

Trends in Research Productivity: An Analysis of the Research Publications of Cochin University of Science and Technology

Sheeja N K

Susan Mathew K

Abstract

The study aims to analyse the research productivity of Cochin University of Science and Technology (CUSAT) during 2009-2013 on the basis of data from Web of Science (ISI). The most prolific authors of CUSAT community, the preferences of source titles for communication of research publications and citation status of CUSAT scholars are identified. The study found that even though the productivity pattern is not steady, there is 3.7 per cent increase shown from 2009 to 2013. The study also found that CUSAT research community prefers foreign journals rather than Indian journals to communicate their research findings.

Keywords: Research Productivity, Publication Trends, Authorship Pattern and CUSAT

1. Introduction

Research productivity is an outcome measurement of scholarly effort (Jacobs, Hartgraves & Beard 1986; Kurz et al. 1989). It is viewed as a key element in status attainment of post-secondary institutions (Boyer, 1990). It has two components that are: (i) knowledge creation (research), and (ii) knowledge distribution (productivity) (Gaston 1970). The research productivity is not only important as a route to academic promotion, it is also important for enhancing an institution's reputation and economic status (Blackburn et al. 1991). Universities, the apex bodies of higher education perform important roles as the guardians of public knowledge. They are significant part of the modern capitalist engine and are recognized as generators of scientific and technological knowledge. Generally, the major responsibilities of academic staff in the modern university are teaching (transmission of knowledge), research (advancement of knowledge) and community service (application of knowledge) (Perkins 1973; Marsh

& Hattie 2002). However, it should be acknowledged that within much of the academy a value hierarchy exists in which research and scholarship are at the top of the pyramid, followed by teaching and then community service (Brand 2000). Creamer (1998) stated that faculty publishing and productivity could be demonstrated as an index of departmental and institutional prestige. Similarly, the study of Henthorne et al. (1998) found that institutional rank and performance contributed to the benchmarking of an institution's research productivity. Olsen (1994) also noted that an increase in productivity led to high prestige for the institution. In short, research productivity enhances a university's reputation and raises a university's rank.

This study aims to evaluate research productivity of Cochin University of Science and Technology (CUSAT) Kerala, one of the major science and technology universities in India.

2. The Institution

Cochin University of Science and Technology (CUSAT) is one of the major universities in India. It



is a government owned autonomous Science and Technology University located at Kochi, Kerala. The university founded in 1971 has three campuses, two in Kochi and one in Kuttanad, Alappuzha. CUSAT is academically organized into nine faculties and currently it has 28 departments, 12 centres and 26 affiliated colleges offering undergraduate, graduate and postgraduate programmes across a wide Spectrum of disciplines in frontier areas of various faculties. The University offers very specialized courses in Naval Architecture, Polymer Technology, Photonics, Safety and Fire Engineering and Marine Engineering apart from a host of traditional science and engineering courses. The main purpose of this study is to analyze and quantify the research output of Cochin University of Science and Technology.

3. Objectives

The main objectives of this paper are:

- ❖ To visualize the overall picture of publications of CUSAT;
- ❖ To outline the year-wise distribution of the publications of researchers in CUSAT;
- ❖ To find out most prolific authors of CUSAT community;
- ❖ To find out the preferences of source titles for communication of research publications; and
- ❖ To identify citation status of documents published by the CUSAT scholars

4. Related Studies

Several studies have been reported from India and abroad about the various aspects of productivity of faculty, academic departments, and research institutions. Most often these studies were based on the number of publications produced over a spe-

cific time period and focused mostly on the research productivity of faculty. Gupta, Kshitij, and Verma (2011) analyzed the research output in the field of computer science in India during 1999–2008. The parameters studied include total research output, its growth, rank and global publication share, citation impact, international collaborative papers, collaborative countries and patterns of research communication in most productive journals. The paper also gave insights into the important features of the most productive institutions, authors and highly cited papers. A comparison between the publications output of India and China, South Korea, Taiwan and Brazil were also made.

Sharma (2009) reported bibliometric studies of the publication trends of the scientists of Central Potato Research Institute during 1991-2007. The study has made an analysis of the authorship pattern and degree of collaboration in potato research and development. It was found that though CPRI scientists publish papers under joint authorship to a certain extent, after that they preferred single authorship.

Kumbar, Gupta, and Dhawan (2008) described the growth, contribution and impact of research carried out by the scientists of University of Mysore in science and technology during 1996-2006. The paper indicated the patterns of communication of university scientists and examined the extent of scattering of their research output in different journals. It also analysed the growth rate of university research and its impact in terms of average citations received. The output and impact of research under different existing subject departments of the university, international collaborative share of research output across various subjects, and major countries involved in international collaboration were ex-

amined. The paper identified characteristics of highly cited papers and the top productive authors.

An analysis of 18,224 papers published by 3439 institutions in 445 Indian science journals and abstracted by Indian Science Abstracts (ISA) during 2006 was made by Kumar, Garg, and Dutt (2009). The study showed that major publication output was from academic institutions followed by state agriculture universities and medical colleges. The highest number of papers was published in the disciplines of agriculture, forestry, animal husbandry and fisheries followed by medical and veterinary sciences. According to the study, the Indian publication output in 2006 has increased considerably as compared to a similar 1984 study.

Jeevan and Gupta (2002) suggested a methodology for studying the quantitative profile of a research university, with a view to get idea about the performance and impact of research produced in each department, and the comparison of the impact of research in various departments. The study was based on the research output from Indian Institute of Technology, Kharagpur. The performances of various departments were judged on the basis of quantitative and qualitative indicators like proportion of papers covered in SCI-covered journals, impact rate, proportion of high quality papers, etc. In addition, factors like the extent to which the papers of each department are co-authored and international collaboration were also studied.

The research productivity of the business management institutes of India during the period 1998-2012 based on Scopus database was studied by Rakhi and Nagarajan (2013). The results indicated a steady increase in publication productivity from only 44 records in 1998 to 186 records in 2012. It was shown

that 74.57% of contributions are multi-authored and among these joint authored, the two authored publications are more in number. Lotka's law is found to be almost applicable in this study. Collaborative research environment was found to be prevalent in IIM.

Toutkoushian et al (2003) analysed readily available data from the Institute of Scientific Information (ISI) to estimate the number of scholarly articles written by an institution's faculty. The measures vary by type of institution, and they are correlated with other selected measures of research resources and institutional quality. It was found that data on the publications of faculty can be used to derive institution-level measures of research output. The study showed that by combining publication data with information on the number of faculty at an institution, the total output can be analysed. This can be especially relevant for smaller institutions that provide a great emphasis for research.

Varghese and Rajan (2009) made an analysis of 632 publications of Rajiv Gandhi Centre for Biotechnology (RGCB) scientists during 1995-2006. It was seen that the publications of RGCB scientists included journal articles, conference papers, patents, book chapters and PhD thesis. The study identified gender wise, department wise and form wise productivity of scientists in RGCB. The type of communication channels, the degree of collaboration and the most prolific authors etc were identified. The year 2005-2006 with 112 articles (25.87 %) was the most productive year in the case of journal articles. The trend towards collaboration among scientists showed the specialization of research in RGCB. During the years the productivity of the scientists of RGCB showed substantial growth both quantitatively and qualitatively.

Pal and Das analyzed the research publications produced by the Indian Statistical Institute (ISI) over a period of twenty years (1991-2010) based on Web of Science. The study evaluated 4204 publications based on authorship pattern, major areas of research, trends in collaboration and preferred channels of communications by scientists. Findings showed that ISI has produced an annual average of 210 publications with a maximum of 290 papers (7%) in 2009 and least number of papers (115) published in 1993 indicating a steady growth trend over the years. Increasing trend of collaboration over the time is prominent as seen in similar institutions. Multi-authored publications are found to be more prevalent with significant degree of collaboration. Most of the collaborations have emanated from leading institutions of 26 countries. The active areas of research were also identified by the study.

5. Methodology

In this study, research publications of CUSAT community which appeared in national and international journals, over a 5 year period from 2009 to 2013, has been evaluated as per scientometric techniques. The data has been drawn from Web of Science, an online scientific citation indexing service maintained by Thomson Reuters that provides a comprehensive citation search. It is a multidisciplinary database which covers 30,000 scholarly books, 12,000 journals and 148,000 conference proceedings. The investigation refined the results to first 5 prolific authors, preferred sources, collaborating countries, and cited papers.

6. Analysis And Results

The study found that a total of 1108 papers were published by CUSAT faculty and research scholars from 2009 to 2013. Among this, 1103 (99.5%) docu-

ments were produced in science and technology and only 0.5% are from social sciences and arts and humanities.

6.1 Year wise Productivity

The Table 1 shows year-wise productivity of CUSAT research community. The analysis of year-wise distribution shows that most productive year in terms of publication count is 2010 with highest number of 243 (21.93%) publications followed by 2013 with 239 (21.57%).

Table 1: Year wise distribution of publications

Years	No. of publications	Percent (%)
2009	198	17.87
2010	243	21.93
2011	220	19.85
2012	208	18.77
2013	239	21.57
Total	1108	100%

6.2 Document Type

Table 2 shows the distribution of documents in terms of document types. Journal articles were found to be the most used document type with 1023 documents followed by abstracts 48, and editorial with 15 and so on.

Table 2: Document type distribution

Sl. No.	Document Type	No. of document Types	Percent (%)
1.	Article	1023	92.32
2.	Abstracts	48	4.33
3.	Editorial	15	1.35
4.	Review	9	0.8
5.	Book	2	0.18
6.	Others	11	0.99
Total		1108	100%

6.3 Author productive profile of university researchers

A select list of highly productive authors is given in Table 3. The list is ranked in the order of decreasing productivity. Dr. Paulose, C. S. from the Biotechnol-

ogy Department is the most prolific author with 81 publications. The next prolific author is Dr. VPN Nampoori, associated with International School of Photonics (ISP) and third prolific author is from Physics Department.

Table 3: Prolific authors in CUSAT

Sl. No.	Name of the Researcher	No. of Documents	Rank	Department
1.	Paulose, C. S.	81	1	Biotechnology
2.	Nampoori, V. P. N.	63	2	Photonics
3.	Anantharaman, M. R.	53	3	Physics
4.	Radhakrishnan, P.	47	4	Photonics
5.	Mohanani P.	46	5	Electronics

6.4 Most preferred Sources

Table 4 presents the list of top 5 sources titles where CUSAT researchers published their articles. The study shows that Journal of Applied Polymer Sci-

ence published by Wiley publications is the most preferred journal of CUSAT community with 20 titles followed by Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy published by Elsevier with 14 titles.

Table 4 Top 5 Source titles in terms of no. of documents

Sl. No.	Name of the journal	Publisher	Rank
1.	Journal of Applied Polymer Science	Wiley	1
2.	Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy	Elsevier	2
3.	Journal of Applied Physics	American Institute of Physics	3
4.	Indian Journal of Geo-Marine Sciences	National Institute of Science Communication And Information Resources	4
5.	Microwave and Optical Technology Letters	Wiley	5

6.5 Country wise Collaboration

Excluding India CUSAT community collaborated with France, USA, Japan, Oman and Germany. In total Researchers of CUSAT community collaborate

with researchers of 47 countries. The table 5 shows top collaborating countries.

Table 5: Country wise collaboration

Sl. No	Name of the Country	Collaboration
1.	India	1006
2.	France	107
3.	USA	44
4.	Japan	30
5.	Oman	21
6.	Germany	21

6.6 Citation status

The CUSAT community received a total number of 4348 citations during 2009-2013 for their 1108 publications. Average citations per items are 3.92 and h-index is 21.

7. Findings

The total number of documents published by CUSAT research community for the period of 2009-2013 is 1108 and among this, the contribution from journal article is 92%. Major contribution of research in CUSAT is from the field of science and technology. The research output of CUSAT researchers shows a wavy nature and Journal of Applied Polymer Science is the most preferred source for publication. The study also noted that CUSAT academic community collaborated with foreign institutions to write research papers. They received 4348 citations during the period under study.

8. Conclusion

Research performance and outputs has a significant role in knowledge based economy as universities are generators of new knowledge. Moreover in higher education, research activity is one of the criteria for moving up the hierarchy from one position to the next. Hence, it is necessary to enhance research activities in universities. This paper demon-

strated the last five years (2009-2013) research productivity of a state level university, CUSAT in Kerala. The study found that even though the productivity pattern is wavy there is 3.7 per cent increase shown from 2009 to 2013. The study also proved that CUSAT research community prefers foreign journals rather than Indian journals to publish their outputs.

References

1. BLACKBURN, T., BIEBER, J., LAWRENCE, J. & TRAUTVETTER, L. Faculty at work : focus on research, scholarship and service. Research in Higher Education, 1991, Vol. 32(4), p p. 385.
2. BOYER, E. Scholarship reconsidered: priorities of the professoriate, The Carnegie Foundation for the Advancement of Teaching, Princeton, New Jersey, 1990.
3. BRAND, M. Changing faculty roles in research universities: using pathways strategy. Change, 2000, Vol. 32(6), pp. 42-45.
4. CREAMER, E. Assessing faculty publication productivity: issues of equity. ASHE-ERIC Higher Education Report, 1998, Vol. 26 (2), pp. 1-126.
5. GASTON, J. The reward system in British Science, American Sociological Review, 1970, Vol. 35(4), pp. 718-732.
6. GUPTA, B. M., KSHITIJ, Avinash , and VERMA, Charu. Mapping of Indian computer science research output, 1999–2008. Scientometrics ,2011, Vol 86(2) .pp 261-283.
7. HENTHORNE, T., LATOUR, M. & LORAAS, T. Publication productivity in three leading US advertising journals, Journal of Advertising Provo, 1998, Vol. 27(2), pp. 53

8. JACOBS, F.A., HARTGRAVES, A.L. & BEARD, L.H. Publication productivity of doctoral alumni: a time adjusted model. *The Accounting Review*, 1986, Vol. 61(1), pp. 179-187.
9. JEEVAN, V. K., and GUPTA B. M. A scientometric analysis of research output from Indian Institute of Technology, Kharagpur. *Scientometrics*, 2002, Vol 53(1), pp. 165-168
10. KUMAR, Suresh, K. C. Garg, and Bharvi Dutt. Indian scientific output as seen through Indian Science Abstracts. *Annals of Library and Information Studies*, 2009, Vol.56(3), pp. 163-168
11. KUMBAR, Mallinath, GUPTA, B. M. and DHAWAN S. M. Growth and impact of research output of University of Mysore, 1996-2006: A case study. *Annals of Library & Information Studies*, 2008, Vol 55(3), pp.185-95.
12. KURZ, R., MUELLER, J., GIBBONS, J. & DICATALDO, F., Faculty performance: suggestions for the refinement of the concept and its measurement. *Journal of Higher Education*, 1989, Vol. 60, pp. 43-58.
13. MARSH, W. & HATTIE, J. The relation between research productivity and teaching effectiveness: complementary, antagonistic or independent constructs. *The Journal of Higher Education*, 2002, Vol. 73(5), pp. 603-641.
14. OLSEN, J. Institutional and technical constraints on faculty gross productivity in American doctoral universities', *Research in Higher Education*, 1994, Vol. 35 (5), pp. 549-567.
15. PAL, Jiban K., and DAS, Prabir Kumar. Quantitative Assessment of Research Contributions of the Indian Statistical Institute: 1991–2010. Available at http://www.researchgate.net/publication/221901667_Quantitative_Assessment_of_Research_Contributions_of_the_Indian_Statistical_Institute_1991_2010/file/e0b49529477ff10237.pdf (Accessed on 27/7/2014)
16. RAKHI, V. S., and NAGARAJAN M. Are the Business Schools in India doing their 'Businesses'? An Evaluation of IIM's Research Productivity Profile. *Journal of Advances in Library and Information Science*, 2013, Vol 2(1), pp 25-30.
17. SHARMA, R. M. Research publication trend among scientists of Central Potato Research Institute: A bibliometric study. *Annals of library and information studies*, 2009, vol 56(1), pp 29-34.
18. VARGHESE, Rekha Rani, and RAJAN, Jinju S. Productivity of scientists of Rajiv Gandhi Centre for Biotechnology (RGCBI): an analysis. *Annals of library Science and Documentation*, 2009, vol 56, pp156-162.
19. TOUTKOUSHIAN, ROBERT K., et al. Using publications counts to measure an institution's research productivity. *Research in Higher Education*, 2003, vol 44(2), pp121-148.

About Authors

Dr. Sheeja N.K., Assistant Librarian, Department of Ship Technology, Cochin University of Science and Technology, Cochin-22, Kerala.

Dr. Susan Mathew K, Assistant Librarian (Sr. Scale), University Library, Cochin University of Science and Technology, Cochin-22, Kerala.