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A Scientometric Profile of Science Faculty of Rashtrasant Tukadoji Maharaj Nagpur University, India during 1990-2019

ABSTRACT

Research productivity of any university is a reflection of its status quo in terms of its position in Higher Education Institution (HEI) ranking framework. This Scientometric study is an attempt to highlight the key features of research productivity of Science Faculty of Rashtrasant Tukadoji Maharaj Nagpur University based on the data collected from Web of Science database over a period of 30 years from 1990 to 2019.This article studied the publication trend by analysis of the 2229 research records. The major objectives of this study were to evaluate the research output in terms of number and type of publications, prolific and productive author, most preferred publication, citation analysis and so on. The complete research output is 2229 with an Annual Growth Rate (AGR) of 6.23 % with 11.4 % of average citations per paper. The period from year 2004 to 2019 was highly productive block with year 2015 contributing highest 7.31 % of the total number of publications during the study period. Physics was found to the core subject in which high level of quantitative as well as qualitative research has been performed by Science Faculty of the university. This paper is an attempt to portray a scientometric profile of the one of the oldest and premier university of India which will be help to highlight appropriate measures required for enhancing the research benchmark of the university to a new high.

KeyWords: Rashtrasant Tukadoji Maharaj Nagpur University, Scientometric Study, Web of Science, Research Productivity, Bibliometrix

INTRODUCTION

Universities of every country form the crucial framework of Higher Education setup which justifies that a country's capacity to generate wealth and achieve high levels of well-being is closely linked to its capacity to generate knowledge. The role of University in today's knowledge economy is based on the research productivity of the various Universities which are the top functioning unit of Higher Education Institutes (HEI's). A defining characteristic of a university is its focus to scholarly activities dealing with creation and dissemination of knowledge. Research and teaching have been the primary objectives of the institutions of higher education in India which plays an important role. The Government of India through the University Grants Commission (UGC) has been striving to strengthen the basic scientific research by giving generous support for research projects to promote research in Indian Universities. (Commission, 2013)

Eventually the quantity of research has been increased significantly during the recent years. However the quality of these publications is a matter of concern as the number of articles published in reputed journals is one of the globally accepted indicators considered for various academic purposes including institutional ranking, recruitments and promotions of faculties and award of research degrees. Even high quality publications in reputed journals help in achieving higher global ranks leading to overall improvement of quality of education. (UGC, 2018).The knowledge created by the university is not only multi-dimensional but it leads to value addition to the overall development of the country.

The Qualitative and Quantitative research productivity measurement and evaluation of these scholarly outputs have become an effective method in deciding the overall importance and significance of any University. Various tools and techniques were employed from time to time to evaluate the performance of any university with the changing dimensions of the nature, purpose and of publication pattern and so on. The most prominent methods introduced were librametry, bibliometrics, scientometrics, informetrics, webometrics and altmetrics. Though these terms are often used interchangeably,

scientometrics is the most popular term amongst all. (Gupta, 2014) Scientometric evaluation of the research productivity is found to the most appropriate and authentic method to study different aspects of research output like quantity wise analysis of publications and detail evaluation of their impact. These studies lead to justification of the overall ranking of the university by means of the evaluation of the productivity of institutional research and publication activities. To highlights how a HEI is developing and putting its efforts in contributing to the research knowledge base is facilitated by scientometric study. (Kademani B.S, 2005) These studies bring to fore the major areas of research concentration and research dynamics. University research serves as a pool of nascent research areas which enables the policy makers to address various burning issues in the country at large.

PROFILE OF RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY

The Rashtrasant Tukadoji Maharaj Nagpur University; formerly known as Nagpur University (hereafter will be referred as RTM Nagpur University) is a NAAC accredited "A" grade State University governed by Maharashtra Public Universities Act, 2016 (Mah. Act No. VI of 2017). It was established on 4th August, 1923 with six affiliated colleges and 927 students. During it's more than nine decades old of glorious journey, the university has achieved many academic excellences. At present five hundred and three affiliated colleges, three conducted colleges, and forty-four Post Graduate Teaching Departments(PGTD) are extending education to more than four Lakh students enrolled under different courses. The research attitude of the university is quite prominent in the missions of the university which is to enhance the status of Departments, Conducted and Affiliated Colleges in the fields of knowledge generation and dissemination by pro-actively supporting cutting-edge research. (University, 2019).

REVIEW OF LITERATURE

The assessment of university based research has become an area of increasing attention of stakeholders. Consequently the study of academic research output and its impact has itself brought into existence a huge amount of literature. (Bapte & Gedam, 2014) have done a scientometric study of Sant Gadge Baba

Amravati University (SGBAU), Amravati during 1996-2017based on the 1130 documents retrieved from SCOPUS database. The study reports the citation pattern, the h-index, authorship pattern and various level of collaboration of the university. It also reports the most prolific authors, the most productive and the emerging domain of research. (Gopikuttan & Aswathy, 2014) evaluated the publication productivity of University of Kerala during the period 2000 to 2012 through a scientometric study for which web of science was used as the source of data. The study analyzed the overall performance of the faculty members of Science Departments of the University by using parameters such as form-wise, year-wise, subject-wise classification of published papers, most productive authors and the most preferred journals, etc. The study also reports impact factor and the citation received. The result shows that the research productivity of the University is quite visible at international level. (Khanna, 2017) has accessed the research output of the Guru Nanak Dev University (GNDU), Amritsar in physics and astronomy during the period 2006 to 2015 based on the data extracted from SCOPUS. The study analyzed the year-wise research productivity, trend of collaborations, most prolific authors, preferred journals, number of citations received by the University during the period under study among others. The study reports that among the Indian universities, GND University stood at 23rd rank in term of publications output and h-index, 16th rank in average citation per paper and 18th rank in share of high cited papers during 2006 to 2015. (Batcha, 2018) has analyzed the various Scientometric components of the articles published by top six universities of Tamil Nadu from 2000 to 2017. The study finds out the research trend, characteristics of growth and collaboration pattern of the published literature during the period of study. The analysis of data reveals that the Average Growth Rate (AGR) increases at the rate of 9.76% and the Cumulative Average Growth Rate (CAGR) calculated for six universities are 9.76. (Kumar & others, 2016) has analyzed 648 research publications published by Maharishi Markandeshwar University during 2007 to 2015 retrieved from SCOPUS database. The study presented a comparative view of the university at national level. The findings of the study revealed that the university was ranked 5th among top 8 universities across Haryana in terms of publications output, citation, h-index and share of international collaboration. Further it ranked 3rd in regard to highly cited papers during the period of study. (Gautam & Rajani, 2015) analyzed the scholarly research trend of Banaras Hindu University during 2004 to 2013 based on the data collected from Indian

Citation Index (ICI). The major scientometric indicators which were studied include year-wise, form-wise, subject-wise distribution of research papers, co -authorship index and collaborative-coefficient, collaboration trend and distribution of citations of the papers. The results of the study indicate that the university has progressed significantly with regard to quantity of scholarly literatures.

OBJECTIVES OF THE STUDY

The main objective of this study is to analyze the publications of Science faculty of RTM Nagpur University research reported during 1990-2019 and indexed in the Web of Science database. In particular, the study aims to find:

- Scientometric profile of researches carried out by RTM Nagpur university during 1990 to 2019
- Document -wise distribution of publications
- Growth of the publications and average citations
- Most cited country
- Author impact
- Source impact
- Frequently occurred author keywords

METHODS

All peer-reviewed scientific publications relating to research productivity of RTM Nagpur University were retrieved from the Web of Science™ Core Collection Database (Clarivate Analysis, Boston, USA). (Clarivate)The search string (Rashtrasant Tukadoji Maharaj Nagpur University OR Nagpur University OR RTM Nagpur University) was used in the organisation field (i.e. OO) and results were filtered by publication year from 1990 to 2019 and further by English language. The database was restricted to Science Citation Index Expanded (SCI-Expanded) keeping in view the scope and objective of the study. The full bibliographic information along with the cited references of each record was exported in plain text format on 27 July 2020. Bibliometrix (version 1.7), an R-Tool of R-Studio (Version 3.6.1) (Aria, 2017) for comprehensive science mapping analysis, and biblioshiny, the shiny interface providing a web interface for bibliometrix, were used to import and manage the metadata from

Web of Science™. It should be noted that data collected consisted of 6 early access articles of 2020 among the total 2229 articles downloaded as on 27 July 2020 and hence these 6 articles are also considered for data analysis by default. The complete duration of data coverage ranging from 1990 to 2019 counts to 30 years of data forms the dataset of this study. The metadata for this study included print features, such as author's name, total number of publications, citations count with total citations (TC), average article citations (AAC), number of citing articles with and without self-citations, journal sources, keywords, and the author-level metrics such as h-, m-, and g indices. H-index is extensively used to measure individual scientific output. The h-index is based on the number of a researcher publications and their impact on peers (number of citations). In order to account for active research span of the author, the m-index or m-quotient (equal to the h-index divided by the number of years since the author's first publication [m-quotient= h-index/n, n =number of years since the first published paper of the scientist]) was applied. Similarly citation evolution trend and the most cited papers of a given author over time were calculated based on the g-index. The Annual Growth Rate of scientific publications was assessed applying a calculator available at www.investopedia.com/calculator/ cagr.aspx.

ANALYSIS AND INTERPRETATION

Overall Publication Performance and Growth Rate

Table 1 shows the main information about the 2229 articles collected during the study period of 1990 to 2019, a span of 30 years. We first assessed the overall publication performance in research productivity during the last 30years. In total, 2229 documents, including 1961 (87.98%) articles and 55 (9.8%) reviews, were published by 2522 authors from RTM Nagpur University. Most of the articles had more than one author with 2496 multi authored articles and only 26 single-authored research articles. Average authors per article were 1.13, average co-authors per article were 3.65, and average number of articles per author was 0.884. This suggests that most authors collaborated with three to four authors. Average number of articles per author is less than one and the number of author appearances (8132) is greater, almost 3 times than the total number of authors (2522), which shows that some authors have multiple publications.

Table 1 - Main Information about Retrieved Documents

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1990:2019
Sources (Journals, Books, etc)	588
Documents	2229
Average years from publication	10.8
Average citations per documents	11.4
Average citations per year per doc	1.208
References	50990
DOCUMENT TYPES	
Article	1961
Article; early access	6
Article; proceedings paper	98
Biographical-item	1
Correction	6
Correction, addition	1
Editorial material	9
Letter	8
Meeting abstract	38
Note	45
Reprint	1
Review	55
DOCUMENT CONTENTS	
Keywords Plus (ID)	4815
Author's Keywords (DE)	4930
AUTHORS	
Authors	2522
Author Appearances	8132
Authors of single-authored documents	26
Authors of multi-authored documents	2496
AUTHORS COLLABORATION	
Single-authored documents	49
Documents per Author	0.884
Authors per Document	1.13
Co-Authors per Documents	3.65
Collaboration Index	1.14

Annual Growth Rate and Research Productivity of RTM Nagpur University

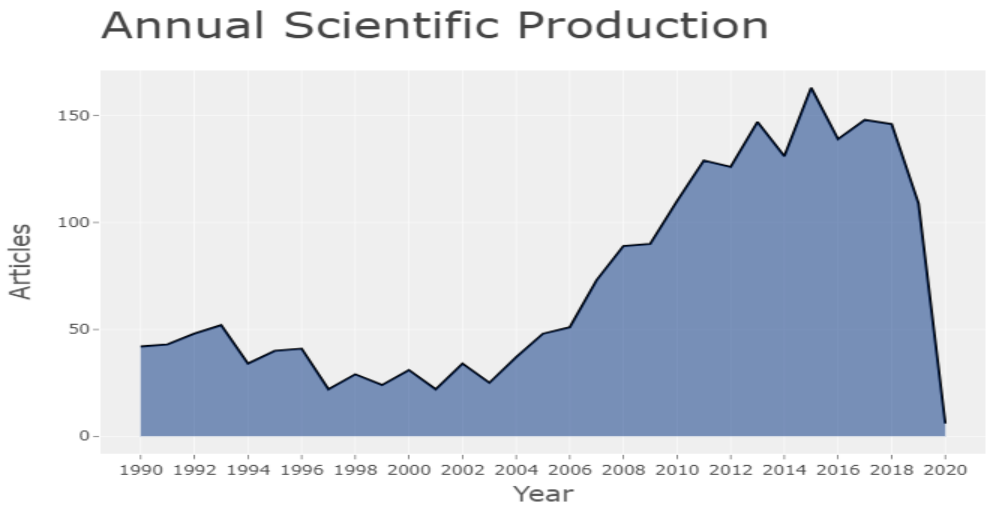
Annual Growth Rate (AGR) is indicative of the year wise growth pattern. Table 2 is indicative of the non-uniform growth trends in terms of productivity of research articles. It was found that after 2003 there was continuous progressive research trends reflected by way of the increased research output.

Table 2 shows that total publications output was very low during1990 (n=42, 1.88%) to 2003 (n =25, 1.12 %) and it was not a very encouraging publication trend quantity wise. But after 2003 there was an increasing trend with research productivity reaching a peak in 2015 (n =163, 7.31%) followed by year 2017 (n=148, 6.64%).The overall increase in research output of the university was substantial from 2010 onwards. Overall Annual Growth Rate (AGR) during the study period was found to be 6.23%. The lowest AGR was recorded in 1997 (n= 22, -46.34%). After 2003, the Annual Growth Rate (AGR) showed an increasing trend as shown in Fig. 1.

Table 2 - Year wise Research output Annual Growth Rate (AGR)

Sr.No	Year	Articles	AGR	Sr.No	Year	Articles	AGR	Sr.No	Year	Articles	AGR
1	1990	42	-	11	2000	31	29.17	21	2010	110	22.22
2	1991	43	2.38	12	2001	22	-29.03	22	2011	129	17.27
3	1992	48	11.63	13	2002	34	54.55	23	2012	126	-2.33
4	1993	52	8.33	14	2003	25	-26.47	24	2013	147	16.67
5	1994	34	-34.62	15	2004	37	48.00	25	2014	131	-10.88
6	1995	40	17.65	16	2005	48	29.73	26	2015	163	24.43
7	1996	41	2.50	17	2006	51	6.25	27	2016	139	-14.72
8	1997	22	-46.34	18	2007	73	43.14	28	2017	148	6.47
9	1998	29	31.82	19	2008	89	21.92	29	2018	146	-1.35
10	1999	24	-17.24	20	2009	90	1.12	30	2019	109	-25.34
								31	2020	6	-94.5
Annual Growth Rate (1990 to 2019) : 6.23 %										**2229**	**6.23**

Figure 1 - Annual Research Growth Productivity of RTM Nagpur University (1990 to 2019)



Citation Rate Dynamics

It was found that for 2229 retrieved documents, a total of 98,727 citations were received including self-citations. The average citation per retrieved document was calculated from table 3 and it was found to be 12.2. There was a consistent increasing citation dynamic ranging from 9.78 in 1996 to 25.97 in 2002. After 2002, the Citation per document shows a declining trend, because most newly published articles had not been cited much at the time of data extraction for this study. It was also analysed that out of 2522 authors only 10.07 % (n=254) authors does not receive single citation rest all others receives citation ranging from 1 to maximum total citation 4802 by Dhoble, S.J, followed by Moharil, S.V (n=2559) and then Kokare, D.M (n=1122). It was also found that amongst total 2522 contributors 907 authors have total citation count of more than 30 citations.

Table 3 - Citation Rate and Dynamics of research productivity

Year	N	Mean TC per Document	Mean TC per Year	Year	N	Mean TC per Document	Mean TC per Year	Year	N	Mean TC per Document	Mean TC per Year
1990	42	24.90	0.83	2000	31	17.16	0.86	2010	110	14.57	1.46
1991	43	7.84	0.27	2001	22	12.14	0.64	2011	129	13.23	1.47
1992	48	9.19	0.33	2002	34	25.97	1.44	2012	126	15.11	1.89
1993	52	13.69	0.51	2003	25	11.80	0.69	2013	147	9.84	1.41

1994	34	9.00	0.35	2004	37	21.78	1.36	2014	131	10.21	1.70
1995	40	11.35	0.45	2005	48	10.08	0.67	2015	163	10.13	2.03
1996	41	9.78	0.41	2006	51	15.37	1.10	2016	139	8.35	2.09
1997	22	15.68	0.68	2007	73	17.26	1.33	2017	148	6.83	2.28
1998	29	10.31	0.47	2008	89	18.35	1.53	2018	146	4.37	2.18
1999	24	10.96	0.52	2009	90	13.31	1.21	2019	109	1.82	1.82
Average Citation per Year(for 30 Years span (1990-2020)= 12.2											

Authorship pattern and most Prolific and Productive authors

In the entire dataset of authors, 1461 authors (57.9%) contributed only single article out of 2229 research articles and were considered “occasional” authors; 830 authors have contributed their research more extensively by writing frequently and collaboratively. This is reflected from Table 4. It was found that 394 authors (15.6%) published two papers; 214 authors (8.5%) published three papers; 222 authors (9.69%) published four or more papers. Authors who published more than one paper were considered to be “core” authors. Of the top ten contributing authors, Dhoble,S.J was ranked first in the number of published articles (n =441) whereas Moharil, S.V (n=185) had the highest h- index(30) while Kokare, D.M (n=64) had the highest m-index(1.250).It is evident from Table-5 that amongst the top 20 most productive authors, maximum ten(10) authors belongs to Physics subject specialization followed by Four(4) authors from Chemistry subject, Three(3) from Pharmaceutical Sciences , Two (2) from Mathematics and One(1) from Zoology.

Table 4 - Authorship Pattern of Research Output

Documents written	No. of Authors	Proportion of Authors	Documents written	No. of Authors	Proportion of Authors	Documents written	No. of Authors	Proportion of Authors
1	1461	0.579	16	6	0.002	38	1	0
2	394	0.156	17	8	0.003	39	1	0
3	214	0.085	18	3	0.001	41	1	0
4	97	0.038	19	3	0.001	43	2	0.001
5	68	0.027	20	5	0.002	44	1	0

6	42	0.017	23	4	0.002	51	2	0.001
7	46	0.018	24	3	0.001	55	1	0
8	33	0.013	25	1	0	58	1	0
9	22	0.009	26	3	0.001	60	1	0
10	22	0.009	27	4	0.002	61	1	0
11	15	0.006	28	4	0.002	64	1	0
12	13	0.005	30	2	0.001	78	1	0
13	9	0.004	31	2	0.001	185	1	0
14	8	0.003	33	2	0.001	441	1	0
15	9	0.004	34	3	0.001			

Table 5 - Authors Impact (Most Productive Author) based on h-index, m –index, g-index

Author	**No. of Articles**	**Core Subject Specialization**	**H_Index**	**G_Index**	**M_Index**	**Tc**	**Np**	**Py_Start**
Dhoble S J	441	Physics	28	46	0.933	4802	441	1991
Moharil S V	185	Physics	30	38	0.968	2559	185	1990
Bhoga S M	78	Physics	12	17	0.387	552	78	1990
Kokare D M	64	Pharmaceutical Sciences	20	30	1.25	1122	64	2005
Garg A N	61	Chemistry	13	20	0.419	528	61	1990
Dhoble N S	60	Physics	13	18	0.684	500	60	2002
Singh K	58	Physics	11	17	0.355	415	58	1990
SubhedarN K	55	Zoology	20	29	0.69	1016	55	1992
Dhopte S M	51	Physics	17	27	0.567	878	51	1991
Muthal P I	51	Physics	17	27	0.567	878	51	1991
Khadekar G S	44	Mathematics	7	11	0.412	169	44	2004
Gedam S C	43	Physics	10	17	0.667	356	43	2006
Subhedar N	43	Pharmaceutical Sciences	16	22	0.516	563	43	1990
Umathe S N	41	Pharmaceutical Sciences	14	23	0.667	610	41	2000
Joshi C P	39	Mathematics	12	18	0.5	429	39	1997
Pode R B	38	Physics	12	24	0.4	613	38	1991
Meshram J S	34	Chemistry	6	10	0.375	159	34	2005
Paliwal Lj	34	Chemistry	14	20	0.636	479	34	1999
Shinde K N	34	Physics	12	22	1.091	553	34	2010
Juneja H D	33	Chemistry	10	19	0.357	408	33	1993

(H-Index- Hirsch Index; Tc= Total Citations; Np Number of Publications; Py. Start= start year of publications)

Figure 2 - Most Productive Author

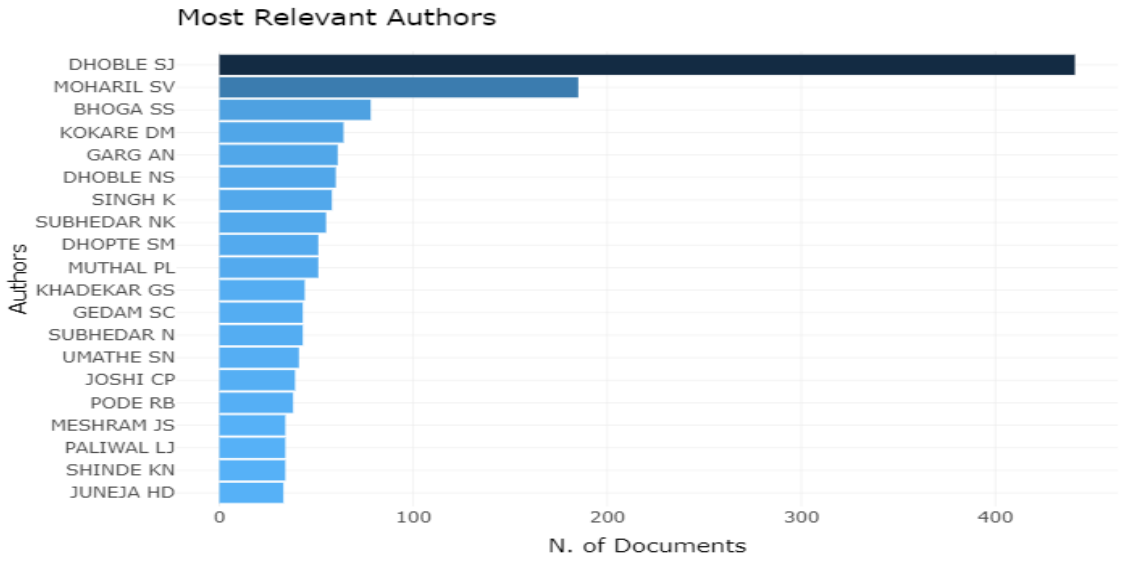
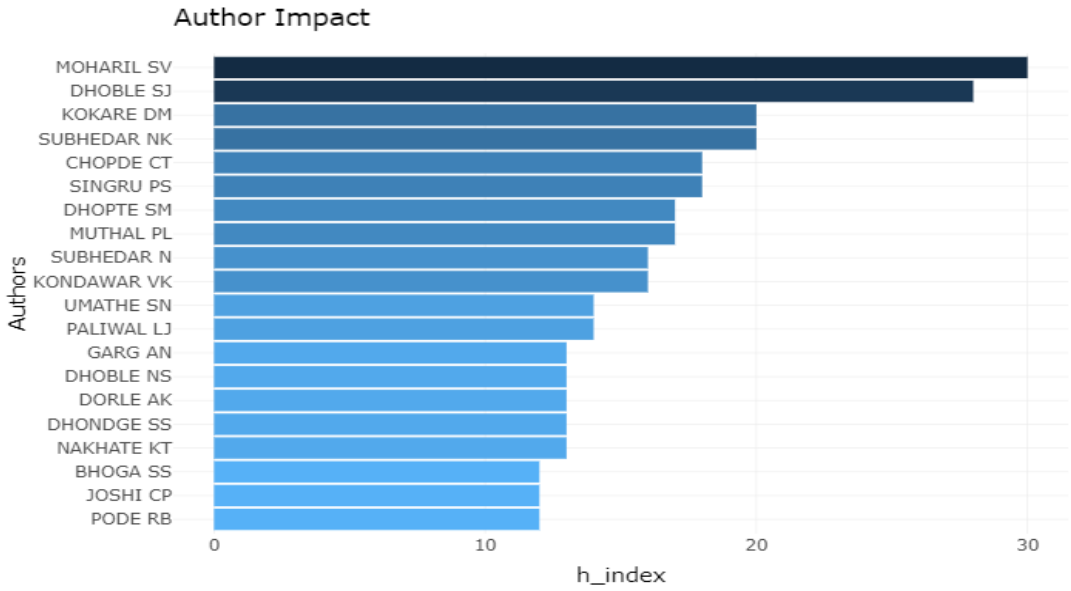


Figure 3 - Most Prolific Author (H-Index)



Core Journals and Most Sought After Source for Publication

In the 30 years of study time frame it was found that there were 588 academic journals which published papers written under the RTM Nagpur University affiliation. Journal of luminescence had the highest publication output (n =112, %), followed by LUMINESCENCE (n =111, %), OPTIK (n =37, %), and Journal of the Geological Society of India (n =34, %). The most cited journals were Journal of Luminescence (n =2104), Journal of Alloy and Compound (n =899), Solid State Ionics (n =701), Applied Physics Letters (n=655), Journal of Electrochemical Society (n =632), and Brain Research (n

=570). Journal of Luminescence had the highest h index (22), following by Brain Research (14), and Journal of Alloys and compounds (13). It was found that top 23 journals forms the major core of the journals (Zone 1) in which major chunks of the research output of RTM Nagpur university is concentrated and distributed upon. Table 6 summarized source impact of the top 20 journals publishing research output of RTM Nagpur University.

Table 6 - Source Impact of Journals based on H-Index

Source	Frequency	H_ Index	G_ Index	M_Index	Tc	Np	Py_Start
Journal Of Luminescence	112	22	31	0.733333333	1570	112	1991
Luminescence	111	11	15	0.916666667	558	111	2009
Optik	37	6	8	0.666666667	156	37	2012
Journal of the Geological Society Of India	34	7	10	0.28	140	34	1996
Radiation Effects And Defects In Solids	34	8	14	0.258064516	232	34	1990
Journal of the Indian Chemical Society	32	6	9	0.193548387	111	32	1990
Indian Journal of Chemistry Section A-Inorganic Bio-Inorganic Physical Theoretical & Analytical Chemistry	31	9	13	0.290322581	206	31	1990
Asian Journal of Chemistry	30	5	6	0.217391304	72	30	1998
Journal of Alloys and Compounds	30	13	20	0.928571429	453	30	2007
Indian Journal of Pure & Applied Physics	26	7	10	0.225806452	143	26	1990
Bulletin of Materials Science	24	7	11	0.24137931	163	24	1992
Indian Journal of Pharmacology	24	2	3	0.153846154	9	24	2008
Brain Research	21	14	21	0.5	512	21	1993
Radiation Measurements	21	9	12	0.36	187	21	1996
Solid State Ionics	21	10	15	0.322580645	261	21	1990
Current Science	20	6	8	0.2	93	20	1991
Journal of Chemical Thermodynamics	20	12	18	0.857142857	335	20	2007

Journal of Heterocyclic Chemistry	20	5	7	0.454545455	85	20	2010
E-Journal of Chemistry	19	6	7	0.461538462	74	19	2008
General and Comparative Endocrinology	18	11	16	0.35483871	267	18	1990

Figure 4 - Most Relevant Source Based on Frequency of Article Publications

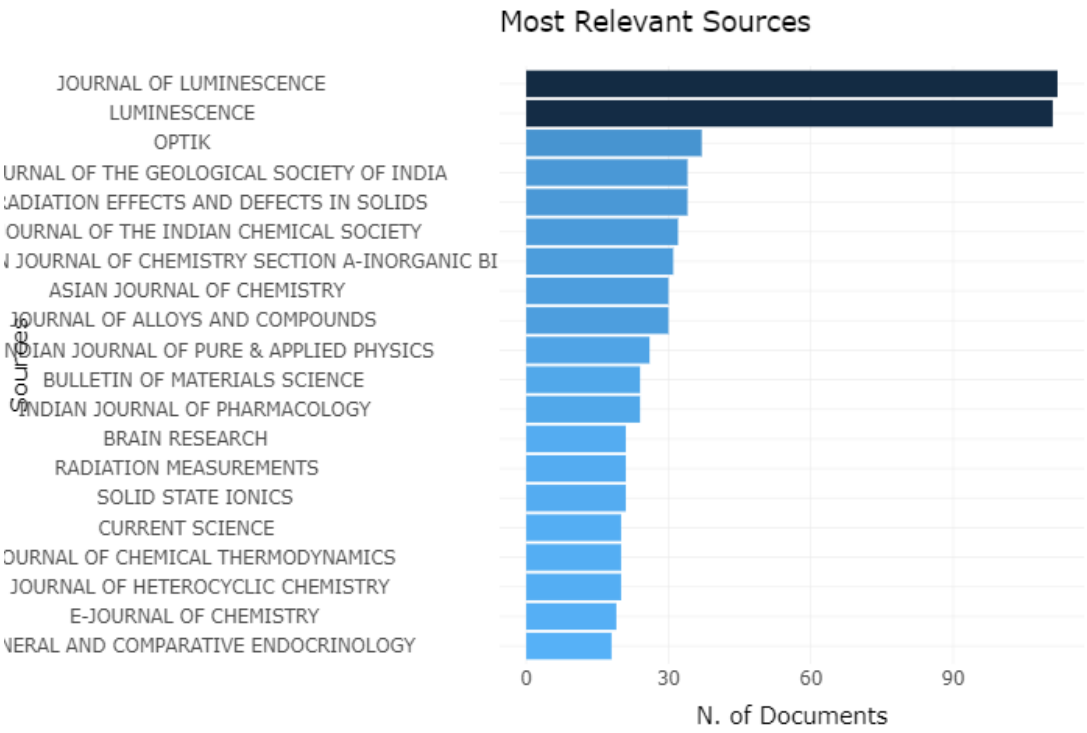
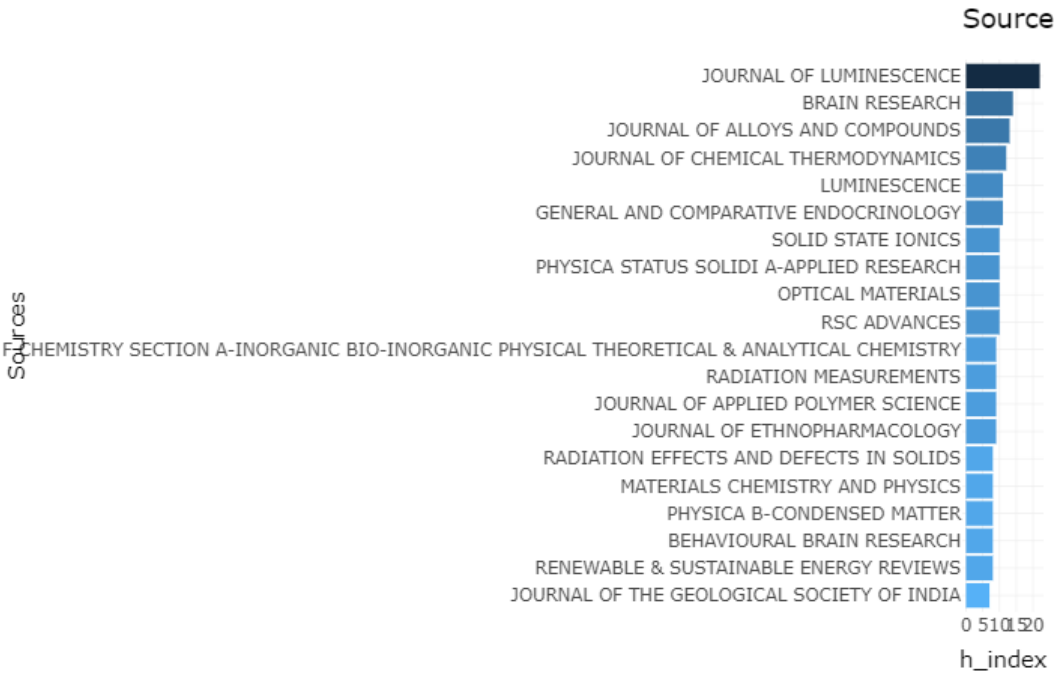


Figure 5 - Most Relevant Source based on H- index



Most Cited Author from RTM Nagpur University

Out of 2229 retrieved documents, it was found that Dhoble S.J was cited the most (n=221) followed by Singh K (n=176) and Dorenbos P (n=172). It was found that all the top three authors of the citation count list belongs to the Physics subject.

Table 7 - Citation count of Authors (Top 15)

Sr.No.	Authors	Citations	Sr.No.	Authors	Citations
1.	Dhoble S J	221	**9.**	Chandra B P	104
2.	Singh K	176	**10.**	Chen R	97
3.	Dorenbos P	172	11.	Kaulgud M V	88
4.	Singh V	156	12.	Sahare P D	87
5.	Gedam S C	140	13.	Nair G B	81
6.	Shinde K N	134	14.	Nagpure I M	79
7.	Kundal P	126	15.	Kokare D M	78
8.	Gurnule W B	118			

Citation Measure of Articles

Global citations measure the number of citations an article has received from articles contained in the entire database, in this particular case, Web of Science. Specifically, global citations measure the impact of an article in the whole bibliographic database. Table 8 shows that the most global cited article was written by Tokumitsu, H in 1990, followed by Kalyani et al. in 2012. TC per year indicates the yearly

average number of times each document has been cited. It is notable that the article by Kalyani, N T published in 2012 received the highest total TC per year i.e. 36.56.

Table 8 - Twenty Most Global Cited Documents

Sr. No.	Paper	Total Citations	Tc Per Year
1.	Tokumitsu H, 1990, J Biol Chem	659	21.2581
2.	Kalyani N T, 2012, Renew Sust Energ Rev	329	36.5556
3.	Tapas A R, 2008, Trop J Pharm Res	329	25.3077
4.	Rao M, 2002, Waste Manage	302	15.8947
5.	Bonde C G, 2004, Bioorgan Med Chem	218	12.8235
6.	Ballal M S, 2007, IEEE T Ind Electron	146	10.4286
7.	Gupta M C, 1992, Macromolecules	145	5
8.	Amnerkar N D, 2010, Eur J Med Chem	132	12
9.	Rao S N, 1999, Polyhedron	115	5.2273
10.	Sethi B, 2016, Chem Eng Process	114	22.8
11.	Bhutada P, 2011, Behav Brain Res	113	11.3
12.	Prasad V, 2011, Nat Commun	110	11
13.	Lanje A S, 2013, Adv Powder Technol	109	13.625
14.	Mangrulkar P A, 2008, J Hazard Mater	104	8
15.	Rakhunde R, 2012, Crit Rev Env Sci Tec	102	11.3333
16.	Kale A, 2008, Phytother Res	100	7.6923
17.	Achliya G S, 2004, J Ethnopharmacol	100	5.8824
18.	Thejokalyani N, 2014, Renew Sust Energ Rev	98	14
19.	Hirani K, 2002, Neuropharmacology	98	5.1579
20.	Bansiwal A, 2009, Colloid Surface B	95	7.9167

Local citations measure the number of citations an article has received from articles included in the analyzed dataset collection. Local citations measure the impact of an article in the analyzed dataset which is 2229 retrieved documents as research output of RTM Nagpur University from 1990-2019 (Table 9). The most local cited articles, with 38 citations, was authored by Dhoble, S.J (2001) followed

by 30 citations by Gedam, S.C (2007) and 28 citations were received for research article by Atone, M.S written in 1993.

Table 9 - Twenty Most Local Cited Document

Sr. No.	Document	Year	Local Citations	Global Citations
1.	Dhoble S J , 2001, J Lumin	2001	38	69
2.	Gedam S C, 2007, J Lumin-A	2007	30	44
3.	Atone M S, 1993, Phys Status Solidi A	1993	28	61
4.	Dandekar M P, 2008, Neuropsychopharmacol	2008	27	56
5.	Dhoble S J, 1993, Phys Status Solidi A	1993	26	49
6.	Gedam S C, 2006, J Lumin	2006	24	38
7.	Dhopte S M, 1991, J Phys D Appl Phys	1991	23	37
8.	Nair G B, 2015, Rsc Adv	2015	23	56
9.	Dhoble S J, 2000, Nucl Instrum Meth B	2000	22	29
10.	Gedam S C, 2007, J Lumin	2007	21	25
11.	Dhoble S J, 2008, J Mater Sci	2008	20	28
12.	Sahare P D, 1990, Radiat Eff Defect S	1990	19	35
13.	Thakre P S, 2011, J Lumin-A	2011	19	20
14.	Kokare D M, 2006, Neuropharmacology	2006	18	43
15.	Tarase M Y, 2008, J Appl Polym Sci	2008	18	33
16.	Gedam S C, 2008, J Lumin	2008	18	22
17.	Sahare P D, 1990, J Phys D Appl Phys	1990	17	62
18.	Kaulgud M Y, 1996, Indian J Chem A	1996	17	21
19.	Patil R R, 2001, Phys Status Solidi A	2001	16	32
20.	Jadhao M M, 2005, J Appl Polym Sci	2005	16	33

Most Frequently Used Words: Keyword Analysis

The most frequently used words over time in author's keywords and Keyword Plus in the articles collected were analyzed. Author keywords are a list of terms that were chosen by authors, as words that represent the overall content of the article. In author's keywords, the use of "photoluminescence "tops the list of most frequent key word used by researchers from RTM Nagpur University and it seems it was most prevalent research topic in 2014. Also luminescence and its related fields found a major research area of study by RTM Nagpur University.

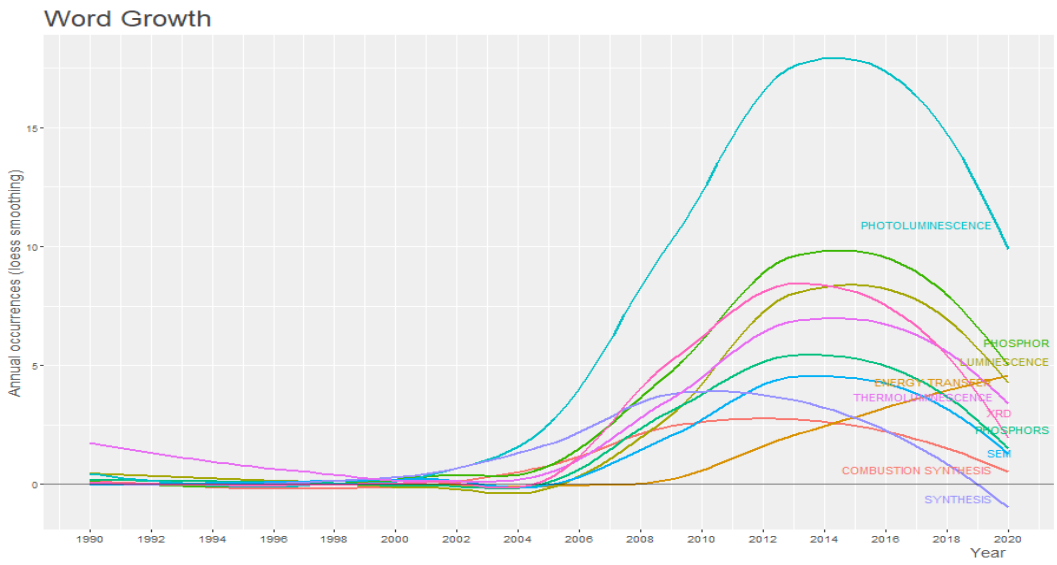
The most frequent author's keywords were "photoluminescence "(n =216), "Phosphor" (n =113), "luminescence" (n =92), "xrd" (n= 91), "thermo luminescence" (n=90), "Phosphors" (n = 60), "SEM"

(n =49), “Synthesis” (n =43), “Combustion Synthesis” (n =32). The overall keyword network visualization is presented in table-10 and figure-6 below

Table 10 - Most Frequent Used Author’s Keyword

Sr. No	Words	Occurrences	Sr. No	Words	Occurrences
1.	Photoluminescence	216	11.	X-ray diffraction	31
2.	Phosphor	113	12.	Solid state lighting	28
3.	Luminescence	92	13.	Phosphate	27
4.	Xrd	91	14.	Dosimetry	26
5.	Thermoluminescence	90	15.	Density	21
6.	Phosphors	60	16.	Immunocytochemistry	20
7.	Sem	49	17.	Optical properties	20
8.	Synthesis	43	18.	Chemical synthesis	18
9.	Combustion synthesis	32	19.	Hptlc	18
10.	Energy transfer	32	20.	Mechanoluminescence	18

Figure 6 - Word Dynamics for Authors’ Keywords (Cumulative)



This word growth of keywords is indicative of the major keywords which formed the most frequent keyword in terms of their frequency of occurrences as well as author’s frequency in using these keywords in their research output. The major top 10 keywords are also indicative of the research trends and key subject area in which research were conducted by RTM Nagpur University. Fig 6 is also indicative of the major research areas attracting an extraordinary degree of attention during the study

period from 1990 to 2019. It is evident from the result that various topics belonging to core subjects of Physics, Chemistry, Pharmaceutical Sciences were the top three subjects in which major research output of RTM Nagpur University is concentrated upon.Table.11 shows top five subjects areas in terms of number of research output in respective subjects.

Table 11 - Top Five Subject wise Productivity of Research Items

S.No	Broader Discipline	Quantity of Research Items
1	Physics	724
2	Chemistry	472
3	Pharmaceutical Sciences	118
4	Engineering Sciences	110
5	Biochemical Sciences	86

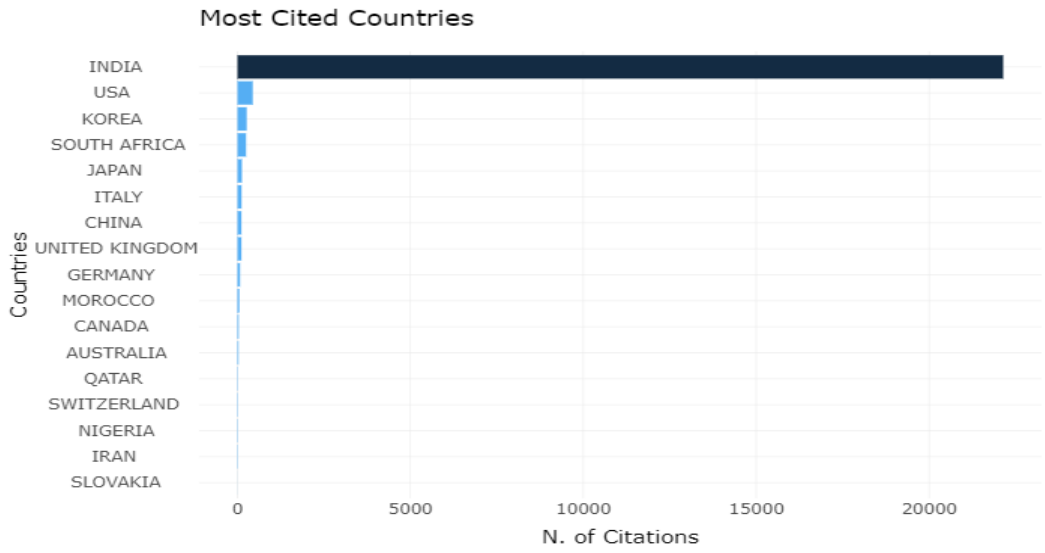
Most Cited Countries

It was found that India remained the most popular country in terms of research reference with number of citation of Indian researchers equals to 22140 followed by USA (n=442) and then Korea(n= 267).Table 12 and figure 7 shows most cited country analysis.

Table 12 - Most cited country based on references

Sr. No.	Country	Total citations	Sr. No.	Country	Total citations
1.	India	22140	10.	Morocco	54
2.	USA	442	11.	Canada	37
3.	Korea	267	12.	Australia	33
4.	South Africa	249	13.	Qatar	19
5.	Japan	129	14.	Switzerland	19
6.	Italy	119	15.	Nigeria	18
7.	China	115	16.	Iran	17
8.	United Kingdom	115	17.	Slovakia	2
9.	Germany	75			

Figure 7 - Most Cited Country as per References



DISCUSSION

In this scientometric study, we demonstrated an overall research output of RTM Nagpur University research output in Science Faculty during the last 30 years, with the total number of 2229 publications during 1990 to 2019. Overall, the research productivity has shown an increasing trend in terms of research output as well as the diversity of research sub-fields. After 2004 there was continuous increase in number of research articles but the overall Annual Growth Rate (AGR) was not substantial(6.23%).Luminescence and Photo luminescence were the most dominant research areas during the study period which may reflect the prevalence of Physics and Chemistry as the major core subjects in which researches were carried out by RTM Nagpur University. Performance indicators measured by the number of received citations are used to identify the quality of the scientific publication and gauge its impact on the scientific community. In this study, retrieved documents received a total of 98,727 citations with an average citation per document of 12.2.

Among the top 20 journals, the 'Journal of Luminescence' published highest number of research articles of RTM Nagpur University in Science faculty indicating that Luminescence and related topics of Physics has been explored to a greater extent by RTM Nagpur University Science faculties.

The keywords employed most often by authors reflect the dynamics of research hotspots during the study period. We found that the keywords "Photoluminescence" and "Phosphor" were the most

common and showed the greatest increase over time. Additionally, all of the top keywords with the strongest citation burst were related to the subjects of Physics and Chemistry suggesting the highly significant concentration of these subjects in research output of RTM Nagpur University. However, other thematic network clusters, indicating diversity within research subfields. Some limitations of this study should be addressed in future scientometric research. First, we used only the Web of Science™ database to search for publications, neglecting other databases such as Scopus, Google Scholar. Thus, other sources may yield different numbers of research items or citation counts. Second, due to constantly changing citation volumes over time, the results of this study are of temporary nature and valid for the time point of the present study's data extraction (27 July 2020). Nevertheless, this study is attempted to provide a detailed scientometric analysis and improves insights into research performance of Science Faculty of RTM Nagpur University. Amongst the 2522 contributing authors, Dhoble, S.J was found to be most prolific author based on the number of articles published whereas Moharil, S.V was found to be most relevant author by way of their h-index calculation.

CONCLUSIONS

This scientometric study has attempted to provide an in-depth analysis of research output of Science Faculty of RTM Nagpur University. The study showed a progressive trend in the three decades of research productivity of RTM Nagpur University, resulting in a better greater recognition in terms of increased number of citations and H- Index .This study has highlighted the progress made by RTM Nagpur University in research in Science Field. The study will help to identify other science subjects in which research productivity can be focused upon. This study suggests broadening the spectrum of subjects as well as subbing subjects for research. This study has helped to understand the strengths and potential gaps in the research and to plan future avenues of research amongst science fraternity of RTM Nagpur University. RTM Nagpur University is one of an oldest and top ranked university, accredited with A grade by the National Assessment Accreditation Council, India. This Study found that few departments are conducting high quality research and produces many publications which reflects the major contribution of the Science Faculty in overall research productivity of RTM Nagpur university.

As one of the oldest university, more efforts should be taken for further expansion and exploration of the research productivity of RTM Nagpur University in various others subjects of Science Faculty in order to boost the overall research standing of the university in HEI ranking framework.

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