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RESEARCH OUTPUT OF UNIVERSITY OF KASHMIR IN SCIENCE & TECHNOLOGY: A BIBILOMETRIC ANALYSIS

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ABSTRACT

Bibliometrics is a research field which employs quantitative methods to probe scientific communication process by measuring and analyzing various aspects of written documents to monitor growth of literature and patterns of research, degree of collaboration, geographical distribution of papers, citation pattern of the papers and citation analysis. The study deals with research output in the field of Science & technology from University of Kashmir for the period 2009-2013.

KEYWORDS : *Kashmir University-Research Output; Research output-Science and Technology; Life Sciences -Research output; Physical Sciences - Research output, Applied Sciences-Research output.*

INTRODUCTION

Scientific knowledge, takes place primarily in universities for the generation of new knowledge today. Research productivity in higher education is gaining importance. Besides teaching, research is a major function of the university faculties. Altbach (2004) states that the western academic model that derived in the Europe has been successful in providing advanced education, fostering research and scientific development and it has been imported by most nation in the world including the US, Japan, China, India and other post colonial countries as well as Malaysia. According to Reitz (2005) and Powell

et al (2002) research is a systematic painstaking investigation of a topic or in a field of study often employing technique of hypotheses and experimentation, undertaken by a person intent on revealing new facts, theories or principles or determining skill and identification of research problems. The importance of Universities' pursuit of knowledge is recognized in the developed countries. One of the noble ideas is that universities should participate in the creation as well as the transmission of knowledge (Altbach, 1998). Research has gained momentum during the past one and half decade, mainly due to support received through Ph.D. Program, in-house projects, and government funding projects (Kumbar et al., 2008).

The University of Jammu and Kashmir was founded in the year 1948. In the year 1969 it was bifurcated into two full-fledged Universities: University of Kashmir at Srinagar and University of Jammu at Jammu. Academically, the University of Kashmir is structured into 13 faculties, with 15 Educational and Scientific Research Centers. It has a network of 148 constituent, affiliated and professional colleges in state of Jammu and Kashmir (Annual Report, 2013). The university offers a wide range of academic and professional courses through formal and non formal modes of education. It has established Satellite Campuses at Anantnag (South Campus) and Baramulla (North Campus) and three more Satellite Campuses at Kupwara, Kargil and Leh are being established to make higher education more accessible to people living in remote areas of the State.

OBJECTIVES

The study is carried with the following objectives

- To assess the research output in the field of Science & Technology at University of Kashmir.
- To assess the growth of research, number of research articles cited and publishing trends.
- To assess the authorship and institutional collaboration at regional, national and international level.
- To assess the funding support at regional, national and international level.

METHODOLOGY & SCOPE

The study is limited to a period of five years (2009-2013) with research articles as the main focus of the study. Research articles published by the faculty members of University of Kashmir were extracted from Thomson Reuters Web of Science. After extracting the bibliographic details data were grouped under three broad streams i.e.

- Life Sciences (Biotechnology, Biochemistry, Bio-resources, Botany, Clinical Biology, Environmental Science and Zoology),
- Applied Sciences (Computer Science, Electronics, Mathematics, Physics, Statistics, University Science Instrumentation Centre)
- and Physical Sciences (Chemistry, Earth Science, Geography, Home Science, Food Technology, Pharmacy).

The bibliographic data of research articles was harvested from Web of Science during 20th January to 15th February 2014.

RELATED LITERATURE

Bibliometric analysis techniques are increasingly used to analyze and evaluate scientific research produced by institutions globally. Gigantic quantity of literature has been published showing

the research output of various universities and research institutions all over the world.

Wolhuter et al. (2013) assess the improvement of the research output of female academic members of staff relative to their male counterparts, in the post 1994 period at South African University. Okafor and Dike (2010) analyzed the research output of academics in the science and engineering faculties of Federal Government owned Universities in Nigeria and reveals that 30.6% of the academics published between 0-4 journals articles, that only 2.7% of them published 30 or more journal articles during the period and as many as 42.1% did not have any article in oversea journals. Usang et al. (2007)examined academic staff research productivity at Universities in South Zone of Nigeria and revealed that male and female academic staff differed significantly in their research productivity; married and single academic staff differed significantly in their research productivity and there is a significant influence of areas of specialization on academic staff research productivity. Garcı´a, et.al. (2012) studied the ranking of research output of universities on the basis of the multidimensional prestige of influential fields of Spanish Universities during the period 2006-2010. . Suryani et al. (2013) observed research publication output in Scopus by the Malaysian private and the public universities in 2010 and found that the Malaysian private universities published a distinctively smaller number of documents in Scopus compared to the public universities.

Many studies have been carried out to assess the research output in the field of Science and Technology in different research institutions/universities of India. Jeevan and Gupta (2002) studied the quantitative profile of research in university, with a view to get the idea about the performance and impact of research produced in each department and the comparison of the impact of research in various departments and revealed found that the researchers perform well when they collaborate more both at national and international levels. Adams et al. (2009) generated the report on annual output of scientific publications covering 1998-2007 of India, which reveals that from 1998-2000, the quantity of publication output steadily increased from roughly 16500 papers in 1998 to nearly 30000 in 2007. Thus, there has been an increase in the research output in scientific field of India from 1998-2007. Vasishta (2011) investigated the contribution and impact of research output on PEC University of technology as reflected in its publications covered in Scopus international multidisciplinary database and described broad characteristics of research publications of PEC during 1996-2009. She concludes that in all 177 research papers were published during 14 years by the nine departments of the PEC, showing an average of growth rate of 131.85%.

Savanur and Konnur (2012) describe growth, contribution and impact of research, channels of communication, collaboration, authorship pattern, analysis of strong and weak areas of research carried out by the scientists at Bangalore University for period of three decades in Sciences. The average number of publications per year was 54.7%. USA is the top collaborating country with 74(31.09%) of papers followed by France with 20(8.4%). Kumbar et al. (2008) study the research of University of Mysore in Science and Technology , analyzed the strong and weak areas of research, their growth rate and impact of research in terms of average citation received and also studied the output and impact of research under different existing subject departments of the university and the collaboration. They conclude that the research activity of University of Mysore in Science and Technology is growing with an average rate of 23% per annum. The analysis was based on publication data consisting of 1518 research papers published by the university from 1996-2006. Wani, Pandit and Nighat (2013) studied the research output of IIT Delhi, for the period of 1964-2010 indexed by “Scopus” with total of 15476 research papers. The study revealed that average citations count of institution is 4.09.

“Engineering” is the dominant discipline with 6,267 papers, whereas “Chemistry” is highly cited subject field with total of 14,264. Kumar, Kumar and Singh (2013) studied the research performance o f

ARIES's Scientists from 2004-2012 and reveals that year 2011 most productive year having published 70 (15.6%) research papers. The contribution of more than four authored have the highest number of articles 232 (51.67%) which is in the top publication, whereas one authored contributions formed 32 (7.13%) and preferred to publish research articles in International Journals than Indian journals. Nagarkar (2014) monitored bibliometric analysis of publications of the Chemistry Department, University of Pune, India, 1999-2012 and revealed that faculty members have published 811 publications during 14 years in various areas of chemistry. Majority of research publications are in the area of Physical Sciences. About 30% of the papers were published during 2010-2012. Bala et al. (2009) analyzed the research activities of the Government Medical College and Hospital (GMCH) Chandigarh as reflected in its 16 years (1992-2007) of 754 publications output covered in Scopus. It focused on publication growth, characteristics, format and media of communication, research impact and quality, patterns of collection, broad and narrow areas of research focus and most cited papers.

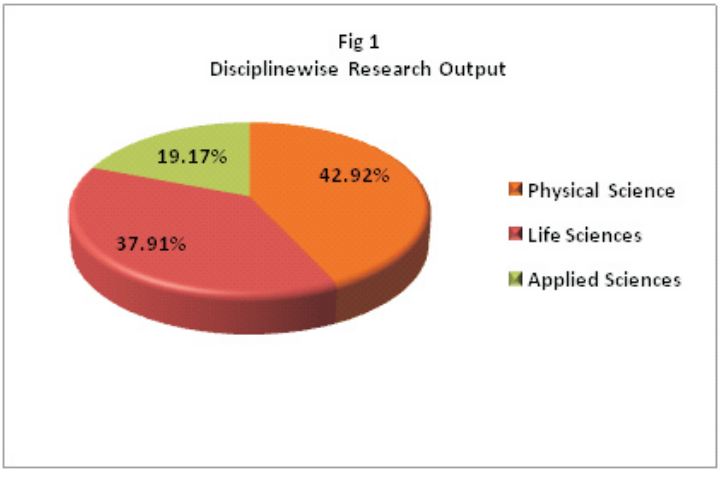
Ali, Shah and Mirza (2012) studied open access publishing at University of Kashmir for the period of 11 years (2000-2010) using SCOPUS as tool for data extraction and reveal that open access is gaining popularity in the University. Dar (2012) studied the research contribution in the faculty of Humanities and level of research works by the scholars and highlights research output reflecting the academic progress at the University. Nabi (2014) studied the Post Graduate research of Government Medical College, Srinagar affiliated to University of Kashmir in the field of Medicine and Surgery from the year 1963-2008 and reveals research output at PG level noted during 1983-92 contribute 57.21% of the total output research.

RESULTS AND DISCUSSION

Research output

54 faculty members have shown their presence in Web of Science contributing 240 research articles. Figure 1 reveals that the Physical Sciences have highest research publication coverage (103; 42.92%) followed by Life Sciences (91; 37.91%) with Applied Sciences ranking third (46; 19.17%).

Fig 1
Disciplinewise Research Output



Yearswise output

The study deciphers total of 240 research articles are contributed by the faculty members of the University of Kashmir. In 2009 the total output of research articles is 36 (15%) with a slight decrease in 2010 (32; 13.34% and again increase from 2011-2013. The highest number of articles are contributed in the year 2013 (69; 28.75%) followed by 2012 (63; 26.25%) and 2011 (40; 16.66%). The year wise growth

is phenomenal and has increased by 566.67% within a span of five years depicting the potential of research activity of the institution (Table 1).

Table 1 Yearwise output

Year	Output	Cumulative Output
2009	36	
2010	32	68
2011	40	108
2012	63	171
2013	69	240
Total	**240**	

Discipline wise Growth

Authors from Physical Sciences have contributed more (103; 42.91%) and rank 1st followed by Life Sciences (91; 37.91%) and Applied Sciences (19.16%) respectively.

The research contribution from Physical Sciences is highest for the years 2013 (35; 14.58%), 2010 (17; 7.08%) and 2009 (18; 7.75%) in comparison to Life Sciences and Physical Sciences. In Life Sciences the highest contributions are for the years 2011 (17; 7.08%) and 2012 (28; 11.66%) while as for Physical Science the contribution of research articles is least (Table 2).

Table 2 Discipline wise growth

Year	2009	2010	2011	2012	2013	Total
Physical Sciences	18	17	12	21	35	**103**
Life Sciences	10	12	17	28	24	**91**
Applied Sciences	8	3	11	14	10	**46**
Total						**240**

Citation reception

The research articles that have been cited by other scientist have been categorized into three groups i.e less than five times; less than ten times and more than eleven times. 215 (89.58%) articles have been cited less than 5 times with 7.92% of the articles cited less than 10 times. A very less score of 2.5% documents have been cited more than 11 times.

All the three streams have highest number of articles cited less than 5 times with Physical Sciences in lead (89; 37.08%) followed by Life Sciences (81; 33.75%) and Applied Sciences (45; 18.75%). 11 articles from Physical Sciences are cited less than ten times with 8 articles from Life Sciences cited less than ten times. No article from Applied Sciences has been cited less than ten times.

Diminutive number of research articles have been cited more than 11 times in Physical Sciences (4) and Life Sciences (2) respectively (Table 3).

Table 3 Citation reception

Discipline	Times Cited		
	>5	>10	<11
Physical Sciences	89	10	4
Life Sciences	81	8	2
Applied Sciences	45	0	0

Publishing Trends

The faculty seems to have preferred to publish their research articles in international sources covering 92.5% (222) and only 18 (7.5%) articles have been preferred in national sources.

Authors have published majority of their works in the sources published form Europe (48.29%) followed by N. America (24.43%) and Asia 22.73%. Authors have also published in sources published from South America and Africa but with a very low score (2.84% and 1.71%).

Authors have shown their presence globally publishing from 29 countries with USA in lead with 43 articles followed by United Kingdom (25) and Netherlands (21). India and New Zealand sharing 18 documents each rank 4th with Japan and Germany on 5th places. Four publications have been preferred by authors published from Pakistan. 3 articles are published from six countries while 2 articles each have been published from four countries and one article each are contributed from sources published from 11 countries.

Authorship pattern

The authorship patterns have been classified into three categories. The study reveals that the works authored by 3-4 authors are highest covering 49.16% of the total output followed by works authored by more than 5 authors (35.58%) with works authored by 1-2 authored works ranking 3rd (16.26%).

Applied Sciences have highest score (48.72%) of papers authored by 1-2 author followed by Physical Sciences (38.46%) and Life Sciences (12.83%).

Majority of the papers (49.95%) in Physical Sciences are authored by 3-4 authors followed by Life Sciences (33.89%) and Applied Sciences (16.95%).

Life Sciences have highest number (55.42%) of works authored by more than five authors followed by Physical Sciences (36.15%) and Applied Sciences with 8.43% (Table 4).

Table 4 Authorship pattern

	1-2	3-4	More than 5
Physical Sciences	38.46%	49.95%	36.15%
Life Sciences	12.83%	33.89%	55.42%
Applied Sciences	48.72%	16.95%	8.43%

Collaboration

45.58% of articles have no collaboration at regional, national or international level and have been contributed by the authors from University of Kashmir.

Regional collaboration (i.e. Jammu and Kashmir State) amounts to 23.33%. The study also unfurls that 17.5% of the articles have a national collaboration with a very less score (14.59%) of

collaboration of international level.

Research funding

61.66% of the research articles are funded by University of Kashmir. However, national funding has been utilized by 28.75% of the articles with regional funding scoring 3rd producing 5.41% of the articles. However, only 4.58% of the articles have been funded from international funding agencies.

A detailed description of the disciplinary funding opportunities is deciphered from Table 5.

Table 5 Research funding

	Physical Sciences	Life Sciences	Applied Sciences
UoK	61	54	32
Regional	1	10	2
National	41	23	5
International	0	6	5

CONCLUSION

The work is exploratory and demands further work for 10-20 years to make a comparative analysis to assess the growth and impact of University of Kashmir in the realm of Science and ultimately help to frame a science communication policy. Growth of research articles is positive reflecting a sustainable scholarship. Though the number of articles is less and the author score is also less, one need to revisit in to the submission policies made by authors towards quality journals especially the ones indexed by Web of Science.

Citation patterns of the works authored by University of Kashmir authors also need to be taken seriously. Enhancing the visibility and discovery of the works will ensure in better citation reception.

Authors from University of Kashmir need to work more in collaborations in order to increase the quality as well as quantity of the research articles. This will also help sharing the research expertise among the researchers.

Authors need to look for opportunities to have funds from international agencies also in order to enhance the quality of research.

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