

Research Publication Trends of the Scientists of Tezpur University: A Scientometric Study

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Abstract

Bibliographic records of 847 items retrieved from Web of Science were studied and increasing publication trends were seen in Tezpur University (T.U.). The average output of the organization was 60 publications per year; the peak was 200 items in 2012 and the minimum was 4 items in the year 1999. Single authorship publication accounted for 6%, while multi authorship publication of articles accounted for 94 %. The top 22 institutions which collaborated with T.U accounted for about 26% share. It was seen that the publications of T.U received a total of 4763 citations during the period of 14 years. The average citation per item was 5.7.

Keywords: Bibliometrics, Scientometrics, Collaboration Pattern, Publication Density

1. Introduction

Metrics studies have an important role in understanding the growth of a discipline and assist in designing national policies for implementation and improving the standards. Most of the metrics studies use online databases for retrieving published literature for the analysis. Scientometrics is the science of measuring and analysing science research. In practice, scientometrics is often done using bibliometrics, which is a measurement of the impact of (scientific) publications. Modern scientometrics is mostly based on the work of Derek J. de Solla Price and Eugene Garfield. Similar scientific fields are Bibliometrics, Informetrics, Webometrics, Virtual ethnography and Web mining. The term 'scientist' used in the title used in lieu of the individual designations of the authors appearing in the authorship affiliation field in the Web of Science records.

In this study an attempt has been made to analyse the research output of Tezpur University towards

international science using different metrics. Use of the term 'scientist' seems to serve the purpose of collating the diverse affiliations associated with the science workers.

Tezpur University is an Indian Central University located in Tezpur in the state of Assam, India established by an act in Parliament of India in 1994. The establishment of Tezpur University is considered to be one of the outcomes of the Assam Accord, along with the establishment of Assam University and Indian Institute of Technology, Guwahati. Tezpur University is a non-affiliating university and it has four schools of studies which are divided into 17 departments and three special academic centres. The then Hon'ble Prime Minister of India, Sh. P. V. Narasimha Rao chaired the opening of the University.

2. Literature Review

A number of quantitative studies based on Scientometrics were consulted to know research productivity of individuals, organizations, countries



etc. To access development of science, these studies are very helpful along with the resource management of libraries.

Dutta and Nikam (2013) examines solar cell research in India as revealed by the publications indexed in Web of Science (WoS) for a period of 20 years from 1991 to 2010 in the paper "Solar cell research in India: A scientometric profile". This paper helps to get the idea of application of different metrics.

Gupta B M (2012) in his paper Scientometric Analysis of Pakistan's S & T research output examined the research output of Pakistan for the period 2001-10 on several parameters. Pal and Das (2012) visualize the publishing performance of Indian Statistical Institute during the period 1991 to 2010.

Thirumagal, Devi and Sethukumari (2012) examined authorship pattern and global research productivity of heart disease which helped to gather knowledge of authorship pattern.

Narongrit et al (2011) studied the research output of ASEAN countries and universities in the field of energy and fuel which can be consulted mainly to get the information about getting research output.

Apart from the above mentioned documents, more documents were consulted which has been mentioned in the Bibliography.

3. Objectives Of The Study

The following are the main objectives of this study:

- a. Comparing the research output of Tezpur University using bibliometric indicators.
- b. Find out year wise distributions of authorship pattern.

- c. To calculate authors productivity.
- d. To identify country wise distributions of journals.
- e. To get degree of relationship between main and co-author.
- f. To map citation of highly productive authors.

4. Methodology

To source publications data and cited data of the institutes, WoS has been used. Bibliographic records for papers have also been retrieved from WoS. Search expression used for the Universities for this purpose will be "Address=(Tezpur Univ) AND Year Published=(1994-2012)".

WoS retrieved 847 records of Tezpur University on 11th September, 2013. Publications data of 847 records pertaining to the institute were downloaded and exported to MS-Excel Worksheet. Raw data were analysed, filtered and tabulated quantitatively to make observations using Bibliometrics and Scientometrics indicators, methods and techniques.

5. Analysis

Following tables represent the quantitative performance of T.U towards International Science through different metrics.

5.1. Year wise distribution of publications:

The distribution of 847 items by publication year revealed rising publication trend with exception in 1999, 2004 and 2009 (Table-1). The rise in the other years might be due to some scholarly events like seminar, workshop, conference, lecture etc. The average output of the organization was 60 publications per year; the peak was 200 items in 2012 and the minimum was 4 items in the year 1999.

Table-1: Chronological Distribution of Publications

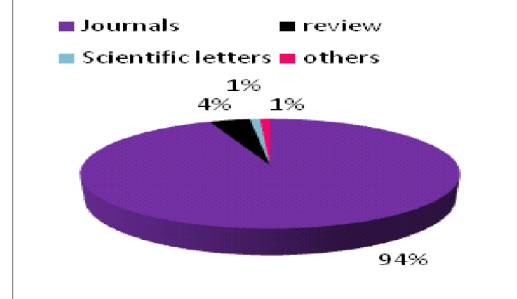
Year	Publications	Cum. No. of publications	% Share	Cum %
1999	4	4	0.47	0.47
2000	9	13	1.06	1.53
2001	10	23	1.18	2.71
2002	18	41	2.13	4.84
2003	17	58	2.01	6.85
2004	23	81	2.72	9.57
2005	43	124	5.08	14.65
2006	42	166	4.96	19.61
2007	58	224	6.85	26.46
2008	78	302	9.21	35.67
2009	80	382	9.45	45.12
2010	117	499	13.81	58.93
2011	148	647	17.47	76.4
2012	200	847	23.61	100.00

5.2. Distribution by Document Types

Here, documents are arranged according to their types. In this count, Journal articles account for 94% share, and the predominate share in the distribution followed by Review Items (4%) and the remaining 2% had appeared in many other publication types viz. Editorial Materials, Meeting Abstract, Corrections etc. (Table-2).

Table-2: Distribution of Publication

Type of publications	Number	Percent
Journal Article	795	93.86
Scientific Letter	7	0.83
Editorial Material	7	0.83
Review	31	3.66
Correction	5	0.59
Meeting Abstract	1	0.12
Book Review	1	0.12
Total	847	100

Fig. 2: Types of Publications

5.3. Distribution of publications by Domain:

The institute is most active in Chemistry (17%), followed by Physics (16%), Engineering (10%), Astronomy and Astrophysics (8%) and other related sub-domains accounted for 13% share of the total contributions. The sub specialities in which Institute pursued research include operational research, multidisciplinary science, cell biology etc.. Since in several cases individual items in the publication list were assigned to more than one subject category, items overlap in more than one domain. (Table-3)

Table-3: Subject-area of Research in T.U.

Sl No.	Subject	Frequency	%
1	Chemistry	193	16.77
2	Physics; Biophysics	186	16.16
3	Materials Science	132	11.47
4	Engineering	110	9.56
5	Polymer Science	90	7.82
6	Energy & Fuels;	60	5.21
7	Biotechnology and Plant science	51	4.43
8	Mathematics	49	4.26
9	Science & Technology - Other topics	46	4.00
10	Environmental Sciences & Ecology	32	2.78
11	Optics	31	2.69
12	Biochemistry & Molecular Biology	28	2.43
13	Computer Science	23	2.00
14	Pharmacology & Pharmacy; Toxicology	22	1.91

15	Instruments & Instrumentation; Nuclear Science & Technology	18	1.56
16	Food Science & Technology	15	1.30
17	Medical Science	14	1.22
18	Agriculture	13	1.13
19	Crystallography; Spectroscopy	10	0.87
20	Astronomy & Astrophysics	8	0.70
21	Geology	7	0.61
22	Metallurgy & Metallurgical Engineering	6	0.52
23	Meteorology & Atmospheric Sciences; Water Resources	3	0.26
24	Forestry	3	0.26
25	Microscopy	1	0.09
Total areas of research		1151	0.00

5.4. Collaboration in Research: Authorship Collaboration Pattern:

This study reveals that the research pursuits in the institute were undertaken in highly collaborative manner. Single authorship accounted for 6%, while multi authorship accounted for 94 %. In particular, two- authored papers accounted for 41%, 3-5 authored papers accounted for 47% and six and more than six authored papers 6%.

Table-4 (b): Author wise distribution

Year	Single	Double	Multi	Mega	Total	% of Total	D.C
1999	1	3	0	0	4	0.47	0.75
2000	1	7	1	0	9	1.06	0.89
2001	1	4	5	0	10	1.18	0.90
2002	3	5	9	1	18	2.13	0.83
2003	1	6	9	1	17	2.01	0.94
2004	3	11	8	1	23	2.72	0.87
2005	1	17	20	5	43	5.08	0.98
2006	3	17	19	3	42	4.96	0.93
2007	5	21	27	5	58	6.85	0.91
2008	9	30	32	7	78	9.21	0.88
2009	4	32	38	6	80	9.45	0.95
2010	3	52	53	9	117	13.81	0.97
2011	9	60	74	5	148	17.47	0.93
2012	8	78	102	12	200	23.61	0.56
Total	52	343	397	55	847	100	0.94(Avg.)
%	6.14	40.49	46.87	6.49			

Furthermore, there were 7 mega- authored publications having more than 12 authors and their distribution is shown in the following figure.

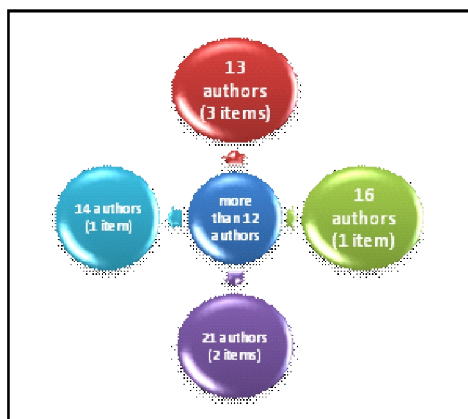


Figure.3: Mega-authored publications (more than 12 authors)

Degree of Collaboration (DC) is a ratio of collaborative publications and total number of publications. It was measured as 0.94 as average.

$$DC = N_m / (N_m + N_s) = 795 / (795 + 52) = 0.94$$

Where, N_m refers to multi-authored (two or more) contributions while, N_s refers to number of single authored papers.

5.5. International Collaboration in Research

The study shows that there are both Indian and Foreign contributions. The numbers of Indian collaborations are lesser than foreign collaborations. Indian collaborations are 116 in numbers (14%) while; abroad collaborations are 731 in number (86%). International collaboration details are given in the table-5.

Table-5: Geographic Distribution

Name of Country	No. Of Articles	% age
India	116	14
Abroad	731	86
Total	847	100

5.6. Institutional collaboration in research

T.U has collaboration with 179 institutions from India as well as from abroad. The top 22 institutions which collaborated with T.U accounted for about 26% share (Table-6). Indian Institute of Technology was its leading collaborative institute with a contribution of 6%. The other major institutes from India were Kalyani University (3%), Jadavpur University (2%), Gauhati University (2%), National Physics Laboratory (1.3%), Dibrugarh University (1.18%), etc.

Table-6: Leading Collaborating Institutes of T.U

Sl.No.	Other collaborating organization	Frequency	% Share	CUM %
1	Indian Institute of Technology	46	5.43	5.43
2	Kalyani University	22	2.60	8.03
3	Jadavpur University	16	1.89	9.92
4	Gauhati University	15	1.77	11.69
5	National Physics Laboratory	11	1.30	12.99
6	Dibrugarh University	10	1.18	14.17
7	Rajiv Gandhi University	9	1.06	15.23
8	Darrang College	9	1.06	16.29
9	Central Nuclear Science	8	0.94	17.23
10	North Eastern Regional Institute of Science & Technology	8	0.94	18.17
11	Assam Agriculture University	8	0.94	19.11
12	Inter University Accelerator Centre	7	0.83	19.94
13	NE Institute of Science & Technology	6	0.71	20.65
14	Tohoku University	6	0.71	21.36
15	Indian Institute of Science	6	0.71	22.07
16	CSIR	6	0.71	22.78
17	University of Colorado	5	0.59	23.37
18	Nowgong College	5	0.59	23.96
19	Defence Reserch Laboratory	5	0.59	24.55
20	University of Illinois,	5	0.59	25.14
21	Regional Institute of Water & Land Management NERIWALM	4	0.47	25.61
22	Indian Institute of Astrophysics	4	0.47	26.08

The leading foreign partner institutions are Tohoku University, Kobe University, University Collarado, University Illinois, and Tokyo Institute of Technol-ogy etc. among which Tohoku University is in the top most position with a percentage of 1%.

5.7. Preferred Journals for Research Communi-cations

The research output of T.U (847 articles) was reported in a total of 125 journal titles. Among these, top 15 titles accounted 32% share, and these titles constitute the core journals of interests to the fac-ulty.

Table-7: Core Journal Titles for Research Communications

Sl.No.	Name of Journal	Freq.	%	CU %
1	Indian Journal of Physics	18	2.13	2.13
2	Indian Journal of Physics and Proceedings of the Indian Association for the Cultivation of Science	18	2.13	4.26
3	Current Science	15	1.77	6.03
4	Journal of Applied Polymer Science	13	1.53	7.56
5	Journal of Polymer Materials	9	1.06	8.62
6	Journal of Applied Physics	8	0.94	9.56
7	Applied Optics	6	0.71	10.27
8	Journal of Nanoscience and Nanotechnology	4	0.47	10.74
9	Molecular Simulation	4	0.47	11.21
10	Energy Sources part a-recovery Utilization and Environmental effects	4	0.47	11.68
11	Journal of Food Science and Technology-Mysore	3	0.35	12.03
12	Journal of Macromolecular Science part a-Pure and Applied Chemistry	3	0.35	12.38
13	Computational and Theoretical Chemistry	2	0.24	12.62
14	Physical Review d	2	0.24	12.86
15	Molecular Simulation	2	0.24	13.1

All the core journals are from reputed publishing houses like Elsevier Ireland Ltd., NISCAIR, Springer, Taylor & Francis Ltd. and Indian Association of Cultivation Science etc.

5.8. Citation Impact of Publication

The publications of T.U received a total of 4763 citations on these 14 years i.e. from 1999 – 2012. The average citation per item is 5.7. The citations data were drawn from the source database on May, 2013. The citation trend shows consistent rise in the impact of T.U's research papers.

Out of 847 publications, 103 highly cited items received 11-20 times citations each. Besides, 162 publications did not receive even a single citation, 131 received 1 citation and 251 received 2-5 citations each.

Table-8: Citation Map of the Publications

Year	Publication	Total Citation	Cu. Citatation	% of total citation
1999	4	17	17	0.36
2000	9	82	99	1.72
2001	10	145	244	3.04
2002	18	133	377	2.79
2003	17	262	639	5.50
2004	23	357	996	7.50
2005	43	475	1471	9.97
2006	42	427	1898	8.96
2007	58	619	2517	13.00
2008	78	559	3076	11.74
2009	80	576	3652	12.09
2010	117	557	4209	11.69
2011	148	407	4616	8.55
2012	200	147	4763	3.09
Total	847	4763		100.00

Table-9: Citation of contributions

Range of Citations	Items Count	Total Citations Received	% of total	Cu %
0	162	0	0	0
1	131	131	2.75	2.75
2—5	251	865	18.16	20.91
6—10	132	784	16.46	37.37
11—20	103	1221	25.64	63.01
21—30	39	694	14.57	77.58
31—40	21	559	11.74	89.32
41—90	8	509	10.69	100
0—90	847	4763	100.00	

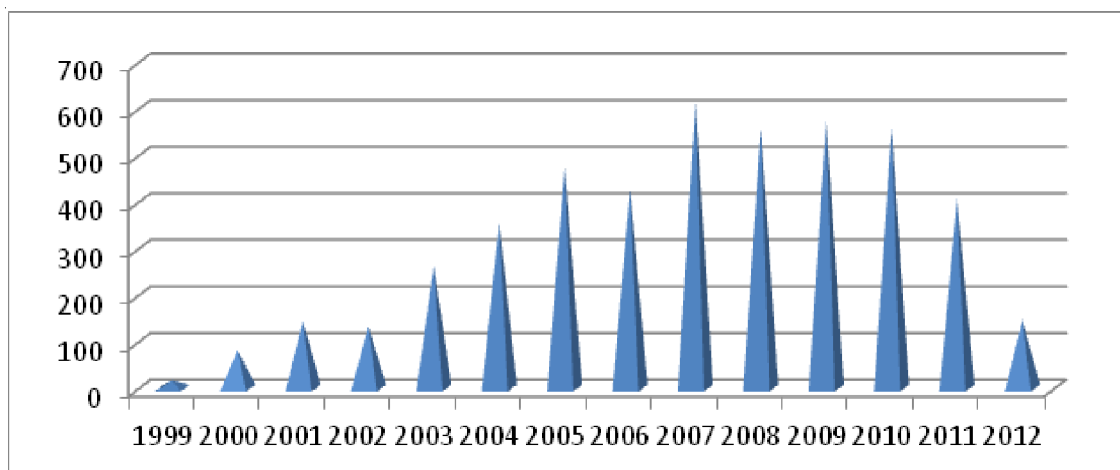


Figure. 5: Citation Mapping

6. Conclusion

As the study covers research papers from 1999 to 2012, in between these 14 years 847 contributions of T.U are found in WoS. Since the time of establishment, T.U is contributing in an increasing trend towards International science. The study also confirms that scholarly publications constitute the best available basis to assess research performance. Tezpur University shows a good scenario of impressive progress in the fields of research.

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