

SCIENTOMETRIC ANALYSIS OF PUBLICATION OUTPUT OF TUMKUR UNIVERSITY FACULTY: A STUDY BASED ON SCOPUS DATABASE

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This paper presents Scientometric analysis of publication output of Tumkur University Faculty reflected in the Scopus Database for a period of 15 years i.e. from 2005 to 2019 (data downloaded on Feb 2019.). A total of 646 records have been retrieved from the database. The paper analyses the growth rate of research publications of Tumkur University in terms of publications, author productivity, and authorship pattern. The findings of the study reveal that the Average Growth Rate was 1.15 years while the mean doubling time was 0.88 years. The maximum number of publications (116) was published in the year 2015. Prof. S.C. Sharma former Vice-Chancellor has the highest citations. Photoluminescence is the highest occurrence key word. Tumkur University faculty collaborates with the University of Mysore with 127 publications. Multi-authored publications are more compared to single-authored publications therefore there is a growing collaborative trend of research publication.

Keywords: Authorship Pattern, Doubling time, Relative Growth Rate, Research Publications, Scientometrics, Scopus Database, Tumkur University

INTRODUCTION

Tague-Sutcliffe (1992) defines “Scientometrics as a study of the quantitative aspects of science as a discipline or economic activity. It is a part of the sociology of science and has application to science policy-making. It involves quantitative studies of scientific activities, including, among others, publication, and so overlaps bibliometrics to some extent”. According to Kademani et al. (2006) “Scientometric evaluation is a very key component of any research and development activity. One well known productivity indicator is the number of publications produced by the scientists, institutions and countries. Studies like this will provide some insight into the complex dynamics of research activity and enable the researchers, scientists, policy makers and science administrators to provide

adequate facilities and proper guidance in which direction the research has to be conducted”. Hence, such an indispensable technique i.e. Scientometrics is used to evaluate the quality and quantity of literature published across disciplines within a particular geographical area. Lin (2006) says that the evaluation of research productivity can be conducted for various reasons in universities and research institutions. It is an important norm for recruitment, promotion, rewards, professional recognition, workload decisions, for allocation of resources and for ranking universities and research institutes. Evaluation of research productivity can reveal contributions of individuals to the advancement of the whole field and it is the chief component for measurement of development of particular field or discipline.

ABOUT TUMKUR UNIVERSITY

Tumkur University was established in 2004 in Tumkur (presently Tumakuru), Karnataka, India. It was carved out of Bangalore University to accommodate the needs of the students from Tumkur district. Established under the Karnataka State Universities Act, 2000, as a multi-faculty university, it has 12 postgraduate departments, 2 constituent colleges and 94 affiliated colleges. It established 29 research centres to promote advanced multi-disciplinary research and academic collaborations. In 2012, the university was recognized under section 12(b) of the UGC Act, 1956. In the same year, the National Assessment and Accreditation Council (NAAC), an inter-university council of the UGC, accredited the University with “B” Grade in the

three-grade rating scale. (https://en.wikipedia.org/wiki/Tumkur_University)

REVIEW OF LITERATURE

Patel (2019) carried out a study on the quantitative analysis of Gujarat University research publications published during 2008-2017 based on Scopus bibliographic database to find out the annual literature growth of university, author productivity etc. 1248 records were analysed and figured out 0.96 Degree of Collaboration, as out of 1248 papers, 38 papers contributed by single author. The study inferred that 32.11 average contribution was from USA only. Batcha (2018) has made an attempt to examine the pattern of growth of literature, citation pattern and research areas and other country collaboration of the data of top six universities of Tamil Nadu published in Web of Science. The study considered the data published during 2000-2017. The study reveals that the growth of literature is appeared inconsistent way. The scientific impact of the six universities is connected with science and more than four-fifth of the literature is cited internationally. The research collaboration with other countries varies among the universities. Spectroscopy, toxicology and environmental science, ecology have been identified as the predominant research areas among the selected universities.

Bapte and Gedam (2018) performed a metric based study for quantitative analysis or research publications of SantGadge Baba Amravati University, Amravati. The bibliographic database, SCOPUS was used to gather the data for research and evaluated 1130 publications. The study reveals

that the Average Degree of Collaboration was 0.96 while the average Modified Collaborative Coefficient was 0.6289. Moreover, the study noticed that the frequency and co-occurrence of keywords denotes the core research areas in multitude subject fields in which the faculty members are engaged with. The research carried out by Khanna et al. (2017) emphasize on the research work performed by the department of physics and astronomy of Guru Nanak Dev University. The authors analyzed 652 bibliographic records from SCOPUS database. The study clearly indicates that journals are the most preferred form of publication to communicate research works by the researchers. The University had registered the average citation impact per paper of 7.01 per cent and publications received 51 to 100 citations. Among the Indian universities, GND University stood at 23rd rank in terms of publications output (652) and h-index (29), 16th rank in average citation per paper (7.01 percent) and 18th rank in share of high cited papers (1 per cent) and 19th rank in terms of international collaborative papers (27.45 per cent) during 2006-15.

Nagarkar et al. (2015) analyzed the research productivity of Life science Department of Savitribaiphule Pune University, based on bibliographic data extracted from Web of Science published in the period of 1999-2013 using bibliometric techniques and software such as HistCite, Intcoll, and Pajek. The study found that the faculty members have published a total of 690 papers in 362 journals and have received 6210 citations. The research productivity of faculty members is increasing, their publications are

getting good citations since the journals have better Impact Factor. The faculty members have collaborated with prominent international researchers and have extended interdisciplinary research. Balasubramani and Parameswaran (2014) presented the research report of Banaras Hindu University indexed in Web of Science online database published by Institute for Scientific information (ISI during 2000 to 2011). The authors evaluated 578 publications to examine the year wise distribution, authorship pattern, publication pattern etc. The study inferred that the annual average research output of BHU was 578 records and the research output of the scientists is fairly collaborative. Gopikuttan and Aswathy (2014) carried out a scientometric study on the publication productivity of the University of Kerala particularly faculty members of Science Departments and the study showed that majority of the publications were in the subject Chemistry are contributed by a two authors. Regarding Collaborative Coefficient, it varies from subject to subject. The faculty members contributed maximum number of articles at the international level.

Rautaray et al. (2013) have analysed 361 papers of KIIT University that have been indexed in Scopus database ranging from the year 2000 to early 2013. It is evident that the highest number of articles i.e. 140 was on Computer Science, followed by Engineering, and Mathematics. The researchers of KIIT University have published their papers in collaboration with 21 different countries and 20 papers of this university have been published in collaboration with researchers of United States of America, followed by

Switzerland. It is observed from the study that, KIIT University has witnessed a few visible research publications from 2000 to 2007. The top author of this university is found to have published 25 articles that have been indexed in Scopus. Majhi and Maharana (2012) conducted a scientometric analysis of research productivity of Sambalpur University (Orissa) on physical science indexed by Scopus from 1971 to 2010. The study revealed that among the broad disciplines of physical Science the contribution to chemistry research is the highest followed by physics and contribution to other discipline is very low. There is a team spirit and collaborative approach in physical science research as majority of research publications have been brought out in joint authorship. The year wise growth of research output shows that no uniform pattern of literature growth has been observed but the publication output is more in recent years than before.

OBJECTIVES OF THE STUDY

The main objectives of the study are as following:

- ❖ To know the growth of literature in terms of research publications of faculty of Tumkur University;
- ❖ To find out the Relative Growth Rate and Doubling Time of publication;
- ❖ To study the authorship pattern;
- ❖ To find out the institutional collaboration with Tumkur University; and
- ❖ To know the preferred channels of communication.

METHODOLOGY

The data for the study were retrieved from the Scopus database by using the keyword “Tumkur University” for a period of fifteen years. A total of 646 records have been found. Downloaded data have been entered into an excel sheet for analysis and tabulation as per the objectives of the study. To compute Relative Growth Rate (RGR) and Doubling time (Dt); Degree of Collaboration (DC); Collaborative Index (CI) and Collaborative Co-efficient (CC) the following formula have been used.

$$R = (\text{Loge}W_2 - \text{Loge}W_1)(T_2 - T_1)$$

Where,

LogeW2 = log of the final number of articles/pages after a specific period of interval

LogeW1 = log of the initial number of articles/pages

T2 = final time (e.g. in years)

T1 = initial time (e.g. in years)

$$Dt = 0.693/R$$

Where,

Dt = Doubling Time

R = Relative Growth Rate

Collaborative Index

$$CI = \frac{\sum A_j = 1jfi}{N}$$

$$\text{Degree of Collaboration (DC)} = \frac{Nm}{Nm + Ns}$$

Where,

Nm = No. of Multi-author Publication

Ns = No. of Single Author

$$\text{Collaborative Coefficient (CC)} = \frac{1 - (f_1 + (f_2/2) + (f_3/3) + (f_4/4) + (f_5/5) + \dots + (f_k/k))}{N}$$

Where,

f₁= single author

f₂= Two Author

f₃= Three Author

f₄= Four Author

f₅= Five Author

f_k= “n” and more than “n” number of Author

ANALYSIS AND INTERPRETATION OF DATA

Relative Growth-Rate (RGR) and Doubling Time (Dt.)

The table 1 reveals the Relative Growth Rate and Doubling Time of research publications. The Relative Growth Rate of publications shows the exponential trend, whereas, doubling time varied. The mean relative growth rate is 1.15 years,

whereas, the mean doubling time is 0.88 year. Interestingly there is no publication during 2006 and 2009 respectively. It may be because of very rapid growth Open Access (OA) publishing has emerged. The authors thought of publishing in OA journals which may reduce the time of publishing. Another reason may be lack of infrastructure supporting system and also lack of financial support from the funding agencies.

Table 1: Relative Growth Rate (RGR) and Doubling time (Dt.)

Year	No. of Publications	CMN	Log(p)	Log 2	RGR	RGR (Mean)	Dt(p)	Dt. (p) (Mean)
2005	1	1	0.00	0.00	0.00	1.15	0	0.88
2007	1	2	0.00	0.69	0.69		1.00	
2008	2	4	0.69	1.39	0.69		1.00	
2010	5	9	1.61	2.20	0.59		1.18	
2011	30	39	3.40	3.66	0.26		2.64	
2012	51	90	3.93	4.50	0.57		1.22	
2013	73	163	4.29	5.09	0.80		0.86	
2014	90	253	4.50	5.53	1.03		0.67	
2015	116	369	4.75	5.91	1.16		0.60	
2016	77	446	4.34	6.10	1.76		0.39	
2017	106	552	4.66	6.31	1.65		0.42	
2018	78	630	4.36	6.45	2.09		0.33	
2019	16	646	2.77	6.47	3.70		0.19	

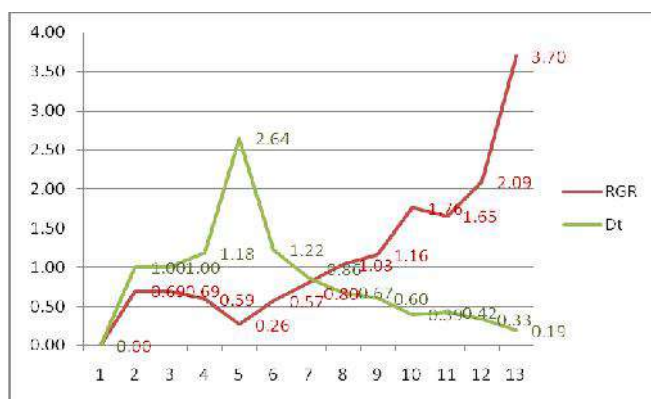


Fig.1 Relative Growth Rate and Doubling time

Year-wise distribution of publications

The figure 2 shows that a total of 646 publications were published during 2005-2019. The maximum numbers of publications (116) were published in the year 2015 and very less number of publications (1) published in the year 2005. The year wise analysis of the growth of publication output shows that the growth was peer in the year 2005 to 2019 and there is a sudden

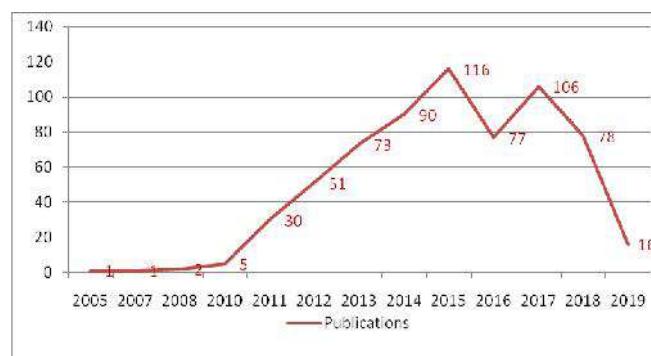


Fig.2 Year-wise distribution of publications

increased 90 to 116 publications during 2014 and 2015 respectively. The high productivity during these years may be due to reason that the university has got good number of major and minor research projects sanctioned by various funding agencies and the researchers had a chance to produce good number of publications.

Authorship Pattern

The table 2 indicates that there are 13 single authored papers, followed by two authors (41);

Table 2: Authorship Distribution

Year	TA	NP	1AP	2AP	3AP	4AP	5AP	>6AP
2005	3	1	0	0	1	0	0	0
2006	0	0	0	0	0	0	0	0
2007	3	1	0	0	1	0	0	0
2008	4	2	0	2	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	29	5	0	1	0	0	1	3
2011	142	30	1	4	3	2	4	16
2012	239	51	2	4	5	8	10	22
2013	375	73	1	4	7	5	11	45
2014	484	90	0	2	6	9	12	61
2015	593	116	3	5	6	10	30	62
2016	366	77	4	11	4	6	8	44
2017	538	106	0	6	11	12	17	60
2018	381	78	1	2	6	19	18	32
2019	84	16	1	0	0	2	3	10
Total	3241	646	13	41	50	73	114	355

Note: TA-Total Author, NP-Number of Publications, 1AP-Author Publication, 2AP & >6AP-Above Author Publications

three authors (50); four (73); five (114); five and above authors (355). Therefore, it is inferred that there is a collaborative research pattern among the teachers of the university. 646 publications were contributed by a total of 3241 authors which constitute 5.02 authors per paper.

Author Collaboration

The table 3 shows the authorship pattern and collaborative measures. Collaborative Index (CI) was lowest (3.00) during the years 2005 to 2007 and it was highest of 5.10 in the years 2014 to 2016. Which shows the status of collaborative research than solo research and it is also note that CI increased slightly during the study period.

Table 3: Author Collaboration

Block Period	TA	NP	1AP	2AP	3AP	4AP	5AP	>6AP	CI
2005-07	6	2	0	0	2	0	0	0	3.00
2008-10	29	7	0	3	0	0	1	3	4.14
2011-13	756	154	4	12	15	15	25	83	4.91
2014-16	1443	283	7	18	16	25	50	167	5.10
2017-19	1003	200	2	8	17	33	38	102	5.02

Note: TA-Total Author, NP-Number of Publication, AP-Author Publication

Table 4: Degree of Collaboration

Block Period	TA	NP	1AP	2AP	3AP	4AP	5AP	>5AP	DC
2005-07	6	2	0	0	2	0	0	0	1.00
2008-10	29	7	0	3	0	0	1	3	1.00
2011-13	756	154	4	12	15	15	25	83	0.97
2014-16	1443	283	7	18	16	25	50	167	0.98
2017-19	1003	200	2	8	17	33	38	102	0.99

Note: TA-Total Author, NP-Number of Publication, AP-Author Publication

Table 5: Collaborative Co-efficient

Block period	TA	NP	1AP	2AP	3AP	4AP	5AP	>6AP	CC
2005-07	6	2	0	0	2	0	0	0	0.67
2008-10	29	7	0	3	0	0	1	3	0.92
2011-13	756	154	4	12	15	15	25	83	0.95
2014-16	1443	283	7	18	16	25	50	167	0.96
2017-19	1003	200	2	8	17	33	38	102	0.78

Note: TA-Total Author, NP-Number of Publication, AP-Author Publication

Degree of Collaboration (DC)

The table 4 reveals the Degree of Collaboration of publications. The average DC was 1.00 during the block periods 2005-2007 and 2008-2010, it was decreased to 0.97 during 2011-2013. Again it was increased to 0.98 during 2014-2016 and 0.99 during 2017-2019. However, the DC varied during the study period.

Collaborative Co-efficient

The table 5 reveals that the value of CC increased from 0.67 to 0.96 during the year 2005 to 2016, whereas, it was slightly decreased during the years 2017 to 2019.

Average Authors Per Paper (AAPP) and Average Productivity Per Author (APPA)

The table 6 reveals the Average Authors Per Paper (AAPP). It shows that the average number of authors per paper is 5.01. The AAPP is 3.00 in the block period 2005-07 and it is increased to 4.14 in the year 2008-10. In the years i.e. 2014-16 the AAPP was highest compared to other years which show the collaborative research trend. The Average Productivity Per Author (APPA) shows that in the year 2005-07 the APPA was 0.33 and it decreased to 0.20 indicate collaborative research. This clearly indicates that the average productivity per author has been decreased during the years 2005-2019. It also indicates the decrease in the single-authored papers.

Table 6: Average Authors Per Publication and Average Productivity Per Author

Block period	NP	TA	AAPP	APPA
2005-07	2	6	3.00	0.33
2008-10	7	29	4.14	0.24
2011-13	154	756	4.91	0.20
2014-16	283	1443	5.10	0.25
2017-19	200	1003	5.01	0.20
Total	646	3241	5.01	0.20

NP-Number of publication, TA-Total Number of Author, AAPP-Average Authors Per Publication, APPA- Average Productivity Per Author

Preferred channels of Communication

The table 7 shows the preferred channels of communication by faculty members of Tumkur University in various subject areas. *Acta Crystallographica section E structure Reports Online* is the dominant journal (63) with IF 0.34 followed by *Spectrochimica Acta part A Molecular and Biomolecular Spectroscopy* (50) with IF 2.880; *Journal of Alloys and compounds*

(40) with IF 3.779. It is evident that few articles also published in the journal '*Economic and Political Weekly*' which happened to be social science journal. It is difficult task to socialize the science. In that direction faculty of science, have made wonderful work.

Frequency of Keywords

The table 8 shows that the list of keywords. "Photoluminescence" is the highest occurrence keyword followed by X-Ray Diffraction (151); Article (103) and scanning Electron Microscopy (103).

Institutional Collaboration

The table 9 shows the affiliated institutions wise research productivity during 2005 to 2019. Tumkur University faculty collaborate with the University of Mysore collaborate with 127 publication, followed by M.S. Ramaiah Institute of Technology (115); Indian Institute of Science, Bangalore (108); East West Institute of Technology (86).

Funding Agency

The table 10 reveals that majority of the works was funded by UGC followed by DST and DOST. Majority of the works were funded by UGC through minor and major research projects.

DISCUSSION AND CONCLUSION

The study found that a total 646 publications were published during 2005- 2019. The maximum number of publications (116) were published in the year 2015 and very less number of publications (1) in the year 2005 to 2007. Growth of publication was peak in the year 2005 to 2019 and there is a sudden increased 90 to 116 published in the year 2014 to 2015 respectively. This result is similar to the study conducted by

Table 7: Preferred channels of Communication

Sl. No.	Journal	Articles	Country of origin	Publisher	Impact factor
1.	Acta Crystallographica Section E Structure Reports Online	63	UK	International Union Crystallography	0.21(2015)
2.	Spectrochimica Acta Part A Molecular And Biomolecular Spectroscopy	50	Netherlands	Elsevier	2.88(2018)
3.	Journal of Alloys And Compounds	40	Netherlands	Elsevier	3.779(2018)
4.	Materials Today Proceedings	28	Netherlands	Elsevier	0.28(2018)
5.	AIP Conference Proceedings	18	USA	American Institute of Physics	0.14(2018)
6.	Journal of Luminescence	18	Netherlands	Elsevier	2.96(2018)
7.	Acta Crystallographica Section E Crystallographic Communications	17	UK	International Union Crystallography	0.450(2018)
8.	Journal of Science Advanced Materials And Devices	14	Netherlands	Elsevier	NA
9.	Materials Research Express	12	UK	IOP Publishing Ltd	1.449(2018)
10.	Journal of Molecular Structure	10	Netherlands	Elsevier	2.011(2018)
11.	Materials Research Bulletin	10	Netherlands	Elsevier	3.355(2018)
12.	International Journal of Pharmacy And Pharmaceutical Sciences	7	India	Innovate Academic Sciences Pvt. Ltd.	0.66(2018)
13.	Arabian Journal of Chemistry	6	Saudi Arabia	Kind Saud University	2.969(2018)
14.	Economic And Political Weekly	6	India	Sameeksha Trust	0.19(2018)
15.	RSC Advances	6	UK	Royal Society of Chemistry	2.936(2018)
16.	Bulletin of Materials Science	5	India	Indian Academy of Sciences	0.925(2016)
17.	Dyes And Pigments	5	Netherlands	Elsevier	3.767(2018)
18.	Journal of Asian Ceramic	5	UK	Taylor & Francis	1.24(2018)
19.	Materials Science Forum	5	Switzerland	Trans Tech Publications Ltd	0.23(2018)
20.	Optical Materials	5	Netherlands	Elsevier	2.32(2018)

Table 8: Frequency of Keywords

Sl. No.	Keywords	Total records
1.	Photoluminescence	159
2.	X Ray Diffraction	151
3.	Article	103
4.	Scanning Electron Microscopy	103
5.	Chemistry	75
6.	Phosphors	74
7.	Luminescence	70
8.	Nanophosphors	69
9.	Light Emission	68
10.	Nanoparticles	68
11.	Transmission Electron Microscopy	68
12.	Powder X-ray Diffraction (pXRD)	65
13.	Controlled Study	60
14.	Synthesis (chemical)	60
15.	Thermoluminescence	58
16.	Crystal Structure	56
17.	Unclassified Drug	56
18.	Nonhuman	55
19.	Nanophosphor	53
20.	Combustion	52

Table 9: Institutional Collaboration

Sl. No.	Name of the Institute/University	Number of publications
1.	Tumkur University, Tumakuru	646
2.	University of Mysore, Mysuru	127
3.	M.S. Ramaiah Institute of Technology, Bengaluru	115
4.	Indian Institute of Science, Bengaluru	108
5.	East West Institute of Technology, Bengaluru	86
6.	B.M.S. Institute of Technology, Yelahanka, Bengaluru	73
7.	Bangalore University, Bengaluru	69
8.	National Aerospace Laboratories, Bengaluru	61
9.	Jain University, Bengaluru	53
10.	Bharathiar University, Coimbatore	49
11.	Dayananda Sagar College of Engineering, Bengaluru	41
12.	BMS Institute of Technology and Management, Bengaluru	39
13.	Dayananda Sagar University, Bengaluru	37
14.	Acharya Institute of Graduate Studies, Bengaluru	35
15.	RashtreeyaVidyalaya College of Engineering, Bengaluru	32
16.	New Horizon College of Engineering, Bengaluru	32
17.	Siddaganga Institute of Technology, Tumakuru	31
18.	Kuvempu University, Shimogga	28
19.	Lal Bahadur Shastri Government First Grade College, Bengaluru	26
20.	Acharya Institute of Technology, Bengaluru	22

Table 10: Funding Agency

Sl. No.	Funding Agency	Place	Number of publications
1.	University Grants Commission (UGC)	New Delhi	47
2.	Department of Science and Technology, Ministry of Science and Technology (DST)	New Delhi	42
3.	Department of Science and Technology (DOST)	Butuan City	21
4.	Council of Scientific and Industrial Research (CSIR)	New Delhi	8
5.	Department of Science and Technology, Government of Kerala	Kerala	8
6.	Bangalore University (BU)	Bangalore	7
7.	Indian Institute of Science (IISc)	Bangalore	7
8.	Science and Engineering Research Board (SERB)	New Delhi	7
9.	Visvesvaraya Technological University (VTU)	Belagavi	7
10.	Jain University (JU)	Bangalore	5
11.	University Grants Committee (UGC)	New Delhi	5
12.	Department of Atomic Energy, Government of India (DAE)	Mumbai	4
13.	UGC-DAE Consortium for Scientific Research, University Grants Commission (UGC-DAE CSR)	New Delhi	4
14.	Ministry of Human Resource Development (MHRD)	New Delhi	3
15.	Société Canadienne de Pédiatrie (SCP)	Canada	3
16.	Bucksbaum Institute for Clinical Excellence	Chicago	2
17.	Central Glass and Ceramic Research Institute (CGCRI)	Kolkata	2
18.	Department of Scientific and Industrial Research, Ministry of Science and Technology (DSIR)	New Delhi	2
19.	Illinois Institute of Technology (IIT)	Illinois	2
20.	Indian Institute of Management Bangalore (IIMB)	Bangalore	2

Batcha (2018). The mean relative growth $R_t(P)$ for the 13 years i.e. 2005 to 2019 indicates a growth rate of 1.115. Additionally, the mean Doubling time $D_t(P)$ for the 13 years i.e. 2005 to 2019 indicates the growth rate of 0.88. The result resembles the study result of Majhi and Maharana (2012). The highest proportion of articles were by more than five authorship (355), followed by 114 of articles by five authors, 73 of articles by three authors, 50 articles by three authors, 41 of article by two authors and 13 of articles by single authors. There is a growing collaborative research trend in the field of

research publication. Collaborative Co-efficient was 0.67 to 0.96 from 2005-2019. The collaborative coefficient for the first block period was 0.67 and it was increased to 0.92 during the second block period. Therefore, it is inferred that there was an increasing trend which shows collaborative research trend. This result is similar to the study results of Bapte and Gedam (2018). Average number of authors per paper is 5.01 and the average productivity per author is 0.20 from the year 2005-2015 respectively. The maximum number of Average Author Per Paper i.e. 5.10 in the year 2014-2016 and minimum i.e. 3.00 in the

year 2005-2007. The maximum number of Authors productivity Per Publication i.e. 0.33 was published in the year 2005-2007 and minimum number of authors productivity i.e. 0.26 was published in the year 2011-2013 and 2017-2019. Photoluminescence is highest occurrence key word followed by x-ray Diffraction (151); Article (103) and scanning Electron Microscopy (103). The Tumkur University faculty collaborate with the University of Mysore with 127 publications, followed by M.S. Ramaiah Institute of Technology (115); Indian Institute of Science, Bangalore (108); East West Institute of Technology (86). The results resemble the results of study conducted by Nagarkar et al. (2015). Majority of the works was funded by UGC, followed by DST and DOST. Majority of the teachers have been revealed that the research growth occurred through minor and major research projects of UGC.

The Scientometric studies help to analyze the research trends in identifying the thrust areas in a discipline. Scientometric is also a significant research method to identify the growth and changes that occurred in the literature. The studies are also useful to the policy makers such as librarians, teachers, and researchers to decide the priority areas in certain domains. The Bibliometrics Laws are very useful in understanding the communication pattern in the scholarly literature which has several implications for libraries and information centers, especially in the research and development institutions.

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