 Source Dynamics and Top Ten Publication Source

Table-3 reflects the top ten ranked publication sources which published most of the articles contributed by the researcher of Tripura University. It is observed that 'Materials Today: Proceedings' is the most preferred source with 30 publications, while the first article got published to this source in the year 2019. 'Vegetos' and 'current science' are the second and third-ranked sources with 13.37% and 11.63%, respectively. The first article from the university was published in the year 2007 at the source 'current science', 'Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy' and 'Journal of the Indian Chemical Society' during the study.

Table-3: Publication Source

Publication Source	Year of First published article	Articles	Rank	Percentage
Materials Today: Proceedings	2019	30	1	17.44
Vegetos	2014	23	2	13.37
Current Science	2007	20	3	11.63
Proyecciones	2015	17	4	9.88
Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy	2007	16	5	9.30
Journal of Coordination Chemistry	2008	14	6	8.14
Advances in Intelligent Systems and Computing	2015	13	7	7.56
Journal of the Indian Chemical Society	2007	11	8	6.40
Journal of Luminescence	2008	10	9	5.81
Journal of Physics and Chemistry of Solids	2010	9	10	
Plant Science Today	2017			5.23

The year-wise source dynamic trends is analysed in Figure-3, and it has been found that 'Current Science' and 'Journal of Indian Chemical Society' was the continuous prefeed sources from the year 2007 while most of the proceeding articles were published in 'Material Today' from the year 2018.

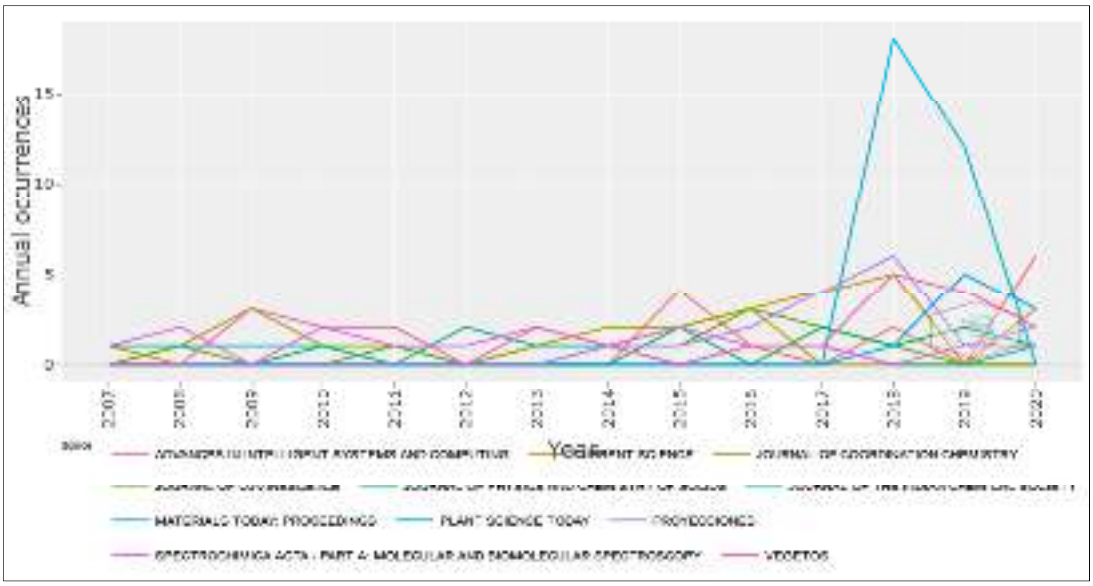

Figure-3: Top Ten Source Dynamics

6.4 Types of Documents and Subject Discipline

The figure-4 shows that Most of the research productivity (76%) are published in articles, and 15% of documents were in the form of Conference Papers during the study period. The single-authored documents are found at 53, while multi-authored documents are 1105, and the collaboration index is 1.02. As per the subject categories by the Scopus database, the most of publications are in the Chemistry (10.5%) subject discipline, followed by Physics & Astronomy (10.19%) and Engineering (9.19%).

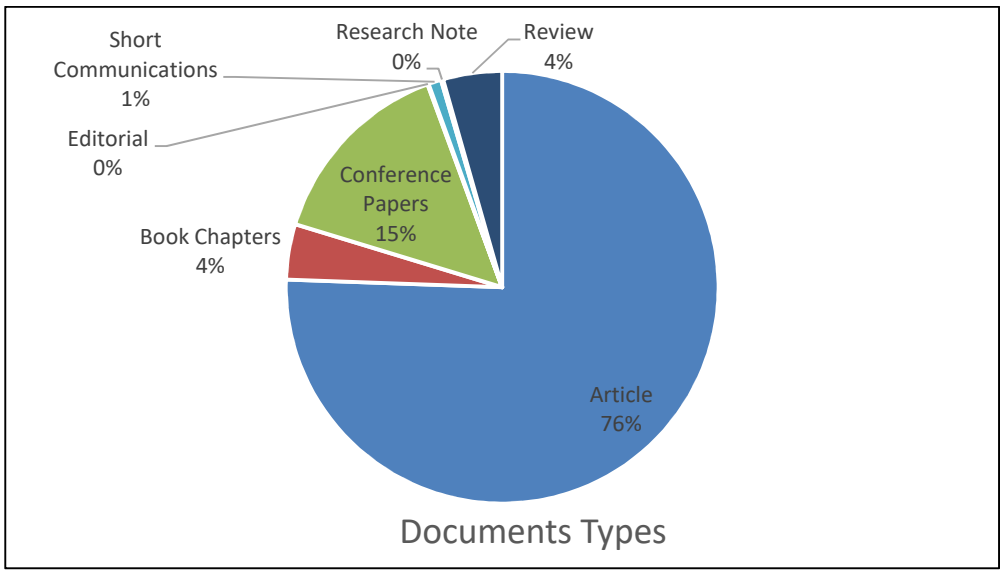

Figure-4: Documents Types

6.5 Thematic Evolution

The thematic evolution of research work contributed by the researchers of Tripura University has been established by the authored assigned keywords for the study period.

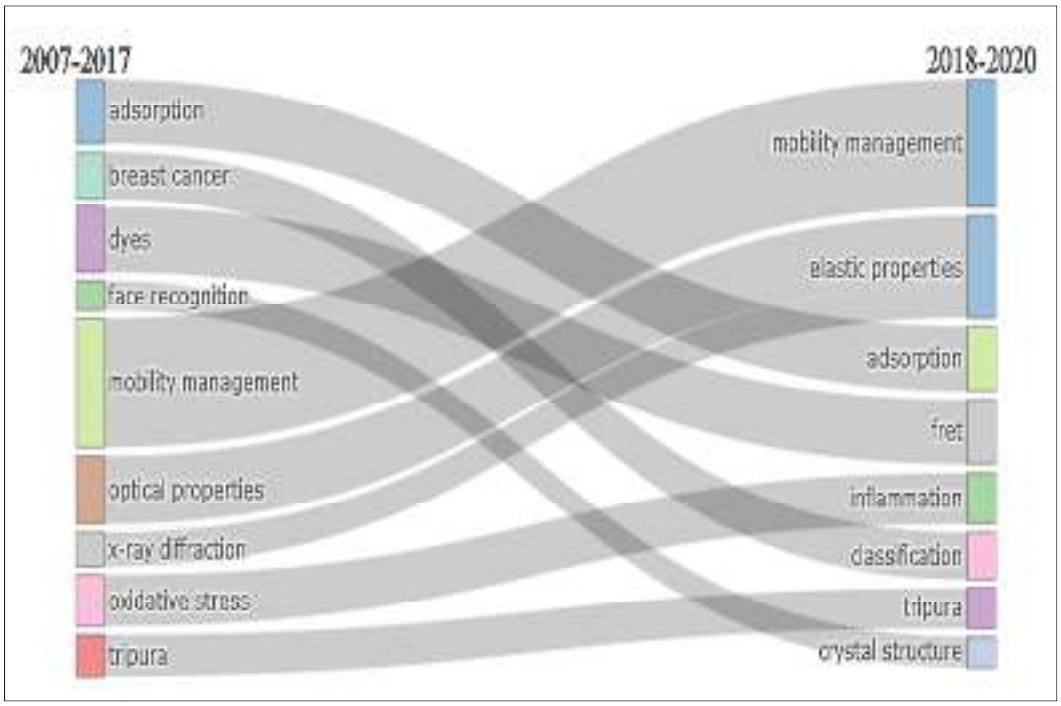

Figure-5: Thematic Evolution of Author's assigned Keywords

The maximum 100 keywords assigned by authors have been selected with a minimum 3 cluster frequency per thousand documents and one number of labels for each cluster. It may be observed from the figure-5 that the 'adsorption' and 'mobility management' are continuously using same in both the clusters from 2007-20017 and 2018-2020. The keyword 'optical properties' and 'x-ray diffraction' are merged with 'elastic properties, and 'breast cancer' and 'dyes' are also merged with 'fret' keyword. Similarly, 'tripura' keywords remains continuous during the period of 2007-2020.

6.6 Institutional and Country-wise Collaboration

It may be observed from the table-4 that Tripura University has the maximum collaboration with the academic institutions of India. The University of Culcutta is the topmost collaborator for T.U. It stands the first rank with 136 research collaborations. NIT Agartala is from the same state, having the third rank with 40 research collaborations. University also has collaborations with most of the countries of the world. The USA is the top collaborator country, followed by Japan and China with 63, 51 and 26 research publications during 2007-2020.

Table-4: Collaboration Metrics					
Collaborative Institutes			**Collaborative Country**		
Institute Name	**Research Productivity**	**Rank**	**Country Name**	**Research Productivity**	**Rank**
University of Calcutta	136	1	USA	63	1
Jadavpur University	129	2	JAPAN	51	2
National Institute of Technology	40	3	CHINA	26	3
North-Eastern Hill University	32	4	CANADA	23	4
University of North Bengal	30	5	UK	20	5
Assam University	28	6	ITALY	17	6
Sambalpur University	27	7	HUNGARY	14	7
Kitasato University	25	8	MALAYSIA	14	8
MBB College	16	9	SPAIN	13	9
Assam Don Bosco University, Banaras Hindu University, CSIR-Indian Institute of Chemical Biology, Department of Condensed Matter Physics and Material Sciences, ICAR Research Complex for NEH Region, National Institute of Technology Agartala.	14	10	BELGIUM	11	10

6.7 Top Ten Funding Sources

Funding sources are an essential aspect in terms of the research productivity of any academic institution. Figure-6 shows the top ten funding agency that has played a pivotal role in the research productivity of Tripura University. The DST, India, is the highest funding source for Tripura University.

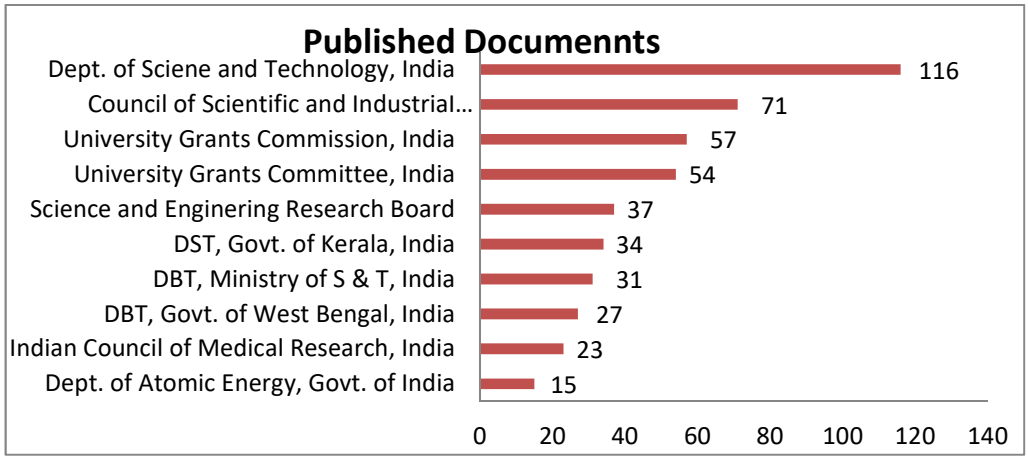

Figure-6: Published Documents sponsored by Funding Agencies

7. Findings

The dataset based on the Scopus database is examined, analysed to fulfil the objective of the study and discussed mainly in the analysis part. The significant findings of the study are;

- A total of 1158 research articles were published by the faculty members of Tripura university during the timespan of 2007-2020. The growth is increasing on a yearly basis, and it is found that the year 2020 is the most productive year, with a maximum of 176 articles published. The average year from the publication is 4.95 and the average citations per year is 8.09. The average citations per year per document are 1.53, which is a pretty significant achievement. The total citations (6920) are also increasing every year.
- The most productive author was Bhattacharjee, D. with132 publications. Hussain, S.A. (89 articles) from the physics department and Bhowmik, M.K.(73 articles) from the Computer Science department are the university's second and third most productive authors. Dinda, B. has the highest citations of 1408 and Bhattacharjee, S. is the second with 1136 citations in his credit. It has been found that Dinda, B. has the highest g-index (37), followed by Bhattacharjee, S. (33), and Debnath, S. (28), and the physics department is the most productive department of Tripura University.
- It is found that 'Materials Today: Proceedings' is the most preferred source with 30 publications, while the first article was published in 2019. 'Vegetos' and 'current science' are the second and third-ranked sources with 13.37% and 11.63%, respectively.
- Most of the research productivity (76%) are published in articles, and 15% of documents were in the form of Conference Papers during the study period. The single-authored documents are found 53 while multi-authored documents are 1105 and the collaboration index is 1.02.
- The most of publications are in the Chemistry (10.5%) subject discipline followed by Physics & Astronomy (10.19%) and Engineering (9.19%) as the subject categories indexed in the Scopus database during the study. It is found that that the 'adsorption' and 'mobility management' are continuously using same in both the clusters from 2007-20017 and 2018-2020. The keyword 'Tripura' remains continuous from 2007 to 2020.
- Tripura University has the maximum collaborations with the University of Calcutta with 136 research contributions. NIT Agartala is from the same state, having the third rank with 40 research collaborations. The USA is the top collaborator country, followed by Japan and China with 63, 51 and 26 research publications during the period of 2007-2020. The DST, India, is the highest funding source for Tripura University.

8. Conclusion

The present study is discovering the research productivity of Tripura University (A Central University), Suryamaninagar, Agartala, Tripura, and the results are a witness for the progress and significant contributions in all the perspectives of research activities in academia. Chemistry, Physics, Engineering, Computer Science and Biological Sciences are the most contributed subject area. However, social science researchers are advised to contribute more in the Scopus index publications. It is suggested that the research collaboration needs to be more with the academic institutions of India and around the Globe.

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