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Dynamics of Librarianship in the Knowledge Society

Festschrift in Honour of
Prof. B. Ramesh Babu

in 4 Volumes

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Scientometric Dimensions of Innovation Communication Productivity of the University of Madras: A Study based on Web of Science Database

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Introduction

Evaluating the productivity of institutional research and developmental activities highlights the contribution of the institution and the individual scientists engaged in research. It also provides some insights into the complex dynamics of research activity and enables the science policy makers and science administrators to make available adequate facilities and direct the research activities in a proper direction. A well known productivity indicator is the number of publications produced by scientists, institutions, or research groups. Over the years, scientometric and bibliometric techniques have

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become tools to evaluate the productivity of research institutes, individual researcher, as well as to map the growth of the research field.

Kademani and Vijai Kumar [1 & 2] have given a bird's eye view of the bibliometric and scientometric techniques used to study various quantitative and qualitative aspects of scientific endeavours. Chidambaram [3] noted that research publications are clearly one of the quantitative measures for the basic research activity in a country. It must be added, however, that what excites the common man, as well as the scientific community, are the peaks of scientific and technological achievements, not just the statistics on publications. There are also other kinds of research and technology development-mission oriented, industry-oriented, country-specific, etc., which cannot obviously be measured by counting only the number of publications.

Koganuramath, Angadi and Kademani [4 & 5] have studied the publication productivity of the Tata Institute of Social Sciences for the year 1990-2000. The study analysed 663 papers and showed that more than 90 % of the papers were single authored.

Kalyane and Kalyane [6] studied the publication productivity of sugarcane breeding institutes, Coimbatore.

Kademani et al. [7] have carried out scientometric analysis of the chemistry division at Bhabha Atomic Research Centre. The study analysed 1733 papers published during 1970-1999 in various domains. The study also highlighted the most prolific authors and the core journals preferred by the scientists. The collaboration trend was towards multi-authorship papers. More than 90 % of the publications were multi authored.

Yankevich [8] studied the publication productivity in some Soviet academic institutions and revealed some peculiarities and tendencies in publication productivity. He also suggested that these tendencies and invention productivity may be used for the prognosis and evaluation of the activity of academic institutions.

Van Ran [9] presents examples of application of bibliometric methods in evaluation. He focused on the assessment of strengths and weaknesses in the research performance of a scientific institution or organisation in an international context. The paper also discussed the identification of patterns of scientific development, particularly the mapping of research activities of the evaluated or organisation on the worldwide map of science.

Over the years scientometric and bibliometric techniques have become tools to evaluate the productivity of research institutes, individual researcher and to map the growth of subject. Publication and citation counts are being extensively used for evaluation purpose of an institution [10 to 41].

The Public Petition dated 11-11-1839 initiated the establishment of Madras University. It was in January 1840 with Mr. George Norton as its President, that the University Board was constituted. In 1854 after a lapse of 14 years, the Government of India formulated a systematic educational policy for India and as a sequel to this on 5th September 1857 by an act of legislative council of India the University was established. The University was organised in the model of London University. The University imparts both Under Graduate and Post Graduate Education through the Affiliated Institutions which are spread over the districts of Chennai, Thrivallur and Kancheepuram. Apart from teaching, research activities in Arts, Humanities, Science, Management and Technology are the main portals at the University. A number of institutions affiliated to Madras University Concentrate in research activities where Ph.D., Programme is available in their respective field of specialisation. The University is also offering teaching and Research programmes in 4 Campuses of Madras University. The 68 University Departments of study and research are spread over in 4 Campuses organised into 18 Schools each of which offer Post Graduate Courses in respective specialisation, part time and full time Ph.D. Programmes, Diploma and Certificate Programmes. Accessing the need for educating a large number of people in the country, the University offers both under Graduate and Post Graduate education through the Institute of Distance Education of the University of Madras. The Institute is popularly called IDE of Madras University. The University has been accredited by National Assessment and Accreditation Council (NAAC) with the five star rating first, and later with an A rating. The UGC has recognised the University as one of the centres for potential for excellence in the country

Objectives

The main objectives of the present study are to quantitatively document the publication productivity behaviour of University of Madras;

- To find out year-wise publication productivity,
- To find out the domain-wise contributions,

- To find out authorship and collaboration pattern in the publications,
- To identify the prolific authors having large number of publications,
- To identify the types of communication channels preferred,
- To find out the channels of communications used,
- To find out the high frequency keywords appeared in indexer assigned-descriptors

Materials and Methods

Data was collected using WoS for the duration between 1999-2011. The WoS provides researchers, administrators, faculty, and students a quick and powerful access to the world's leading citation databases. Using suitable search strategy, records pertaining to University of Madras in the address field (University of Madras in address or University of Madras in address and India in address) were downloaded for 1999-2011. A total of 3831 publications were downloaded. All the records were classified into 12 broad subject categories based on WoS subject categories. Further, all the bibliographic details were transferred to spread sheet application. The data was analysed as per the objectives of the study.

Results and Discussion

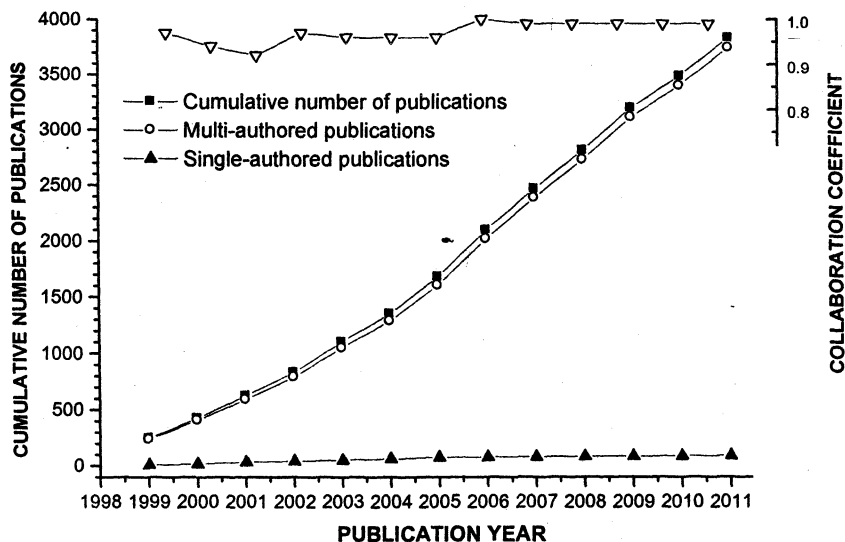
Yearwise growth of publications

During the years 1999 to 2011, University of Madras has produced a total of 3830 publications. Highest number of publications were 417 in 2006. Average number of publications per year was 294.62. Table-1 and Figure-1 give year-wise publication productivity, authorship pattern (single author and multi-author), collaboration trend among authors of University of Madras and cumulative growth of publications.

About 97.65 % of publications were multi-authored and only 2.35 % single-authored. It is indicative of the trend towards multi-authored papers. Highest collaboration coefficient (number of collaborative papers divided by total number of papers) was found in 2006.

Table 1: Year-wise productivity and collaboration coefficient in the publications

<i>Year</i>	<i>Singleauthored papers</i>	<i>Multi-authore dpapers</i>	<i>Total</i>	<i>Collaboration Coefficient</i>
1999	7	238	245	0.97
2000	10	170	180	0.94
2001	17	184	201	0.92
2002	7	198	205	0.97
2003	11	260	271	0.96
2004	10	238	248	0.96
2005	14	316	330	0.96
2006	2	415	417	1.00
2007	2	367	369	0.99
2008	3	340	343	0.99
2009	2	383	385	0.99
2010	2	288	290	0.99
2011	3	343	346	0.99
Total	90	3740	3830	

**Figure 1: Chronological publication productivity trend of University of Madras**

Degree of Collaboration

Extend of collaboration can be measured with the help of multi- authored papers. To measure the collaborative research pattern a simple indicator called collaboration coefficient is used. Collaboration co-efficient is the ratio of the number of collaborative research papers during a certain period of time. As per the formula given by Subramanyan [41], for determining the degree of collaboration in a discipline, the value of collaboration will be between 0 and 1.

To determine the degree of collaboration of publications of University of Madras, the number of single authored and multi-authored publications is calculated and is applied to the formula:

$$C = \frac{Nm}{Nm + Ns}$$

C = Degree of Collaboration
 Nm = Number of multi authored works
 Ns = Number of single authored works

Here $C = 3740/3830 = 0.98$. Hence the Degree of Collaboration of publications of the University of Madras authors is 0.98.

Most prolific authors

The most prolific authors were D. Welmurugan who topped the list with 317 publications during the period under study followed by R. Raghunathan with 254 publications, M N Ponnuswamy with 192 publications, H K Fun with 160 publications, K Ravikumar K with 146 publications, A K Mohanakrishnan with 138 publications, P Varalakshmi with 108 publications. Table 2 provides a list of top 46 authors out of 4066 who have contributed at least 40 publications each.

Table 1: Most prolific authors of University of Madras

Sl.No	Author Name	No of Authorships	Sl.No	Author Name	No of Authorships
1	VELMURUGAN D	317	28	NARAYANAN V	50
2	RAGHUNATHAN R	254	29	SRINIVASAN PC	50
3	PONNUSWAMY MN	192	30	DHAYALAN V	49
4	FUN HK	160	31	NARAYANASAMY A	49
5	RAVIKUMAR K	146	32	POORNACHANDRAN M	49
6	MOHANAKRISHNAN AK	138	33	RAJAN SS	49
7	VARALAKSHMI P	108	34	SUBRAMANIAN S	49
8	RAJAKUMAR P	87	35	BALASUBRAMANIAN K	46

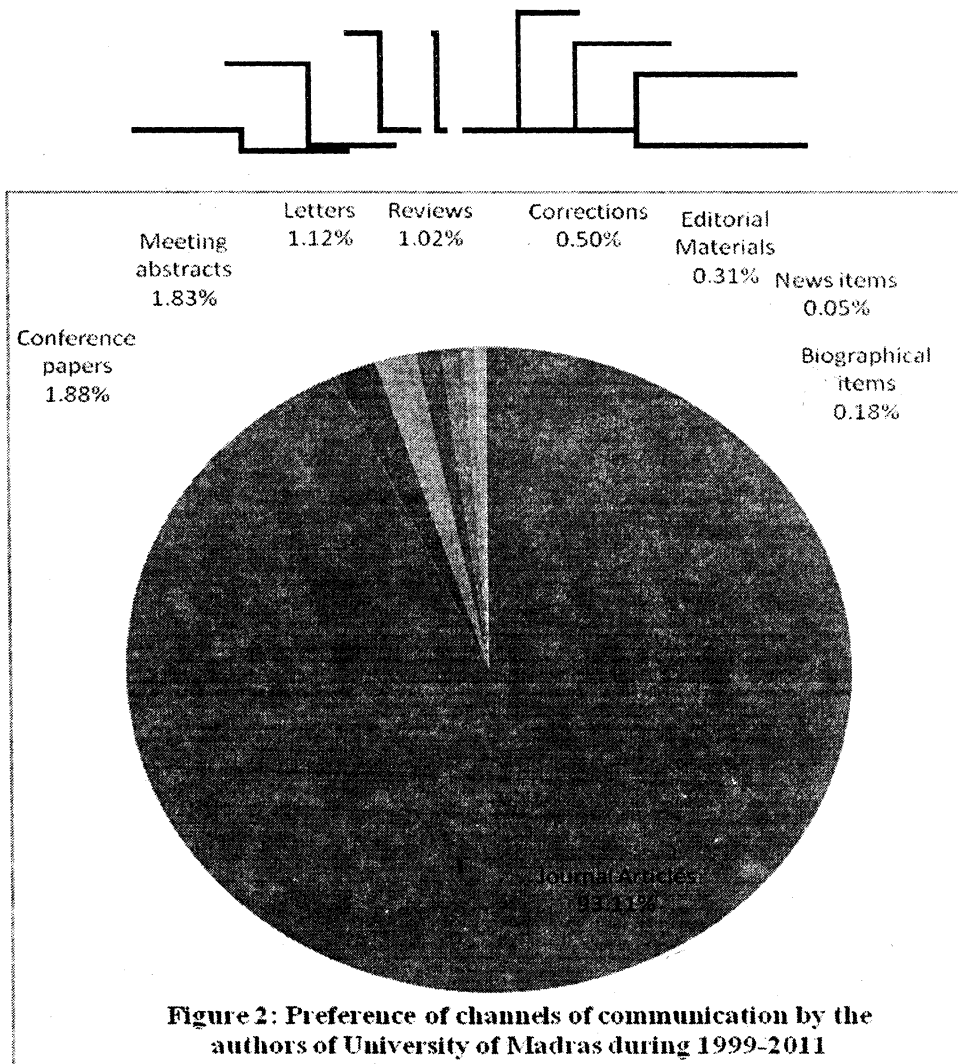
9	KANDASWAMY M	82	36	DEVI CSS	45
10	SELVANAYAGAM S	82	37	RAMESH A	45
11	CHINNAKALI K	77	38	SUTHANTHIRARAJ SA	44
12	DEVAKI T	70	39	MALATHI R	43
13	GAYATHRI D	68	40	SHANTHI P	43
14	SAKTHISEKARAN D	64	41	MARUTHAMUTHU P	42
15	ARUNAKARAN J	62	42	PATTABHI V	42
16	MANIVANNAN V	59	43	DEVARAJ H	41
17	NARAYANAN SS	59	44	CHAKKARAVARTHI G	40
18	RAJESWARI S	59	45	MENON T	40
19	RAMAKRISHNAN VT	59	46	SUBBIAHPANDIA	40
20	RAMAMURTHY P	59			
21	RAJ SSS	58			
22	RAMESH P	58			
23	SACHDANANDAM P	58			
24	PANNEERSELVAM C	57			
25	ARULDHAS MM	56			
26	DEVARAJ SN	56			
27	RAMASAMY S	55			

Preference of channels of communications

Distribution of publications in types of documents is depicted in Table 2 and Figure 2. The University of Madras's publications were spread over variety of publication media, journal articles (3637) (94.94 %), conference papers (72) (1.88 %), meeting abstracts (70)(1.83 %), letters(43)(1.12%), review (39)(1.02%), corrections (19)(0.50%), editorial materials (12)(0.30%), biographical items (7)(0.18%), news items(2)(0.05%).

Table 2: Preference of channels of communication by the authors of University of Madras

Sl.No	Document Type	No of Publications	Percentage
1	Journal Articles	3566	93.11
2	Conference papers	72	1.88
3	Meeting abstracts	70	1.83
4	Letters	43	1.12
5	Reviews	39	1.02
6	Corrections	19	0.50
7	Editorial Materials	12	0.31
8	Biographical items	7	0.18
9	News items	2	0.05
	Total	3830	100



The leading journals preferred by the authors of University of Madras are *Acta Crystallographica Section E Structure Reports Online* with 571 publications, *Acta Crystallographica Section C Crystal Structure Communications* with 87 publications, *Tetrahedron Letters* with 80 publications, *Molecular and Cellular Biochemistry* with 63 publications, *Chemico Biological Interactions* with 59 publications, *Synthetic Communications* with 57 publications, *Current Science* with 56 publications. Journal wise scattering of publications is provided in Table 3. The publications were published in 843 different journals.

Table 3: Journals preferred for publishing articles by University of Madras

<i>Sl.No</i>	<i>Journal Title</i>	<i>No of Publications</i>	<i>Percentage</i>
1	ACTA CRYSTALLOGRAPHICA SECTION E STRUCTURE REPORTS ONLINE	571	14.91
2	ACTA CRYSTALLOGRAPHICA SECTION C CRYSTAL STRUCTURE COMMUNICATIONS	87	2.27
3	TETRAHEDRON LETTERS	80	2.09
4	MOLECULAR AND CELLULAR BIOCHEMISTRY	63	1.65
5	CHEMICO BIOLOGICAL INTERACTIONS	59	1.54
6	SYNTHETIC COMMUNICATIONS	57	1.49
7	CURRENT SCIENCE	56	1.46
8	TETRAHEDRON	46	1.20
9	CRYSTAL RESEARCH AND TECHNOLOGY	44	1.15
10	JOURNAL OF THE GEOLOGICAL SOCIETY OF INDIA	37	0.97
11	CLINICA CHIMICA ACTA	35	0.91
12	POLYHEDRON	34	0.89
13	JOURNAL OF ETHNOPHARMACOLOGY	29	0.76
14	PHYTOTHERAPY RESEARCH	26	0.68
15	INDIAN JOURNAL OF MEDICAL RESEARCH	24	0.63
16	BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS	21	0.55
17	JOURNAL OF CLINICAL BIOCHEMISTRY AND NUTRITION	19	0.50
18	BULLETIN OF ELECTROCHEMISTRY	18	0.47
19	FITOTERAPIA	18	0.47
20	LIFE SCIENCES	18	0.47
21	WORLD JOURNAL OF MICROBIOLOGY BIOTECHNOLOGY	18	0.47
22	ACTA CRYSTALLOGRAPHICA SECTION F STRUCTURAL BIOLOGY AND CRYSTALLIZATION COMMUNICATIONS	17	0.44
23	MOLECULAR CRYSTALS AND LIQUID CRYSTALS	17	0.44
24	BIOLOGICAL PHARMACEUTICAL BULLETIN	16	0.42
25	BIOMEDICINE PHARMACOTHERAPY	16	0.42
26	HUMAN EXPERIMENTAL TOXICOLOGY	16	0.42
27	JOURNAL OF HEALTH SCIENCE	16	0.42
28	JOURNAL OF MOLECULAR CATALYSIS A CHEMICAL	16	0.42
29	ENVIRONMENTAL MONITORING AND ASSESSMENT	15	0.39
30	FOOD AND CHEMICAL TOXICOLOGY	15	0.39
31	INDIAN JOURNAL OF CHEMISTRY SECTION B ORGANIC CHEMISTRY INCLUDING MEDICINAL CHEMISTRY	15	0.39
32	MATERIALS LETTERS	15	0.39
33	SPECTROCHIMICA ACTA PART A MOLECULAR AND BIOMOLECULAR SPECTROSCOPY	15	0.39
34-39	6 journals with 14 publications each	84	

40-43	4 journals with 13 publications each	52
44-46	3 journals with 12 publications each	36
47-50	4 journals with 11 publications each	44
51-54	4 journals with 10 publications each	40
55-60	6 journals with 9 publications each	54
61-67	7 journals with 8 publications each	56
68-81	14 journals with 7 publications each	98
82-113	32 journals with 6 publications each	192
114-141	28 journals with 5 publications each	140
142-198	57 journals with 4 publications each	228
199-290	92 journals with 3 publications each	276
291-454	164 journals with 2 publications each	328
455-843	389 journals with 1 publication each	389
Total		3566

Conclusion

Evaluation of the productivity of institutional research and developmental activities highlights the contribution of the institution and the individuals engaged in research. The analysis shows that the authors of University of Madras are publishing their research outputs in various forms like journal articles, conference papers, meeting abstracts, letters, reviews, corrections, editorial materials and other publications. Journal articles are the most preferred form of publication of authors of University of Madras and it amounts to more than 93% of the total publications.

Measuring research productivity of an institution reflects its scientific and technological developments and progress. Evaluating the productivity of institutional research and developmental activities highlights the contribution of the institution and the individual scientists engaged in research. It also provides some insights into the complex dynamics of research activity and directs the research activities in a proper direction.

It is suggested that other qualitative indicators based on citations and impact factors of the institution may be taken up to know the institution's standing globally.

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