Research Productivity of Government Aided Technical Education Institutions of Tamilnadu: A Scientometric Dimension

J Arumugam
{jacs1986tvl@gmail.com }

Librarian, PSG College of Technology, Coimbatore[1], India.

Abstract. Scientometric dimensions have been applied to present a qualitative and quantitative analysis of publications of government aided technical education institutions of Tamilnadu. Data for the study have been collected from Scopus database for the period of 2000-2019.This paper highlights the scientific parameters such as year wise growth pattern, Authorship pattern, most prolific authors with impactful sources, institution affiliations, collaborative countries, citation at national and international level. This paper also analyzes the highly cited papers of the authors and institutional source impact. There is an increasing trend in the publications for the last ten years since the government has come up with various initiates of measuring the research productivity and its impact in the education and scientific environment..

Keywords: Research Productivity, Technical Institutions, Coimbatore Institute of Technology, PSG College of Technology, Thiagarajar College of Engineering, Scientometrics.

1 Introduction

Building research capacity is a common aim at an institutional level, as well as at national and international levels **(Wootton, 2013).**In the academic and industry settings, researchers are highly encouraged to engage in scientific research and publish study results in a timely manner using the best possible platform **(Agarwal, et. al., 2016).**Every institution strives to build its research capacity by all means financial, motivational, non-financial, morally so as to prove its worthiness in the current working field. The institutions wish to measure the research output or research impact of its employees. Some measure the research output by taking publication count into account while others use some indices and metrics to measure the impact of the research. Both these methods are used to assess the research performance of individual researchers or groups of researchers. Research productivity, or just productivity, refers to the amount and quality of scholarly output collectively produced by a group of researchers / institutions **(Rawls, 2018).** It is a total number of research publications of faculty members working in education institutions. It may be individual research productivity, departmental research productivity, institutional research productivity or a county's productivity.

ICCAP 2021, December 07-08, Chennai, India

DOI 10.4108/eai.7-12-2021.2314505

2 Aim And Objectives Of The Study

The present study was conducted to examine the research productivity of the faculty members of Government aided Technical higher education institutions of Tamilnadu for the period of 2000-2019.

- To examine the evolution and growth metrics of research output of selected Government aided technical HEIs in Tamilnadu
- To explore author-metrics of research output of selected Government aided technical HEIs in Tamilnadu
- To explore the geo-metrics of research output of selected Government aided technical HEIs in Tamilnadu
- To explore the source and institutional metrics of research output of selected Government aided technical HEIs in Tamilnadu

3 Literature Review

Pradhan and Ramesh (2017) performed a scientometric evaluation of engineering research at Indian Institutes of Technology Madras and Bombay during 2006-2015. The data for the study was downloaded from Scopus database. The findings of this study revealed that the researchers from IITM published 5378 papers and the researchers from IITB published 4430 papers on various aspects of engineering sciences in different type of document sources. The scientists of IITM published their papers in 771 journals published from 31 countries including India and the scientists of IITB published their papers in 593 journal titles published from 29 different countries including India. It indicates that about 33.48% papers by the scientists of IITM and 39.25% papers by IITB were published in journals originating from the USA. The number of papers published in journals from UK was almost the same for both IITM and IITB. The share of papers published by the authors of two institutions in journals published from India was 6.27% and 4.42% respectively by both the institutions. More number of papers published by researchers from IITB was highly cited as compared to IITM.

Mandhirasalam (2016) applied Bibliometric and scientometric techniques to present a quantitative and qualitative analysis of the publication output of PSG College of Technology (PSGCT), Coimbatore. Data for the study have been collected from the Scopus database for the period 1971 to 2014. Among the 2357 papers published in the span of 44 years, highest number of 319 papers was published in 2012. 2112 papers (89.6%) were published during the last ten years i.e. from 2005 to 2014. Journal is the most preferred channel of publication with 1633 papers. 'H' Index of PSGCT is 41. This study reveals that PSGCET has largely contributed to research in science, engineering and technology and the publication output of faculty has increased considerably during the last 10 years.

Bid (2016) dealt with the analysis of publications of Indian Institute of Technology Kharagpur (IIT Kharagpur) during 2000 to 2015 appeared in SCOPUS database. It attempts to analyze the growth and development of research activity of IIT Kharagpur as reflected in publications output. Data for a total of 18927 have been downloaded and analysed according to objectives. The study reveals that the growth of literature follows the exponential growth pattern, journal articles are the most published form of literature (74.37%), Journal of Applied Polymer Science and Journal of Applied Physics are top journals, Jadavpur University and

National Institute of Technology are top collaborating institutions/university with Indian Institute of Technology, Kharagpur. The highly productive subject areas are engineering and materials science, computer science, physics and astronomy. US, Germany and UK are the most favored countries for collaborations and authorship pattern analysis shows that degree of collaboration (0.95) significantly high.

4 Need And Significance Of The Study

To understand the technical education institutions research productivity in terms of quantity as well as the quality to promote the research and innovation in the engineering stream. Technical education institutions are analyzed for this study to improvise the scientific publications with good number of global citation.

5 Limitations Of The Study

The present study covers all forms of scholarly communications of the faculty members of three government aided institutions in Tamilnadu who have secured at least in Top 100 ranking are taken into consideration. Only technical HEIs are included under the purview of the study for the period of 20 years (2000-2019). The study is limited to the research productivity as indexed in Scopus database.

6 Methodology

The researcher has selected the Scopus database to download the required data. Since Scopus has more coverage of journals than Web of Science, the researcher has decided to download the required data i.e. research productivity of three government aided Technical higher education institutions from Scopus database for the period of 2000 to 2019.The research output of select government aided Technical HEIs includes 8423 records approximately. BIBEXCEL, Bibliometrix and Biblioshiny, VOS Viewer and SPSS Ver.23 are used for analyzing the exported data.

7 Data Analysis And Intrepretation

Year wise Growth Distribution of Institutions

Table 1 shows the year wise growth distribution of selected government aided technical education institutions in Tamilnadu for the period 2000-2019. 20 years of publication record for PSG College of Technology, Coimbatore, Coimbatore Institute of Technology, Coimbatore Thiagarajar College of Engineering, Madurai has been taken for this study. The below table has the calculated data for relative growth rate, Doubling time, Annual relative growth rate and annual growth rate.

Institutions	PSG					CIT					TCE				
Year	No. of Records	RGR	DT	ARoG	AGR	No. of Records	RGR	DT	ARoG	AGR	No. of Records	RGR	DT	ARoG	AGR
2000	28	-	-	-	-	4	-	-	-	-	6	-	-	-	-
2001	31	0.75	0.93	1.11	0.11	7	1.01	0.69	1.75	0.75	15	1.25	0.55	2.50	1.50
2002	38	0.50	1.39	1.23	0.23	7	0.49	1.41	1.00	0.00	20	0.67	1.04	1.33	0.33
2003	47	0.40	1.75	1.24	0.24	10	0.44	1.57	1.43	0.43	24	0.46	1.50	1.20	0.20
2004	89	0.48	1.44	1.89	0.89	14	0.41	1.71	1.40	0.40	29	0.37	1.88	1.21	0.21
2005	134	0.45	1.53	1.51	0.51	16	0.32	2.15	1.14	0.14	47	0.41	1.71	1.62	0.62
2006	166	0.37	1.86	1.24	0.24	47	0.59	1.17	2.94	1.94	57	0.34	2.04	1.21	0.21
2007	211	0.33	2.08	1.27	0.27	49	0.38	1.81	1.04	0.04	67	0.29	2.38	1.18	0.18
2008	192	0.23	3.02	0.91	0.09	54	0.30	2.31	1.10	0.10	117	0.37	1.90	1.75	0.75
2009	231	0.22	3.14	1.20	0.20	53	0.23	3.05	0.98	0.02	121	0.28	2.52	1.03	0.03
2010	216	0.17	4.08	0.94	0.06	58	0.20	3.45	1.09	0.09	146	0.25	2.72	1.21	0.21
2011	282	0.19	3.73	1.31	0.31	93	0.26	2.71	1.60	0.60	213	0.28	2.44	1.46	0.46
2012	371	0.20	3.44	1.32	0.32	98	0.21	3.25	1.05	0.05	183	0.19	3.60	0.86	0.14
2013	331	0.15	4.60	0.89	0.11	128	0.22	3.09	1.31	0.31	225	0.20	3.55	1.23	0.23
2014	402	0.16	4.42	1.21	0.21	200	0.27	2.54	1.56	0.56	277	0.20	3.51	1.23	0.23
2015	411	0.14	5.01	1.02	0.02	184	0.20	3.49	0.92	0.08	318	0.19	3.71	1.15	0.15
2016	349	0.10	6.65	0.85	0.15	116	0.11	6.45	0.63	0.37	212	0.11	6.44	0.67	0.33
2017	325	0.09	7.87	0.93	0.07	87	0.07	9.41	0.75	0.25	197	0.09	7.65	0.93	0.07
2018	397	0.10	7.07	1.22	0.22	109	0.09	8.13	1.25	0.25	258	0.11	6.45	1.31	0.31
2019	412	0.09	7.49	1.04	0.04	122	0.09	7.92	1.12	0.12	206	0.08	8.86	0.80	0.20

Table 1: Year wise Growth of Publications

As shown in the table 1, 4223 records were published by PSG College of Technology, and there is an increasing trend from the year 2005 onwards with the relative growth rate of 0.45, average years of publication 7.29. Whereas Coimbatore Institute of Technology, Coimbatore has published 1461 documents with average year of publication 6.7 and Thiagarajar College of Engineering, Madurai has 2739 records of publication in its credit with the average year of publication is 6.78. It is clearly evident that PSG College of Technology has a good record of publications with the relative growth rate.

Authorship pattern and Degree of Collaboration

Table 2 identifies the Authorship pattern, degree of collaboration, Collaborative Author Index, Average Authors per Paper and Authors Productivity efficiency. PSG College of Technology has 4442 authors work in its credit which includes 81 single authors, 4361 multiple authored documents. 0.95 documents per author is getting published with 1.05 authors per document and 1.07 collaborative index. Whereas Coimbatore Institute of Technology has 1600 authors contributed in which 12 single authored documents, 1588 multi authored documents.CIT has collaboration index of 1.1. 2914 authors are involved the research productivity of Thiagarajar College of Engineering in which 21 are single authored documents, 2893 is multi authored documents, 0.94 documents per author, 1.06 authors per document and 1.07 is the collaboration index.

Year	Total articles	No of authors	Single Author	CAI	More than Two Authors	CAI	DC	RSA	AAPP	PPA
PSG	4223	4442	81	52.49	4361	164.05	1.03	0.02	1.05	0.95
CIT	1461	1600	12	21.59	1588	165.85	0.22	0.00	1.10	0.91
TCE	2739	2914	21	20.74	2893	165.90	1.06	0.01	1.06	0.94

Table 2. Authorship pattern and Degree of Collaboration

The above table shows Thiagarajar College of Engineering has the degree of collaboration of 1.06 followed by PSG College of Technology 1.03 and 0.22 Coimbatore Institute of Technology.

Most Prolific Authors of Institutions

Table 3 describes the most prolific authors of the studied institutions with number of articles published and fractionalization of articles by the author of the institutions.

PSG			CIT			TCE		
Authors	Articles	Articles Fractionalized	Authors	Articles	Articles Fractionalized	Authors	Articles	Articles Fractionalized
DEVADASAN SR	155	40.24	MUTHUKUMARASAMY N	163	35.38	BASKAR S	95	32.90
SIVANANDAM SN	114	46.20	MURUGAN N	131	49.74	VENKATESH P	85	27.87
THILAGAVATHI G	105	44.15	SELLADURAI V	82	29.47	SUKANESH R	82	34.22
RAJASEKARAN S	83	51.45	AGILAN S	80	16.15	RAJARAM S	81	31.03
RAMACHANDRAN T	83	28.58	BALASUNDARAPRABHU R	72	14.58	THIRUVENGADAM SJ	79	28.47
BALASUNDARAPRABHU R	81	16.18	VELAUTHAPILLAID	68	12.68	KAMARAJ N	76	30.53
SUMATHI S	80	35.00	THAMBIDURAI M	57	10.87	BALAMURUGAN NB	73	27.49
JEROME J	75	28.58	THIRUMARIMURUGAN M	46	13.22	SHALINIE SM	67	28.75
KRISHNARAJ V	74	23.31	SENTHIL TS	44	10.44	RAJU S	60	17.19
MUTHUKUMARASAMY N	72	14.48	RAJESWARI A	42	17.70	JAWAHAR N	59	21.45

Table 3. Most Prolific Authors of Institutions

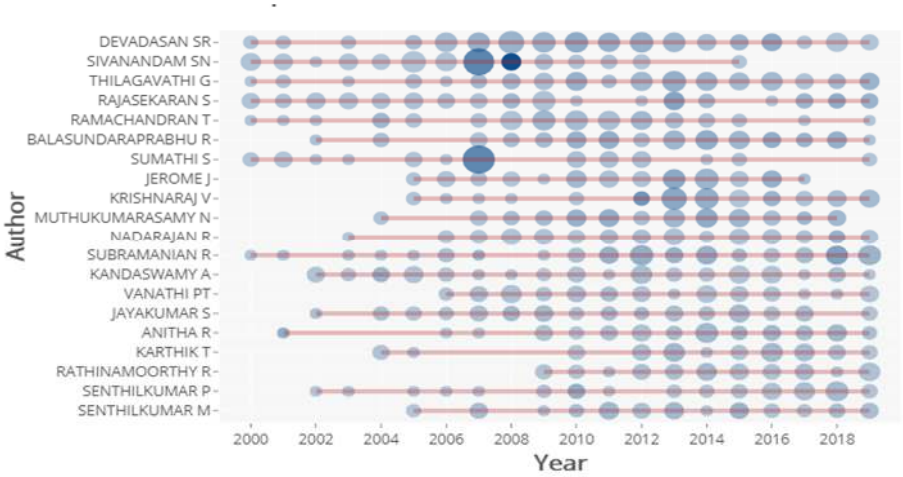

Figure 1. PSG –Top 10 Authors Productivity over the period (2000-2019)

Figure 1 shows Dr.S R Devadasan is the most prolific author of PSG College of Technology over the period with 155 articles, followed by Dr.S N Sivanandam 115 articles and Dr.G Thilagavathi 105 documents in their credits.

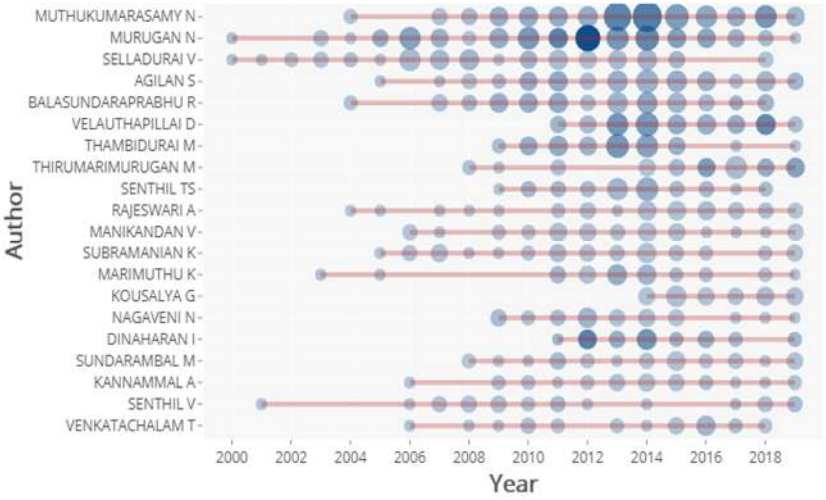

Figure 2. CIT –Top 10 Authors Productivity over the period (2000-2019)

Figure 2 shows Dr.N Muthukumarasamy is the most prolific author of Coimbatore Institute of Technology over the period with 163 articles, followed by Dr. N Murugan 131 articles and Dr.V Selladurai 82 documents in their credits.

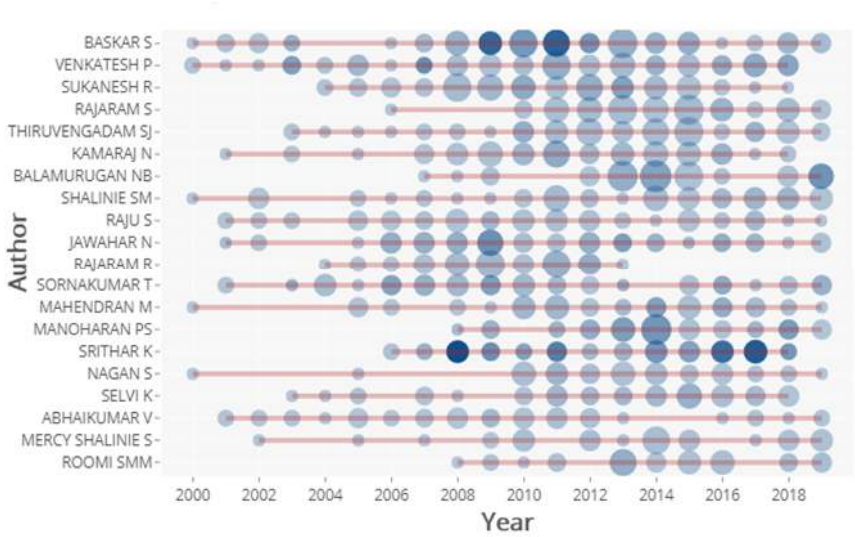

Figure 3. TCE –Top 10 Authors Productivity over the period (2000-2019)

Figure 3 shows Dr.S Baskar is the most prolific author of Thiagarajar College of Engineering over the period with 95 articles, followed by Dr. P Venkatesh 85 articles and Dr.R Sukanesh 82 documents in their credits.

Predominant Source of Publication

Table 4 describes the predominant source of publications by the analyzed institutions for the study period. International Journal of Applied Engineering Research is the most preferred journal by all three institutions

PSG		**CIT**		**TCE**	
Sources	**Articles**	**Sources**	**Articles**	**Sources**	**Articles**
INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	97	INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	62	INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	103
INDIAN JOURNAL OF FIBRE AND TEXTILE RESEARCH	83	EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	32	LECTURE NOTES IN COMPUTER SCIENCE	38
EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	59	ADVANCED MATERIALS RESEARCH	21	COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE	36
ASIAN TEXTILE JOURNAL	58	JOURNAL OF MATERIALS SCIENCE: MATERIALS IN ELECTRONICS	21	ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	35
MAN-MADE TEXTILES IN INDIA	48	PROCEDIA COMPUTER SCIENCE	20	EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	30
STUDIES IN COMPUTATIONAL INTELLIGENCE	48	ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	16	JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA): ELECTRICAL ENGINEERING	30

				DIVISION	
JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH	44	MATERIALS AND DESIGN	14	LECTURE NOTES IN ELECTRICAL ENGINEERING	21
COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE	39	CLUSTER COMPUTING	13	APPLIED MECHANICS AND MATERIALS	20
JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA) PART TX: TEXTILE ENGINEERING DIVISION	36	INTERNATIONAL JOURNAL OF CHEMTECH RESEARCH	13	INTERNATIONAL REVIEW OF ELECTRICAL ENGINEERING	19
JOURNAL OF THE TEXTILE INSTITUTE	36	OPTIK	13	AIP CONFERENCE PROCEEDINGS	18

Table 4. Predominant Source of Publication

Institutional Source Impact

The below table shows the most institutions source impact for PSG College of Technology with the parameters of h-index, g-index, m-index , Total citations and number of publications. International Journal of Applied Engineering Research is most impactful source with h-index of 4 and total citation of 39, International Journal of Fibre and Textile Research has h-index 16 and total citation of 829 followed by European Journal of Scientific Research with 253 citations.

PSG College of Technology- Source Impact						
Source	**h_ index**	**g_ index**	**m_ index**	**TC**	**NP**	**PY_ start**
INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	4	4	0.4	39	97	2011
INDIAN JOURNAL OF FIBRE AND TEXTILE RESEARCH	16	24	0.76	829	83	2000
EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	8	14	0.57	253	59	2007
ASIAN TEXTILE JOURNAL	4	4	0.19	53	58	2000
MAN-MADE TEXTILES IN INDIA	4	4	0.2	30	48	2001
STUDIES IN COMPUTATIONAL INTELLIGENCE	4	5	0.28	48	48	2007
JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH	6	10	0.375	175	44	2005
COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE	6	10	0.54	133	39	2010
JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA), PART TX: TEXTILE ENGINEERING DIVISION	4	14	0.19	223	36	2000
JOURNAL OF THE TEXTILE INSTITUTE	11	16	0.78	351	36	2007
APPLIED MECHANICS AND MATERIALS	4	4	0.44	38	34	2012
ASIAN DYER	4	4	0.28	27	32	2007

Table 5. PSG College of Technology- Source Impact

Table 6 shows source impact for Coimbatore Institute of Technology with the parameters of h-index, g-index, m-index , Total citations and number of publications. International Journal of Applied Engineering Research is most impactful source with h-index of 2 and total

citation of 15, Journal of Materials Science: Materials in Electronics has h-index 11 and total citation of 276 followed by European Journal of Scientific Research with 118 citations.

Coimbatore Institute of Technology-- Source Impact						
Source	**h_index**	**g_index**	**m_index**	**TC**	**NP**	**PY_start**
INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	2	2	0.28	15	62	2014
EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	7	9	0.58	118	32	2009
ADVANCED MATERIALS RESEARCH	4	4	0.33	32	21	2009
JOURNAL OF MATERIALS SCIENCE: MATERIALS IN ELECTRONICS	11	16	1.1	276	21	2011
PROCEDIA COMPUTER SCIENCE	7	11	0.63	137	20	2010
ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	3	5	0.375	36	16	2013
MATERIALS AND DESIGN	14	14	1.16	1078	14	2009
CLUSTER COMPUTING	2	3	0.66	19	13	2018
INTERNATIONAL JOURNAL OF CHEMTECH RESEARCH	5	6	0.41	49	13	2009
OPTIK	8	13	1	199	13	2013
PROCEEDINGS OF 2011 INTERNATIONAL CONFERENCE ON PROCESS AUTOMATION, CONTROL AND COMPUTING, PACC 2011	4	7	0.4	57	13	2011
SUPERLATTICES AND MICROSTRUCTURES	9	12	1.28	154	13	2014

Table 6. Coimbatore Institute of Technology- Source Impact

Table 7 shows source impact for Thiagarajar College of Engineering publications. International Journal of Applied Engineering Research is most impactful source with h-index of 2 and total citation of 21 Journal of the Institution of Engineers (India): Electrical Engineering Division has h-index 9 and total citation of 186 followed by European Journal of Scientific Research with 105citations.

Thiagarajar College of Engineering-- Source Impact						
Source	**h_index**	**g_index**	**m_index**	**TC**	**NP**	**PY_start**
INTERNATIONAL JOURNAL OF APPLIED ENGINEERING RESEARCH	2	2	0.25	21	103	2013
LECTURE NOTES IN COMPUTER SCIENCE (INCLUDING SUBSERIES LECTURE NOTES IN ARTIFICIAL INTELLIGENCE AND LECTURE NOTES IN BIOINFORMATICS)	4	6	0.25	76	38	2005
COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE	4	5	0.33	54	36	2009
ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	4	4	0.57	53	35	2014
EUROPEAN JOURNAL OF SCIENTIFIC RESEARCH	6	9	0.5	105	30	2009
JOURNAL OF THE INSTITUTION OF ENGINEERS (INDIA): ELECTRICAL ENGINEERING DIVISION	9	12	0.43	186	30	2000
LECTURE NOTES IN ELECTRICAL ENGINEERING	3	4	0.375	26	21	2013
APPLIED MECHANICS AND MATERIALS	3	3	0.33	30	20	2012
INTERNATIONAL REVIEW OF ELECTRICAL ENGINEERING	4	5	0.4	56	19	2011

AIP CONFERENCE PROCEEDINGS	2	2	0.18	12	18	2010
2018 NATIONAL POWER ENGINEERING CONFERENCE, NPEC 2018	2	2	0.66	12	17	2018
APPLIED SOFT COMPUTING JOURNAL	12	17	0.66	645	17	2003

Table 7.Thiagarajar College of Engineering-- Source Impact

Predominant Collaborative Institutions

Table 8 shows the predominant collaborative institutions by the institutions of study. PSG College of Technology has collaborated more with Coimbatore Institute of Technology, Anna University, Kumaraguru College of Technology and so on. Coimbatore Institute of Technology has affiliated vise versa with PSG College of Technology, Anna University, Government College of Technology, Coimbatore. Thiagarajar College of Engineering has published more articles with Anna University, Sethu Institute of Technology and Velammal College of Engineering and Technology respectively.

PSG		**CIT**		**TCE**	
Affiliations	**Articles**	**Affiliations**	**Articles**	**Affiliations**	**Articles**
COIMBATORE INSTITUTE OF TECHNOLOGY	180	PSG COLLEGE OF TECHNOLOGY	161	ANNA UNIVERSITY	167
ANNA UNIVERSITY	159	ANNA UNIVERSITY	83	SETHU INSTITUTE OF TECHNOLOGY	85
KUMARAGURU COLLEGE OF TECHNOLOGY	128	GOVERNMENT COLLEGE OF TECHNOLOGY	55	VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY	61
BANNARI AMMAN INSTITUTE OF TECHNOLOGY	99	UNIVERSITY COLLEGE OF BERGEN	50	K.L.N. COLLEGE OF ENGINEERING	58
PSG INSTITUTE OF ADVANCED STUDIES	99	KARUNYA UNIVERSITY	42	KAMARAJ COLLEGE OF ENGINEERING AND TECHNOLOGY	58
PSG COLLEGE OF ARTS AND SCIENCE	61	KUMARAGURU COLLEGE OF TECHNOLOGY	40	MEPCO SCHLENK ENGINEERING COLLEGE	55
NATIONAL INSTITUTE OF TECHNOLOGY	59	BHARATHIAR UNIVERSITY	37	KALASALINGAM UNIVERSITY	33
BHARATHIAR UNIVERSITY	50	ERODE SENGUNTHAR ENGINEERING COLLEGE	36	MADURAI KAMARAJ UNIVERSITY	32
KARPAGAM COLLEGE OF ENGINEERING	48	SEOUL NATIONAL UNIVERSITY	29	VIT UNIVERSITY	26
PSG INSTITUTE OF TECHNOLOGY AND APPLIED RESEARCH	46	KONGU ENGINEERING COLLEGE	28	SYED AMMAL ENGINEERING COLLEGE	23

Table 8. Predominant Collaborative Institutions

Collaborative Countries

Table 9 describes the institution publications collaborated with other countries. PSG College of Technology has collaborated with Iran, China, and USA and so on. Coimbatore Institute of Technology has collaborated with Korea, Mexico and USA. Thiagarajar College of Engineering has collaborated with Malaysia, Singapore, and USA and so on.

PSG						CIT						TCE					
Country	Articles	Freq	SCP	MCP	MCP_Ratio	Country	Articles	Freq	SCP	MCP	MCP_Ratio	Country	Articles	Freq	SCP	MCP	MCP_Ratio
INDIA	2156	0.97073	2049	107	0.04	INDIA	682	0.930 42	629	53	0.07	INDIA	1273	0.963 664	1205	68	0.05
IRAN	16	0.0072	0	16	1	KOREA	33	0.045 02	0	33	1	MALAYSIA	22	0.016 654	0	22	1
CHINA	9	0.00405	0	9	1	MEXICO	4	0.005 46	0	4	1	USA	5	0.003 785	0	5	1
USA	9	0.00405	1	8	0.88	USA	4	0.005 46	0	4	1	SINGAPORE	4	0.003 028	0	4	1
KOREA	6	0.0027	0	6	1	NORWAY	3	0.004 09	0	3	1	AUSTRALIA	3	0.002 271	0	3	1
CANADA	3	0.00135	0	3	1	SAUDI ARABIA	2	0.002 73	0	2	1	SOUTH AFRICA	3	0.002 271	0	3	1
FRANCE	3	0.00135	0	3	1	SOUTH AFRICA	2	0.002 73	0	2	1	UNITED KINGDOM	3	0.002 271	0	3	1
JAPAN	3	0.00135	0	3	1	FRANCE	1	0.001 36	0	1	1	BRAZIL	2	0.001 514	0	2	1
MALAYSIA	3	0.00135	0	3	1	ITALY	1	0.001 36	1	0	0	CHINA	2	0.001 514	0	2	1
NETHERLANDS	3	0.00135	0	3	1	MALAYSIA	1	0.001 36	0	1	1	IRAN	2	0.001 514	0	2	1

Table 9. Collaborative Countries

Highly Cited Documents

Table 10 highlights the highly cited documents of PSG College of Technology for the study period. Article published in Journal of Manufacturing Technology, 2005 authored by Dr.SR Devadesan has received 21 local citations and 51 global citations. Dr.G Thilagavathy has published a article in Indian Journal of fibre Textile research, 2207 has received 100 global citations.

PSG College of Technology					
Document	**DOI**	**Year**	**Local. Citations**	**Global. Citations**	**Local Citations (%)**
DEVADASAN SR, 2005, J MANUF TECHNOL MANAGE	10.1108/17410380510609456	2005	21	51	41.18
ANANDAKUMAR H, 2014, J COMPUT SCI	10.3844/jcssp.2014.745.754	2014	12	31	38.71
PAI GAV, 2009, IEEE TRANS EVOL COMPUT	10.1109/TEVC.2009.2014360	2009	10	45	22.22
ANANDAKUMAR H, 2017, CLUSTER COMPUT	10.1007/s10586-017-0798-3	2017	10	100	10.00
THILAGAVATHI G, 2007, INDIAN J FIBRE TEXT RES		2007	9	70	12.86
RAMESH G, 2007, J MANUF TECHNOL MANAGE	10.1108/17410380710722890	2007	9	89	10.11
DEVADASAN SR, 2006, TQM MAG	10.1108/09544780610647865	2006	9	28	32.14

VINODH S, 2008, INT J PROCESS MANAGE BENCHMARKING	10.1504/IJPMB.2008.017960	2008	9	17	52.94
ANANDAKUMAR H, 2017, INTELL AUTOM SOFT COMP	10.1080/10798587.2017.1364931	2017	9	59	15.25
VINODH S, 2010, INT J ADV MANUF TECHNOL-a	10.1007/s00170-009-2142-4	2010	8	34	23.53
ANANDAKUMAR H, 2018, COMPUT ELECTR ENG	10.1016/j.compeleceng.2017.09.016	2018	8	101	7.92
DEVADASAN SR, 2003, INT J QUAL RELIAB MANAGE	10.1108/02656710310476525	2003	7	24	29.17

Table 10- PSG College of Technology Highly Cited Documents

Table 11 highlights the highly cited documents of Coimbatore Institute of Technology for the study period. Article authored by Dr.M Thambidurai (2013) has received 8 local citations and 39 global citations. Dr.N Gokilamani (2013) article has received 53 global citations followed by Dr.S Gopalarishanan has received 96 global citations as shown in the table 11.

Coimbatore Institute of Technology					
Document	**DOI**	**Year**	**Local. Citations**	**Global. Citations**	**Local Citations (%)**
THAMBIDURAI M, 2013, MATER LETT	10.1016/j.matlet.2012.10.036	2013	8	39	20.51
GOKILAMANI N, 2013, J SOL GEL SCI TECHNOL	10.1007/s10971-013-2994-9	2013	7	53	13.21
GOPALAKRISHNAN S, 2011, MATER DES	10.1016/j.matdes.2010.05.055	2011	7	96	7.29
GOKILAMANI N, 2013, J MATER SCI MATER ELECTRON	10.1007/s10854-013-1261-8	2013	6	26	23.08
THAMBIDURAI M, 2013, J MATER SCI MATER ELECTRON-a	10.1007/s10854-013-1103-8	2013	6	16	37.50
THAMBIDURAI M, 2011, J MATER SCI MATER ELECTRON	10.1007/s10854-011-0342-9	2011	6	29	20.69
SENTHIL TS, 2010, MATER SCI ENG B SOLID STATE ADV TECHNOL	10.1016/j.mseb.2010.04.009	2010	6	44	13.64
KANNAN T, 2006, J MATER PROCESS TECHNOL	10.1016/j.jmatprotec.2006.03.157	2006	6	90	6.67
ASHOK KUMAR B, 2012, MATER DES	10.1016/j.matdes.2012.03.038	2012	5	105	4.76
SHANMUGA SUNDARAM N, 2010, MATER DES	10.1016/j.matdes.2010.04.035	2010	5	88	5.68
KAVITHAMANI A, 2009, IEEE REG 10 ANNU INT CONF PROC TENCON	10.1109/TENCON.2009.5396219	2009	5	11	45.45
RAMAKRISHNAN VM, 2018, MATER RES BULL	10.1016/j.materresbull.2017.09.017	2018	4	45	8.89

Table 11-Coimbatore Institute of Technology- Highly Cited Documents

Table 12 reports the highly cited documents published by of Thiagaraja College of Engineering, Madurai for the study period. Article authored by Dr.A Ravi (2011) has received 12 local citations and 76 global citations. Dr.V Velmurugan (2008) article has received 226 global citations.

Thiagaraja College of Engineering					
Document	**DOI**	**Year**	**Local. Citations**	**Global. Citations**	**Local Citations (%)**

RAVI A, 2011, SOL ENERGY	10.1016/j.solener.2011.08.020	2011	12	76	15.79
VELMURUGAN V, 2008, ENERGY CONVERS MANAGE	10.1016/j.enconman.2008.05.010	2008	12	226	5.31
VELMURUGAN V, 2008, ENERGY	10.1016/j.energy.2008.07.001	2008	12	134	8.96
KANNAN S, 2009, IEEE TRANS POWER SYST	10.1109/TPWRS.2008.2004737	2009	11	132	8.33
SARAVANAN M, 2007, ELECTR POWER SYST RES	10.1016/j.epsr.2006.03.006	2007	11	283	3.89
VENKATESH P, 2003, IEEE TRANS POWER SYST	10.1109/TPWRS.2003.811008	2003	9	314	2.87
MURUGAVEL KK, 2010, APPL ENERGY	10.1016/j.apenergy.2009.07.023	2010	8	176	4.55
KALIDASA MURUGAVEL K, 2008, DESALINATION-a	10.1016/j.desal.2007.01.062	2008	8	118	6.78
VELMURUGAN V, 2007, DESALINATION	10.1016/j.desal.2006.12.012	2007	7	114	6.14
BANUMATHI A, 2007, J MED SYST	10.1007/s10916-007-9057-0	2007	7	15	46.67
KANNAN S, 2005, IEEE TRANS POWER SYST	10.1109/TPWRS.2004.840451	2005	7	189	3.70
KANNAN S, 2004, ELECTR POWER SYST RES	10.1016/j.epsr.2003.12.009	2004	7	194	3.61

Table 12-Thiagarajar College of Engineering- Highly Cited Documents

8 Findings and Suggestions

- PSG College of Technology, Coimbatore has the highest research productivity compared to Coimbatore Institute of Technology and Thiagarajar College of Engineering, Madurai. The growth of publication is in exponential pattern for the 20 years of period.
- Many of the articles are published as multi authored documents by all the government aided technical higher education institutions in Tamilnadu.
- Dr.S R Devadasan from PSG College of Technology, Dr.N Muthukumarasamy from Coimbatore Institute of technology and Dr.S Baskar are the most prolificauthors of the analyzed institution with highest publications and citations for the study period.
- Journals are the predominant source of publication by all the institutions where as International Journal of Applied Engineering Research is the journal having the highest number of publications by all the institutions.
- PSG College of Technology has collaborated with Coimbatore Institute of Technology for the publications in various journals. These 3 institutional collaborations with NITs and IIT are to be improved.
- Textile Journals has received global citations more than 100 compared to other journals published by studied institutions.
- Material Science is the one of the subject has good number of publications by the referenced institutions.
- Many of the articles were collaborated with Indian institutions apart from USA, Iran, Korea , Malaysia and so on.

9 Conclusion

This paper highlights the various scientometric dimensions of government aided technical institutions in Tamilnadu. It is a timely study to understand the position of institutions where the improvement need to be done inorder to produce the high quality research dynamics in the engineering domain. Research productivity of various institutions can map the gap of research and curriculum in the global scenario. This kind of research to be encourage by the funding bodies to bridge the applications and theory especially in the engineering stream. Nowadays Government has taken various measures to develop the research quality of the institutions by ranking the institution periodically with various dimensions of educational impact. This paper can provide a good insight on institutional performance and its development scientifically.

References

[1] Agarwal, A., Durairajannayagam, D., Tatagari, S., Esteves, S.C., Harlev, A., Henkel, R., Roychoudhury, S., Homa, S., …Bashiri, A. (2016). Bibliometrics: tracking research impact by selecting the appropriate metrics. Asian Journal of Andrology, 18, 296-309. doi: 10.4103/1008-682X.171582.

[2] Bid, S. (2016). Indian Institute of Technology, Kharagpur: A Scientometric study of Research Output. SSARSC International Journal of Library Information Network and Knowledge, 1(1), 1-15.

[3] Mandhirasalam, M. (2016). Research Output of PSG College of Technology, Coimbatore : A Scientometric Study. SRELS Journal of Information Management, 53(3), 229-235. Retrieved from http://www.informaticsjournals.com/index.php/srels/article/view/6400.

[4] Pradhan, B., & Ramesh, D. B. (2017). Scientometrics of Engineering Research at Indian Institutes of Technology Madras and Bombay during 2006-2015. DESIDOC Journal of Library & Information Technology, 37(3), 213–220. https://doi.org/10.14429/djlit.37.3.10967.

[5] Rawls, M.W.(2018). Assessing Research Productivity from an Institutional Effectiveness Perspective: How Universities Inflfluence Faculty Research Productivity. Thesis submitted to Virginia Commonwealth University. Retrieved from https://scholarscompass.vcu.edu/etd/5471.

[6] Wootton, R. (2013). A simple, generalizable method for measuring individual research productivity and its use in the long-term analysis of departmental performance, including between-country comparisons.Wootton Health Research Policy and Systems, 11(2), 1-14.

[7] M. Tholkapiyan, A.Mohan, Vijayan.D.S , “A survey of recent studieson chlorophyll variation in Indian coastal waters”, IOP Conf. Series: Materials Science and Engineering 993 (2020) 012041, doi:10.1088/1757-899X/993/1/012041.