

A BIBLIOMETRICS STUDY OF SCIENTISTS IN THE SCHOOL OF PHYSICAL SCIENCES, NORTH MAHARASHTRA UNIVERSITY, JALGAON.

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ABSTRACT

This paper focuses on Research productivity of faculty members in the School of Physical Sciences, NMU, Jalgaon, Proposed research, Objective of the study, Hypothesis of the study, Scope and limitation of the study, Research methodology, Review of literature, Author Productivity: Language wise productivity, Designation wise productivity, subject and Gender wise productivity, Year wise productivity & key authors, Bradford's Law, Lotka's Law, Prices square root law, Authorship Patters, Major findings and Implications.

INTRODUCTION

Teachers (Scientists) and research scholar's need information for keeping up with new developments, to get acquainted with the state of art and to provide the background information for preparing to produced new information. The publication of the information gathered by the faculty members or Scientists is a prestige to the institution. Research and development, demonstration, up-scaling and commercialization in their field have positions

themselves in the driving seat both in the developed and developing countries. The Educational System is being promoted in the country keeping in view its enormous potential to improve various applicable branches to create opportunities for employment generation and to add to the economic progress of the nation. The rapid technological development and the exponential growth of information have changed the traditional concept of Education. “Faculty adds to the knowledge bases of their fields by doing research and communicating findings in a variety of published formats, which differ according to field. Teachers and research scholar’s need information for keeping up with new developments, to get acquainted with the state of art and to provide the background information for preparing to produced new information. The publication of the information gathered by the faculty is a prestige to the institution. It is necessary for the institution to make aware outside world about their output. Mankind is an Individual in its mode of output as in the substance of its thoughts. Printed papers and books label one of the methods of measuring the output of institution in the form of original ideas with the names of its authors, publications then are observable phenomenon that can represent scholarly productivity” (Soman, 2002).Bibliometrics is a type of research methods used in library and information science and utilized quantitative analysis and statistics to describe patterns of publication within a given field or body of literature. In fact, many research fields use bibliometric methods to explore the impact of their field, the impact of a set of researchers, or the impact of a particular paper. Bibliometrics are now used in quantitative research

assessment exercises of academic output which is starting to threaten practice based research.

PROPOSED RESEARCH

Many information faculty members have used different terms for bibliometric studies. The pioneering work was statistical analysis of the literature by Cole and Eagles in 1917; Second attempt was made by Hulme in 1923. He used the term “Statistical bibliography to refer the application of quantitative techniques to libraries. He defined statistical bibliography as “to shed light on the process of written communication and of the nature and course of development of a discipline by means of counting the various facts of written communication” (Kumar and Kumar 2005).

Dr. S. R. Ranganathan in 1948 at the ASLIB conference held at Lamington Spa coined the term Librametry on the lines of Biometry, Econometry, Psychometry, etc. (Guha, 1993). He defined librametrics as the used of Mathematical and Statistical methods for analyzing library activities and library resources. (Ravichandrarao & Neelamaeghan, 1992). Several subdisciplines such as, Bibliometrics, Scientometrics and Infometrics have emerged. The term informetrics is comparatively speaking, a recent development and is often used to include both Bibliometrics and Scienometrics. Although in practice the three terms are often used interchangeably, there are subtle differences between them as seen by the following definitions. The

British Standards Documentation Term (1976) defines bibliometrics as “Study of the use of

documents and patterns of publications in which mathematical and statistical methods have been applied”.

THE NORTH MAHARASHTRA UNIVERSITY, JALGAON

The North Maharashtra University, Jalgaon, established on 15th August, 1990 under the Maharashtra Universities Act, XXIX of 1989, started its academic and administrative functioning from the academic year 1991-92. Within the span of 3 years, the University is recognized under section 2 (f) in 1991 and 12 (B) in 1994 under the University Grants Commission (UGC) Act, 1956. The jurisdiction of the University is extended over three districts i.e. Jalgaon, Dhule and Nandurbar, a pre-dominantly tribal and rural area of Khandesh region. The University has opened its doors of higher education to mostly “first generation learners” of this area. Access, equity and academic excellence are the thrust areas of the University’s educational endeavor. There are 220 affiliated colleges and 04 University recognized Research Institutes/Centers under the jurisdiction of University. Out of these, 01 college is recognized as College of Excellence, 05 colleges have been identified as College with Potential for Excellence and 01 college has been granted autonomous status by the UGC, New Delhi Board and Government of Maharashtra. A climate of research, teaching, learning, student development, value education and community outreach programmes is nurtured through vital links between the University Schools/Institute and all affiliated colleges. There are eight faculties namely, Arts and Fine Arts, Commerce and Management, Science, Engineering and Technology, Pharmacy, Law, Education and Mental, Moral and Social Sciences covering various UG/PG/M.Phil. /Ph.D.

programmes on the University Campus as well as in the affiliated colleges. The University has successfully adopted the ‘School Concept’ with academic flexibility for the optimal use of infrastructure and resources. There are 13 Schools and 01 Institute imparting education in 11-UG, 62-PG and 37-Ph.D. Programmes. The University has implemented Cumulative Grade Point Average System from the academic year 2009-10 and Choice Based Credit System from the academic year 2014-15 to all the P.G. courses on the campus. Total 06 Schools/Institute of the University has been recognized for their research activities by National/International agencies like UGC SAP, DST-FIST, UGC Innovative, UGC-NON-SAP, MHRD-TEQIP-World Bank etc.

THE SCHOOL OF PHYSICAL SCIENCES

The School of Physical Sciences consists of two departments namely, Department of Physics and Department of Electronics. In the academic year 1991-92 the School started its academic activity in Government Polytechnic, Jalgaon. In the first year of establishment, the School started a post-graduate program in Electronics under the Department of Electronics. In the subsequent year, a post-graduate course in Physics, with two specializations in Material Science and Energy Studies, was introduced under the Department of Physics. After the construction of few buildings on University Campus at Umavi Nagar, the School was initially shifted in the building of School of Chemical Sciences and finally, on October 2, 1997 in its own building. The University Grants Commission (UGC), New Delhi has recognized the research excellence of the School by granting the Departmental Research Support (DRS) – Phase I scheme in 2004 and it was

upgraded to DRS – Phase II in 2010. Apart from the UGC support, the School also received major funding from the Department of Science and Technology (DST), New Delhi under the FIST program in 2005. It is also worth mentioning that the faculty members of the School have received considerable individual support through research projects from the National and International funding agencies like Council of Scientific and Industrial Research (CSIR), New Delhi; UGC, New Delhi, All India Council for Technical Education (AICTE), New Delhi; Ministry of Non-conventional Energy Sources (MNES), New Delhi, DST, New Delhi, Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy (DAE), Mumbai and Third World Academy of Sciences (TWAS), Italy.

OBJECTIVE OF THE STUDY

Present study has been undertaken with a view

- To measure productivity patterns of scientists (faculty members) in the School of Physical Sciences, NMU, Jalgaon

However, specific objective of the study are:

1. To know the author productivity;
2. To analyzed domain/subject wise productivity;
3. To find out the Year wise productivity;
4. To find out the Designation-wise productivity; and
5. To find out the Gender wise productivity

HYPOTHESIS OF THE STUDY

The hypothesis formulated for the study as

1. More the publications are published in English Language;
2. More the experience more the productivity;
3. Male scientists produce more publications than female; and
4. Research productivity of faculty members increases their publications year by year.
5. Higher is the degree of collaboration, higher is the research productivity.

SCOPE AND LIMITATIONS OF THE STUDY

The study is confined to the research productivity of (Scientists) faculty members in the School of Physical Sciences, NMU, Jalgaon. Research productivity of faculty members who are working at present. The study is a survey of the research productivity brought out by faculty members. The research productivity included all the (National/International) conferences, seminar, workshops, research papers, Journal's Articles, M. Phil/Ph. D. guided by Supervisor, Books & Chapters in Books by Authors and other Research by faculty members.

RESEARCH METHODOLOGY

Surveys of scientists (faculty members) are used for this study and questionnaire technique is used to collect the data from the faculty members in the School of Physical Sciences, NMU, Jalgaon. The Questionnaire was contained with bibliographical description of

faculty members' publications only i.e. personal information, curriculum activities, International and National Journals, Conference, Seminars, workshops, Symposiums, Books, Chapters in Books, M. Phil/Ph. D. guided by Supervisor and others publications. Back ground information about research productivity by faculty members have been collected based on the NMU's Web-site, Internet Searching, NMU's annual report, Published Literature, Journals, Directories, Brochures, their Newsletters and other sources etc. and Relevant data of research productivity of faculty members have been collected. Collected data has been analyzed by statistical techniques and presented in tabular as well as in graphical form. In graphical form, Bar Charts, Pie Charts, Line Graphs are used for presentation. For the purpose of analyzing the data collected, some statistical techniques have also been used. In addition, some of the tools, techniques used for analyzing includes bibliometrics tools and techniques to come to the conclusions.

REVIEW OF LITERATURE

B. K. Sen and V. V. Lakshmi (1991) In this paper, authors explained that the year 1988 will be recorded in the history of bibliometric studies in India as one of the memorable years in as much as this particular year witnessed the establishment of the Bibliometric Section, and the National Centre on Bibliometrics, at INSDOC, organization for a 12-day workshop on Bibliometrics and scientific communication at IICB, Calcutta, and a seminar by the Society of Information Science, also at Calcutta on the same topic. In addition some noteworthy studies have been conducted and a sizeable number of good papers published. Three decades that have passed ever since the publication of first paper on bibliometrics

from Indian, no year has been so eventful as the year under review. In this article we shall first describe the notable events, followed by significant papers that have been published in 1988.¹²

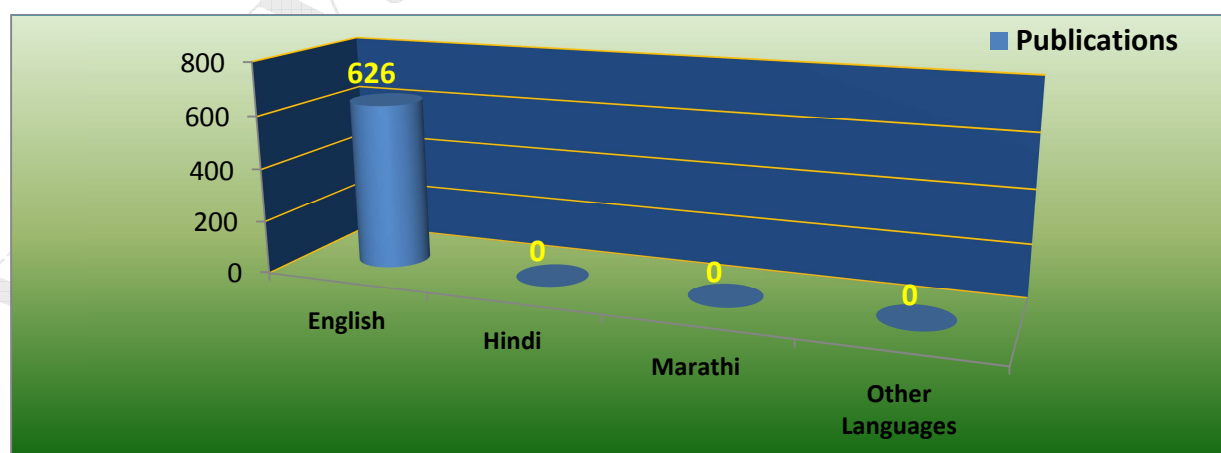
M. Koganuramath, M. Angadi and B. Kademani (2002) Bibliometric analysis of 663 papers published by social scientist of Tata Institute of Social Sciences during 1990-2000 in diverse domains in the social sciences were analyzed for authorship pattern and collaboration. The result indicates that the collaboration co-efficient of the 613 singled-authored papers is 92.46%, followed by 6.33% (42papers) two authored papers. Maximum collaboration coefficient (0.13) was found, according to author, during 1996-1997.⁴

A. Kaur and S. Aggarwal (2010) This study attempts to bibliometrical analysis of research publications of department of chemistry, Guru Nanak Dev University, Amritsar for the period 2002-2006. It analyses all the 269 research publications from 84 journals. It examines year wise distribution of papers, collaboration within the university and with foreign institutes, authorship pattern, journals in which authors publish impact factor of journal etc.³

S. S. Thool (2013) Research productivity of faculty Members in Visvesvaraya National Institute of Technology, Nagpur has been analyzed bibliometrically. The data collected from Faculty Members' curriculum vitae and questionnaires. 167 Faculty Members (teachers) are working in various departments of VNIT and present study is limited to the Faculty Members who are working at present in the various departments of VNIT, is also limited up to the year 2012 only. Bibliometric studies are used to identify the pattern of publication, relative growth rate, authorship pattern, collaborative measures, author's productivity, and

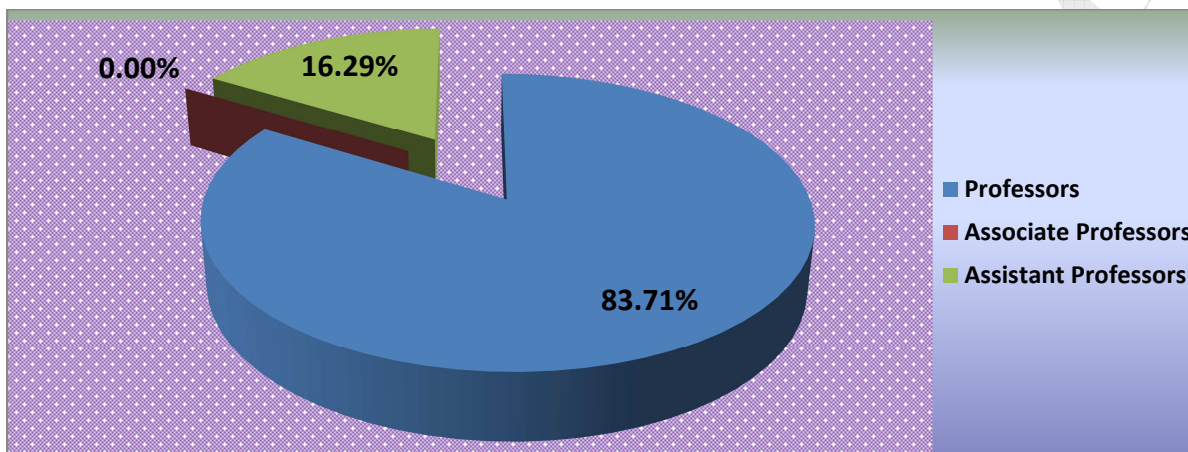
most prolific authors. The laws of Lotka and Bradford have also been tested. Total 3684 publications are contributed by 121 faculty members. Professors and Associate Professors, combinely have contributed to 79.97% publications. The ratio of publications of male to female Assistant professors is 17.82:49.61, Associate professors 37.58:50.39 and professors 44.60:0. The total numbers of 3684 publications of 121 faculty members were divided into 3 equal zones is in the ratio of 10:26:85 which indicates that the data fits into the Bradford’s law of scattering. The price square root law is applicable to Applied Chemistry, Applied Mechanics, Applied Physics, Architecture & Planning, Chemical Engineering, Civil Engineering, Computer Science & Engineering, Electrical & Electronics Engineering, Electronics & Communication Engineering, Mathematics, Mechanical Engineering, Metallurgical & Materials Engineering and Mining Engineering. However, in no case 80/20 rule was applicable, while it was 20:50 i.e. 20% authors contributed to 50% papers.¹⁵

Figure no. 1: Productivity of Faculty Members: Language Wise Distribution



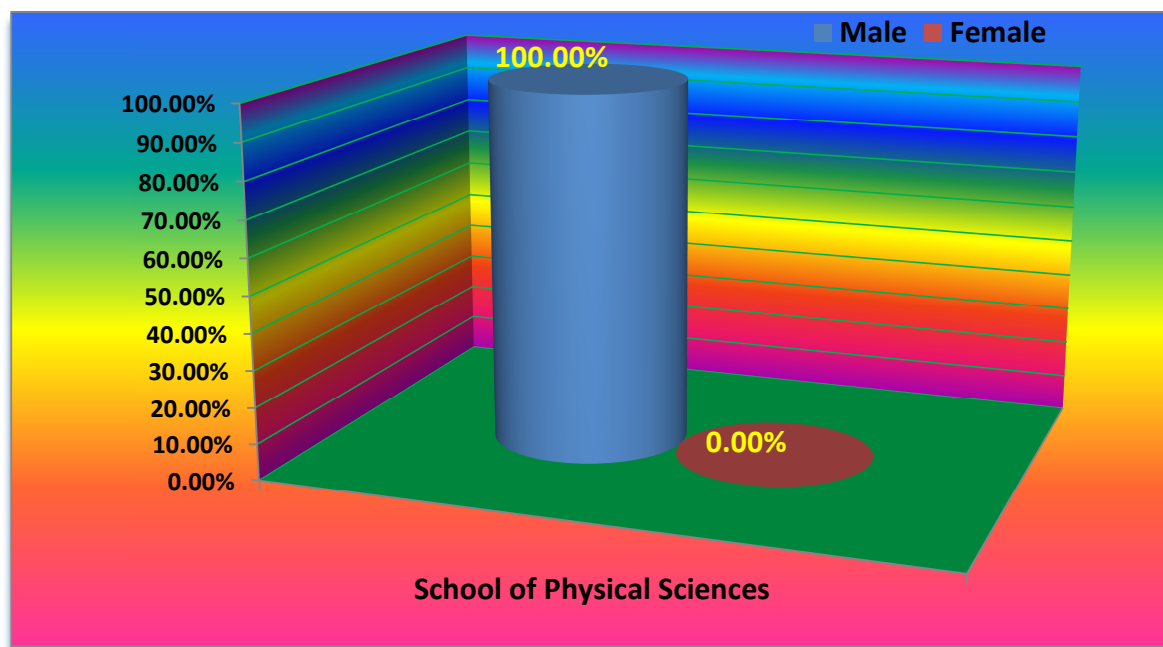
From the above figure, 626(100%) publications are published in alone English language by all (scientists) faculty members, means the School of Physical Sciences subjects are dominated by English language. This indicates that **“More the publications are published in English language” (hypothesis no.1)** is valid.

Figure no. 2: Productivity of Faculty Members: Designation wise distribution



From the above figure, 9 faculty members published total 626 publications, Professors and Associate Professors, combinely have contributed to 83.71% publications. It can be further noted that on an average 83.71% publications were published by professors, 0.00% by Associate professors and 16.29% by Assistant professors, which means senior people published more number of publications. This indicates that **“More the experience more the productivity” (hypothesis no. 2)** is valid.

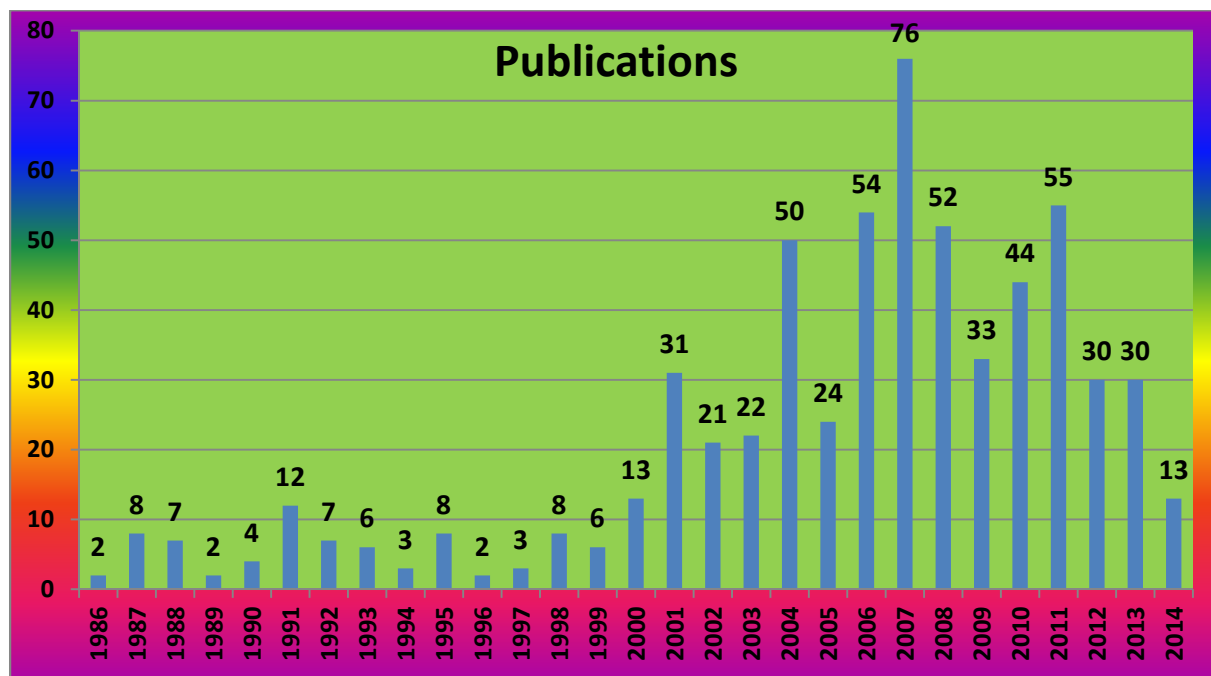
Figure no. 3: Productivity of faculty Members in School of Physical Sciences: Subject and Gender wise distribution



The above figure, Data of in all 9 Scientists was analyzed according to gender. It can be found from the above table that male scientists have published 626(100%) publications giving 69.56 publications per male scientists and female scientists have published 0(0%) publications giving 0.00 publications per female scientists. This indicates that **“Male faculty members produce more publications than female” (hypothesis no.3)** is valid.

Figure no. 4: Productivity of faculty Members in School of Physical Sciences: Year and

Subject wise distribution

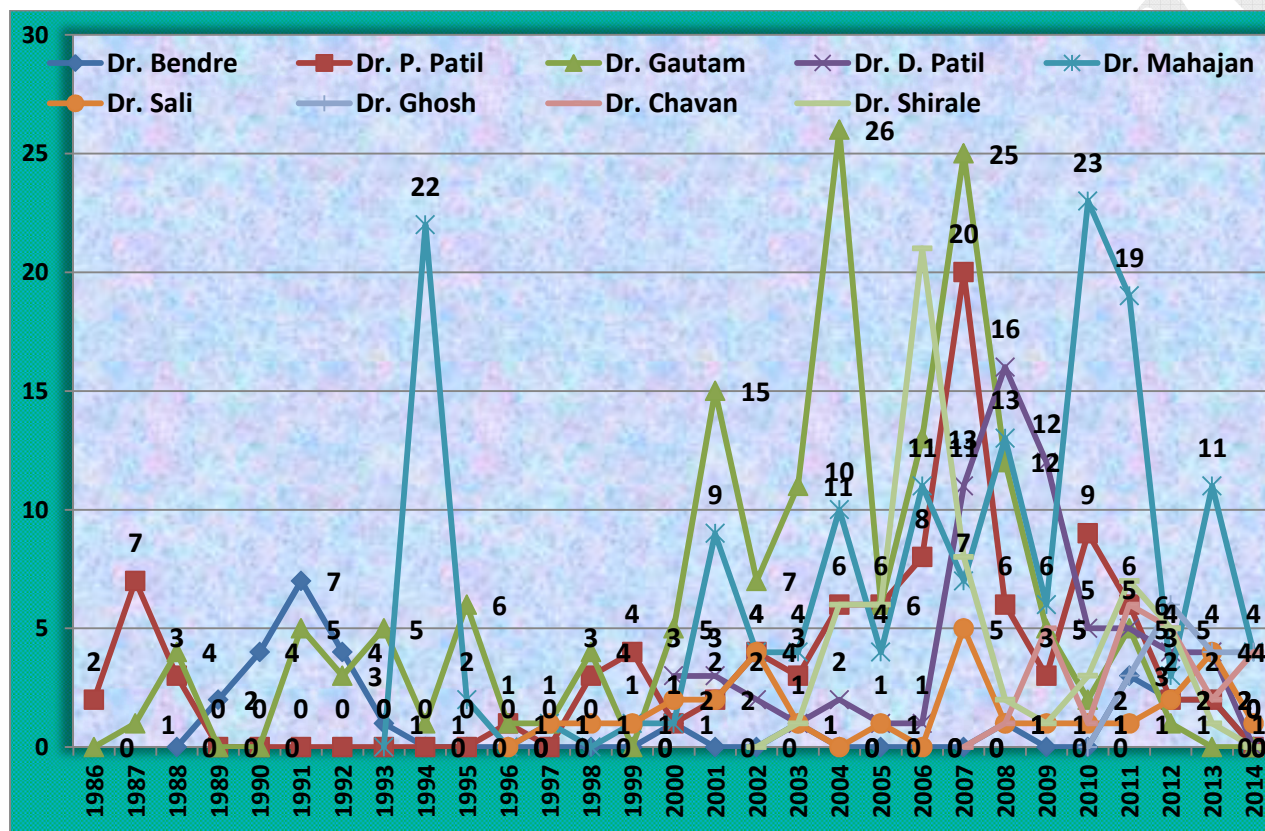


In this domain, most productive year was 2007, as total productivity in this year was 76 publications, followed by 55 publications in 2011, 54 publications in 2006, 52 publications in 2008 and 50 publications in 2004. The year wise productivity is increased from 1986 to 1987, and then it has been decreased in 1988, then increased from 1989 to 1991 and then decreased in 1992 to 1994, then increased from 1996 to 1998 and then decreased at 1999 increased from 1999 to 2001. Then increased from 2002 to 2007 except year 2005 and increased from 2009-2011 then decreased 2012 to 2014. It is also observed that decreased-increased manner from 1986 to 2014. It means that the year wise productivity is increased-decreased manner means fluctuation productivity during the period of 1986 to 2014, then year wise productivity is increased i.e. 1989 to 1991, 1996 to 1998, 1999 to 2001, 2002 to 2004, 2005 to 2007 and 2009 to 2011 means productivity is continuously increased

up to 3 years. Hence, this indicates that **“Research productivity of faculty members increases their publications year by year” (hypothesis no.4)** is valid.

Figure no. 5: Productivity of faculty members: year wise distribution and key author in

School of Physical Sciences



From the above figure, the scientists of School of Physical Sciences have published 76 out of 626 publications in 2007 year, which year is highest publications year, followed by 55 publications in the year of 2011, 54 publications in 2006, 52 publications in 2008 and 50 publications in 2004 year. It was also observed from the figure no. 5, in the School of Physical Sciences, Dr. D. K. Gautam has published 15(2001), 11(2003), 26(2004), 13(2006), 25(2007) and 12(2008) during the life productivity period of 1987 to 2012, he had been 6

times key author and Similarly, Dr. M. A. Mahajan has also published 10(2004), 11(2006), 13(2008), 23(2010), 19(2011) and 11(2013) during the life productivity period of 1994 to 2014, he had also been 6 times key author and Dr. D. S. Patil has published 11(2007), 16(2008) and 12(2009) during the life productivity period of 2000 to 2013, he had been 3 times key author. Dr. P. P. Patil and Dr. D. J. Shirale published 20 in 2007 year and 21 published in 2006 year respectively; both had been 1 time key author in their life productivity period in this context. However Dr. D. K. Gautam, who has published highest 164 publications amongst all 9 Scientists in this domain is the key author and ranked first.

Table no. 1: Bradford’s Law of Scattering

Zones	No. of Papers	No. of Authors
I	299	2
II	229	3
III	98	4

The attempt was made to test applicability of Bradford’s Law of Scattering, as shown in above table. The total numbers of 626 publications of 9 faculty members were divided into 3 equal zones, while numbers of authors writing similar numbers of papers in each zone is in the ratio of 2:3:4. Which indicates that the data fits into the Bradford’s Law of Scattering.

Table no. 2: productivity of faculty members: Application of Lotka’s Law

No. of Papers	No. of Authors
17	1
24	1
28	1
29	1
61	1
70	1
98	1
135	1
164	1

The applicability of Lotka’s law was tested on the data but it was found that, the data does not fit into the Lotka’s law even though the researcher has attempted to apply it with mathematical method.

Price’s Square Root Law of Scientific Productivity

An attempt was made to analyze distribution of publications of 9 faculty members in School of Physical Sciences, North Maharashtra University, Jalgaon in increasing order of productivity. The distribution of authors and their contributions are presented in following table.

Table no. 3: Distribution of publications in School of Physical Sciences

No. of Papers	No. of Authors	Percentage	Total Contributions	Percentage of Contributions
17	1	11.11%	17	2.72%
24	1	11.11%	24	3.83%
28	1	11.11%	28	4.47%
29	1	11.11%	29	4.63%
61	1	11.11%	61	9.74%
70	1	11.11%	70	11.18%
98	1	11.11%	98	15.66%
135	1	11.11%	135	21.57%
164	1	11.11%	164	26.20%
Total	9	100%	626	100%

Table No. 4: Applicability of Price’s Square Root Law and 80/20 Rules in School of Physical Sciences

Authors	No. of Authors	Papers	
		No. of Papers	Percentage
Square root of total authors	3	397	63.42%
Ten percent of total authors	1	164	26.20%
Twenty percent of total authors	2	299	47.76%
Thirty percent of total authors	3	397	63.42%
Forty percent of total authors	4	467	74.60%

It can be observed from above table that Square root of total authors in School of Physical Sciences is 3 authors, contribute to 63.42% of the total papers, which is more than 50% as predicted by De Solla Price, which means the data fits in the price Square Root Law. Similarly, it can be observed that 10%, 20%, 30% and 40% of total authors in School of Physical Sciences contribute only 26.20%, 47.76%, 63.42% and 74.60% respectively of the total papers, this is much below the 80% as predicted by 80/20 Rules.

Table no. 5: Productivity of Faculty Members: Author wise distribution and Collaboration Coefficient in School of Physical Sciences Domain

Faculty Members	Total Number of authorship												Total no. of Paper	C. C
	1	2	3	4	5	6	7	8	9	10	12	14		
Dr. S. T. Bendre	1	5	0	5	7	5	3	2	0	0	0	0	28 (4.47%)	0.96
Dr. P. P. Patil	3	25	32	14	15	4	2	3	0	0	0	0	98 (15.66%)	0.97
Dr. D. K. Gautam	10	57	45	31	11	3	6	1	0	0	0	0	164 (26.2%)	0.94
Dr. D. S. Patil	1	26	26	14	2	0	1	0	0	0	0	0	70 (11.18%)	0.99
Dr. M. A. Mahajan	3	36	50	36	8	2	0	0	0	0	0	0	135 (21.57%)	0.98
Dr. Dr. J. V. Sali	1	3	6	7	9	1	2	0	0	0	0	0	29 (4.63%)	0.97
Dr. S. S. Ghosh	1	1	2	2	1	1	1	3	1	1	2	1	17 (2.72%)	0.94
Dr. P. G. Chavan	0	2	1	3	6	4	4	1	3	0	0	0	24 (3.83%)	1
Dr. D. J. Shirale	2	3	6	2	5	5	24	7	6	1	0	0	61 (9.74%)	0.97
Total	22	158	168	114	64	25	43	17	10	2	2	1	626 (100%)	
Authors hip	22	316	504	456	320	150	301	136	90	20	24	14	2353	
Percentage	0.93	13.43	21.42	19.38	13.60	6.38	12.79	5.78	3.83	0.85	1.02	0.60		

From the above table, by assigning one credit to each collaborator 2353 authors have contributed to 626 items. The collaborative index is 3.76. Dr. D. K. Gautam has published highest publications i.e. 10 Publications in first authored publications while in multi authored publications Dr. D. K. Gautam leads by 154 publications with collaborative coefficient of 0.94, followed by 132 publications of Dr. M. A. Mahajan with collaborative coefficient of 0.98, followed by 95 publications of Dr. P. P. Patil with collaborate coefficient 0.97 and 59 publications of Dr. D. J. Shirale with collaborate coefficient 0.97. Highest 2 authored publications were observed in Dr. D. K. Gautam, highest 3 authored publications were observed in Dr. M. A. Mahajan, highest 7 authored publications were observed in Dr. D. J. Shirale and highest 14 authored publications were observed in Dr. S. S. Ghosh with collaborative coefficient of 0.94. Even though it is stated that higher is the degree of collaboration higher is the research productivity and which leads to greater productivity is not true in case of present data in School of Physical Sciences because those scientists whose collaboration coefficient or degrees of collaboration is 1, have published 24 papers. This indicated that **“Higher is the degree of collaboration, higher is the research productivity.” (Hypothesis no. 5)** is invalid.

MAJOR FINDINGS

1. Total 626 publications are contributed by 9 Scientists (faculty members) in the School of Physical Sciences.
2. 100% publications are published in alone English language by 9 faculty members, means the subjects of School of Physical Sciences are dominated by English language. (Figure

no. 1), this indicates that the hypothesis **“More the publications are published in English language”(hypothesis no.1)** is valid.

3. The designations of Professors and Associate Professors, combinely have contributed to 83.71% publications. It can be further noted that on an average 83.71% publications were published by professors, 0.00% by Associate professors and 16.29% by Assistant professors, which means senior people published more number of publications. This indicates that **“More the experience more the productivity” (hypothesis no. 2)** is valid.
4. It is also found that male scientists have published 626(100%) publications giving 69.56 publications per male scientists and female scientists have published 0(0%) publications giving 0.00 publications per female scientists. This indicates that **“Male faculty members produce more publications than female” (hypothesis no.3)** is valid.
5. In this domain, most productive year was 2007, as total productivity in this year was 76 publications, followed by 55 publications in 2011, 54 publications in 2006, 52 publications in 2008 and 50 publications in 2004. The year wise productivity is increased from 1986 to 1987, and then it has been decreased in 1988, then increased from 1989 to 1991 and then decreased in 1992 to 1994, then increased from 1996 to 1998 and then decreased at1999 increased from 1999 to 2001.It means that the year wise productivity is increased-decreased manner means fluctuation productivity during the period of 1986 to 2014, then year wise productivity is increased i.e.1989 to 1991, 1996 to 1998, 1999 to 2001, 2002 to 2004, 2005 to 2007 and 2009 to 2011 means productivity is continuously

increased up to 3 years. Hence, this indicates that **“Research productivity of faculty members increases their publications year by year” (hypothesis no.4)** is valid.

6. Dr. D. K. Gautam, who has published highest 164 publications amongst all 9 (Scientists) faculty members in School of Physical Sciences domain is the key author and was found ranked first.
7. By test applicability of Bradford’s Law of Scattering, the total numbers of 626 publications of 9scientists were divided into 3 equal zones, while numbers of authors writing similar numbers of papers in each zone is in the ratio of 2:3:4.
8. The Square root of total authors in School of Physical Sciences is 3 authors; contribute to 63.42% of the total papers, which is more than 50% as predicted by De Solla Price, which means the data fits in the price Square Root Law. Similarly, it can be observed that 10%, 20%, 30% and 40% of total authors in School of Physical Sciences contribute only 26.20%, 47.76%, 63.42% and 74.60% respectively of the total papers, this is much below the 80% as predicted by 80/20 Rules.
9. In this domain, the collaborative index is 3.76. Dr. D. K. Gautam has published highest publications i.e. 10 Publications in first authored publications while in multi authored publications Dr. D. K. Gautam leads by 154 publications with collaborative coefficient of 0.94, followed by 132 publications of Dr. M. A. Mahajan with collaborative coefficient of 0.98, followed by 95 publications of Dr. P. P. Patil with collaborate coefficient 0.97 and 59 publications of Dr. D. J. Shirale with collaborate coefficient 0.97. Highest 2 authored publications were observed in Dr. D. K. Gautam, highest 3 authored publications were

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IMPLICATIONS

Based on the results/findings of the study the following are the implications

1. The School of Physical Sciences, NMU Jalgaon should make journal as peer review journal with wide circulation at national as well as international level.
2. Authors with highest impact factor should be given rewards.
3. Heads of the School of Physical Sciences should motivate their faculty members to write their research articles in peer review journals.
4. Heads of the School of Physical Sciences should forward the research activities of faculty members (Scientists) without any bias.

5. Understanding research activity is one of the motivating factor, the faculty members undertake research activity to the maximum extent possible and should write articles on the area of research field.
6. The faculty members should write in peer review journal in the subject concerned with the highest impact factor, which ultimately will increase impact factor of the faculty members.
7. Research is a continuously process; the faculty members (scientists) should publish their research work on regular basis.
8. Faculty members of Assistant professors should have needed to increase their research activity in his/her field.
9. It is suggested that incentives should be given on the basis of publications for the faculty members.

REFERENCES

- Bibliometrics, Available at <http://en.wikipedia.org/wiki/Bibliometrics> (Accessed on 26 September 2013).
- Devarajan G, *Bibliometric Studies*, (ESS ESS Publications; New Delhi), 1997.
- Kaur A and Aggarwal S, Bibliometric Analysis of Research publications of Department of Chemistry, Guru Nanak Dev University, Amritsar, *IASLIC Bulletin*, 55 (1) (2010) 20-28.
- Koganuramath M, Angadi M and Kademani B, Bibliometric Dimension of Innovation Communication Productivity of Tata Institute of Social Sciences, *Malaysian Journal of Library and Information Science*, 7 (1) (2002) 69-76.

- Kumar P S G, *Research Methods and Statistical Techniques*, 1st edn (B R Publishing Corporation; Delhi), 2004, p. 465-541.
- Lotka's law, Available at http://www.iva.dk/bh/Core%20Concepts%20in%20LIS/articles%20a-z/lotkas_law.htm (Accessed on 5 June 2013).
- NMU Jalgaon of Statistical Information, Available at <http://www.nmu.ac.in/domaths/en-us/academics/statisticalinformation.aspx> (Accessed on 5 June 2013).
- North Maharashtra University Jalgaon, Available at <http://nmu.ac.in/en-us/aboutus/aboutuniversity.aspx> (Accessed on 5 June 2013).
- Panda B D, *Research methodology for library science (With statistical methods and bibliometrics)*, (Anmol Publication; New Delhi), 1997.
- Parvathamma N, *Bibliometrics its origin and applications*. In C. R. Karisiddappa, S. L. Sangam and B. S. Maheswarrappa (Ed.), *Current studies in library and information science Vol.-2*, (Nanak Publication; Delhi), 1993, p.161-183.
- School of Physical Sciences, Jalgaon, Available at <http://nmu.ac.in/sops/en-us/home.aspx> (Accessed on 10 May 2013).
- Sen B K and Lakshmi V V, *Bibliometrics in India- 1988: a review*, *ILA Bulletin*, XXVI (4) (1991) 200-206.
- Sengupta I N, *Bibliometrics and its application*, In DhyaniPuspa (ed) *Library and Information science*, (Atlantic Publishers; New Delhi), 1990, p. 254-263.
- Teaching Faculty of School of Physical Sciences, NMU Jalgaon, Available at <http://nmu.ac.in/sops/en-us/faculty/teachingfaculty.aspx> (Accessed on 10 May 2013).
- Thool S S, *Research Productivity of faculty members in Engineering and Technology from 1960-2008 in VNIT, Nagpur: A bibliometric study*, PhD thesis, RTM Nagpur University, Nagpur, 2013.