Scientometric Analysis of Research Output in Science in Tamil Nadu Universities

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Abstract

This paper presents a Scientometric analysis of the research output in Science in Tamil Nadu Universities. The analysis covers mainly the number of publications, authorship pattern, Subject-wise distribution of publications and Country-wise distribution of publications. Three authored research is more in number and it works out to more than one fourth of the total publications. Also it is found that research by two authors is about 25 percent. On the whole more than 50 per cent of the publications are by two to three authors

Keywords

Scientometrics, Science research Output, Universities; Tamil Nadu
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Introduction

The terms *bibliometrics* and *scientometrics* have been introduced almost simultaneously in the same year in 1969. Scientometrics is defined as "the application of those quantitative methods which are dealing with the analysis of science viewed as an information process". According to these interpretations, Scientometrics is restricted to the measurement of science communication, whereas bibliometrics is designed to deal with more general information processes.

Review of Literature

LaponKandeishein and Prebor (2011) [1]presented the state of bibliographical research in the discipline of Hebrew printing during a 30-year period, ranging from the latter quarter of the twentieth century until the beginning of the third millennium (1976-2006). Krampen, Eye and Schui (2011)[2] studied bibliometric data on psychology publications from 1977 through 2008 are modelled and forecasted for the 10 years following 2008. Kumar Suchetan and et. al. (2012)[3] Bibliometric method is most often used in the field of library and information science; as well it has an equal applicability in other areas also. In fact, in many research fields use of bibliometric methods is carried out to explore the impact of their field, the impact of a set of researchers, or the impact of a particular paper etc. Bibliometrics are now used in quantitative research assessment exercises of academic output. Dhanavandan and Tamizhchelvan (2014)[4] studied the research articles published and its citation from Universities in South Tamil Nadu. During period from 2009 to 2013, 377 articles were published which include, in the year 2009, 81 (21.49%) articles were published by three universities sand 45 citations were identified from Indian Citation Index

Objectives

The important objectives of the study are:

1. To identify the quantum of research productivity of Tamilnadu Universities as included in Web of Science database during the period from 1991 to 2015
2. To identify the country-wise publication distribution of research productivity of scholars from Tamilnadu Universities
3. To analyse the authorship pattern of Tamilnadu University faculty and scholars in research productivity in various disciplines
4. To study the trend in authorship pattern in State and Deemed Universities

5. To identify the subject-wise publication of research productivity of scholars from Tamilnadu Universities

Methodology

This present study entitled ***"Scientometric analysis of research output in science of Tamilnadu Universities"*** is a case study encompassing records output by Tamilnadu Universities downloaded from the ISI Thompsons Web of Science Database. Initially the query was formulated using Address India for a period from 1991 to 2015. From the result page using the analysis option the publications of various institutions are displayed. From the results of the analysis, the Tamilnadu Universities are checked and thus the query is refined. Hence the resultant query was one using OR operator in between the name of the universities and time span 1991-2015. The total number of records as a result of this query was 34338. These records includes those collaborative publications among the Universities as a single unit. Hence, in order to ascertain the exact number of publications from each University, the search was again made under each University separately for the same period and this resulted in a sum total of 38343. The difference between the total number of records downloaded by using OR operator and downloading the records for individual universities separately and by summing up the total count is due to the inter-university collaborations. Hence, the total number of records is counted as 34338 while analyzing the output of all the Universities together and while analyzing the output of individual universities, their individual output is considered which counts to 4602.

Analysis and Interpretation

Table 1 : Trend of Research Productivity in State Universities

Year	Publications	Percent	Growth rate
1991	388	1.18	
1992	374	1.14	-0.04
1993	438	1.33	0.17
1994	488	1.48	0.11
1995	538	1.64	0.10
1996	577	1.75	0.07
1997	640	1.95	0.11
1998	661	2.01	0.03
1999	732	2.23	0.11
2000	820	2.49	0.12
2001	712	2.17	-0.13
2002	773	2.35	0.09
2003	947	2.88	0.23
2004	1138	3.46	0.20
2005	1219	3.71	0.07
2006	1359	4.13	0.11
2007	1606	4.88	0.18
2008	2255	6.86	0.40
2009	1896	5.77	-0.16
2010	1912	5.82	0.01
2011	2253	6.85	0.18
2012	2881	8.76	0.28
2013	2783	8.46	-0.03
2014	2867	8.72	0.03
2015	2623	7.98	-0.09
	32880	100	0.09

Table 1 shows the trend of research in state universities. From the year 1991 onwards there is no uniformity in the growth or decline in research productivity. The growth rate is also not uniform. It is observed that there is negative growth in the years 1992, 2001 and 2013. At the same time, the average growth rate works out to 0.09 which is positive. The inference is that, there is positive growth in research productivity in the State Universities.

The doubling time d = 25 x log (2)/ (log (2623) – log (388)

= 25 x 0.693/ 7.87 – 5.96

= 17.4/ 1.91

Doubling time d = 9.1

That is, the research productivity in Tamil nadu State funded universities will double in 9 years.

Table 2 Subject-wise Distribution of research in State Universities

University/Subject	1	2	3	4	5	6	7	8	9	10	11	12	Total
Chemistry	1660	1352	1218	849	623	750	489	10	183	143	3	0	7280
Physics	1859	1351	769	724	909	447	266	2	236	104	3	0	6670
Biological Sciences	655	1400	866	658	635	320	179	620	65	134	12	6	5550
Medicine	436	1755	1444	209	215	342	77	38	28	53	10	2	4609
Engineering	1668	259	497	50	47	186	99	0	27	24	3	0	2860
Materials Science	607	139	194	55	45	130	152	0	31	27	0	0	1380
Mathematics	187	164	79	59	102	218	18	1	41	43	0	0	912
Science & Technology - Other Topics	157	179	126	166	117	78	8	47	11	20	1	0	910
Social Sciences	184	163	188	28	45	25	12	28	22	31	27	0	753
Environmental	192	99	202	39	60	88	18	4	16	26	6	0	750
Computer Science	381	75	90	33	28	63	10	2	21	27	0	0	730
Plant Sciences	9	57	182	108	67	36	5	0	1	9	0	2	476
	7995	6993	5855	2978	2893	2683	1333	752	682	641	65	10	32880

1.Anna University
2.University of Madras
3.Annamalai University of Madras
4.Madurai Kamaraj University
5.Bharathidasan University
6.Bharathiar University
7.Alagappa University
8.Tamil Nadu Veternery University
9.Periyar University
10. Manonmaniam Sundaranar University
11. Tamil University
12. Tamil Nadu Agricultural University

Table 2 shows the research productivity of State Universities in various subjects. It is found that:

- Anna University has the highest research productivity in the field of Physics followed by Engineering and chemistry. Research in other fields are not so remarkable.
- University of Madras has the highest research productivity in Medicine followed by Biology, Physics and Chemistry
- Annamalai University has the highest research productivity in Medicine followed by Chemistry, Biology and physics
- Madurai Kamaraj University has the highest research productivity in Chemistry followed by physics and biology
- Bharathidasan University has the highest research productivity in Physics followed by biology and chemistry
- Bharathiar University has the highest productivity in the field of chemistry followed by physics and biology
- Alagappa University has the highest productivity in the field of chemistry followed by physics and biology
- Tamilnadu Veterinary University has the highest productivity in Biology
- Periyar University and Manonmaniam Sundaranar University has more research in the fields of Chemistry, Physics and Biology

Table 3 - Authorship pattern in State Universities

No of Authors	Publications	Percent
1	923	2.81
2	8712	26.50
3	8238	25.05
4	6277	19.09
5	4471	13.60

6	2101	6.39
7	932	2.83
8	534	1.62
9	267	0.81
10	134	0.41
More than 10	291	0.89
	32880	100.00

Majority of the reviews reveal that most of the research in the present age is collaborative in nature and this is attested by Table 3. From this table it can be inferred that the scholars from State Universities of Tamilnadu prefer to do collaborative research rather than solo. Three authored research is more in number and it works out to more than one fourth of the total publications**.** Also it is found that research by two authors is about 25 percent. On the whole more than 50 per cent of the publications are by two to three authors. Here also, it is to be noted that, as the number of authors increases above three, the number of publications decreases. This indicates that the optimum number of authors in a publication by scholars from Tamilnadu State Universities is two to three.

Table 4 - Country of Publication

S.No	Country	Publications	Percent
1.	USA	8447	24.60
2.	England	8439	24.58
3.	Netherlands	5195	15.13
4.	India	4540	13.22
5.	Germany	1536	4.47
6.	Switzerland	1262	3.68
7.	Denmark	707	2.06
8.	Japan	376	1.09
9.	Ireland	361	1.05
10.	South Korea	331	0.96
11.	Singapore	288	0.84
12.	France	269	0.78
13.	Poland	212	0.62
14.	Romania	190	0.55
15.	Nigeria	180	0.52
16.	China	171	0.50
17.	Canada	161	0.47
18.	Italy	152	0.44
19.	Czech	123	0.36
20.	United Arab	112	0.33
21.	Australia	106	0.31
22.	Iran	96	0.28
23.	Serbia	93	0.27
24.	Bulgaria	89	0.26
25.	Brazil	72	0.21
26.	Hungary	61	0.18
27.	Austria	58	0.17
28.	Turkey	52	0.15
29.	Spain	50	0.15
30.	Croatia	49	0.14
31.	Scotland	45	0.13
32.	New Zealand	42	0.12
33.	Pakistan	36	0.10
34.	Norway	34	0.10
35.	Taiwan	33	0.10
36.	Israel	31	0.09
37.	Bangladesh	31	0.09
38.	Malaysia	27	0.08
39.	Thailand	24	0.07
40.	Slovakia	22	0.06
41.	Kenya	22	0.06
42.	Chile	18	0.05
43.	Sweden	18	0.05
44.	Greece	17	0.05
45.	South Africa	16	0.05
46.	Lithuania	14	0.04
47.	Benin	13	0.04
48.	Jordan	13	0.04
49.	Slovenia	11	0.03
50.	Argentina	11	0.03
51.	Costa Rica	9	0.03
52.	Saudi Arabia	8	0.02
53.	Yugoslavia	8	0.02
54.	Russia	7	0.02
55.	Mexico	7	0.02
56.	Ethiopia	6	0.02
57.	West Indies	5	0.01
58.	Hong Kong	5	0.01
59.	Colombia	5	0.01
60.	Trinid &	4	0.01
61.	Belgium	4	0.01
62.	Wales	2	0.01
63.	Latvia	2	0.01
64.	Kuwait	2	0.01
65.	Bahrain	1	0.00
66.	Venezuela	1	0.00
67.	Uganda	1	0.00
68.	Nepal	1	0.00
69.	Macedonia	1	0.00
70.	Philippines	1	0.00
71.	Panama	1	0.00
72.	Ukraine	1	0.00
		32880	100.00

Research Publications by scholars from Tamilnadu Universities are published in journals from 72 countries of the world of which USA (24.6%) and England (24.58%) take a major share of nearly one fourth of the total output. India ranks fourth in the research output by Scholars from Tamilnadu with 13.22 per cent. From the percentage analysis it can be inferred that scholars from Tamilnadu publish their research findings mostly in journals from foreign countries.

Findings

From the year 1991 till the year 2015, there is considerable increase in the research productivity and without any reason, there is decline during the year 2015. The research productivity of Tamilnadu Universities will double in 7.7 years or simply 8 years. The research productivity by State Universities are classified according to the Web of science subject categories and presented in Table 2. It is found that more research is done in the field of chemistry followed by Physics and Biology. Nearly sixty percent of the research is in the fields chemistry, Physics and Biology. The remaining 40 percent of research is in the fields like medicine, engineering, materials science, mathematics etc. The results of the study show that the scholars from State Universities of Tamilnadu prefer to do collaborative research rather than solo. Three authored research is more in number and it works out to more than one fourth of the total publications**.** Also it is found that research by two authors is about 25 percent. On the whole more than 50 per cent of the publications are by two to three authors. Research Publications by scholars from Tamilnadu Universities are published in journals from 72 countries of the world of which USA (24.6%) and England (24.58%) take a major share of nearly one fourth of the total output. India ranks fourth in the research output by Scholars from Tamil nadu with 13.22 per cent.

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