

Scientometric Profile of Three State Government Universities of Odisha as Reflected by Scopus Database during 2006-2015

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Abstract - The present study is a bibliometric analysis of the research output indexed in Scopus database during the period 2006-2015 of the three state Universities of Odisha such as Utkal University situated at Bhubaneswar, Sambalpur University situated in Burla and Berhampur University situated at Berhampur. A total number of 5597 articles has been studied and analysed the yearly contribution, most preferred subject area, most productive authors, most productive journals, most productive institutions and most cited papers of the three state Universities of Odisha. This study gives an idea about the core areas of research taking place in the three state Universities of Odisha and it might also be useful for various policy makers of Odisha to assess their funding and decide upon the future core areas of research in the years to come.

Keywords: Bibliometric Analysis, Utkal University, Sambalpur University, Berhampur University, Research Output, Scopus

INTRODUCTION

Research is essential for expansion and diversification of any subject field. It plays a vital role in the socioeconomic and physical development of a country. Scientific research output is an intangible wealth of a nation or a state. The research output in the peer reviewed journals is a measure of the research activity and constitutes an important bibliometric indicator. There are many government and private universities, autonomous institutions including technical institutions in Odisha. Among these, the present study covers only three state government universities. These are Utkal University (Bhubaneswar), Sambalpur University (Burla) and Berhampur University (Berhampur). The present study is a bibliometric analysis of the research output of these three state government universities of Odisha. The results of the study are based on data of publications indexed by *Scopus* during the period 2006 to 2015.

LITERATURE REVIEW

Garg and Kumar (2016) analysed 5334 articles published by the state of Odisha and indexed by Web of Science. Authors found that highest number of papers was published in the area of physical sciences followed by engineering sciences. Among all the institutions, the Institute of Life Sciences, Bhubaneswar and Central Institute of Freshwater and Aquaculture made the highest impact in terms of citation per paper and relative citation impact. A significant number of papers were published in journals published from the advanced countries of the West. About 40% papers published by the scientists from Odisha remained uncited. Das; Rout and

Parida (2013) analysed the publication patterns of Odisha. The data were collected from ISI Web of Science for the period 1967-2011, found that from 1972, the publications grew steadily up to 1982 but after that the growth was inconsistent. Authors of the state have collaborated with most of the developed countries of the world. It also showed that the publications of new institutes were increasing but publications of old colleges have decreased. The areas of clinical sciences, geology, environmental sciences, marine sciences, and computer sciences did not get much attention. Mahapatra and Jena (2006) studied scientific research productivity of Orissa during the period of 1985-2004 based on 875 research papers from 40 research journals. The study found that majority of authors prefers to publish their papers in collaboration with others. It was also found that research on agricultural science is more compared to other subjects. Swain and others (2013) examined the research productivity of KIIT University. The study examined 361 papers indexed in Scopus from the year 2000 to February, 2013. The study attempted to measure authorship pattern, degree of collaboration, year wise distribution of articles and corresponding citations, etc. and found that the majority of research are being carried by multiple authors and further revealed that authors of the same University have published maximum number of articles in computer science, engineering and technology and comparative clinical pathology.

OBJECTIVES OF THE STUDY

Objectives of the present study are as follows:

- To identify the type of documents used by scholars of the three universities to publish their research results;
- To analyze the yearly distribution of publications of the three universities;
- To identify the most preferred sub-disciplines of research of the three;
- To examine the communication behaviour of the scholars of the three universities and to identify the publishing country of the journals used for publishing the research results;
- To examine the pattern of authorship of the three universities and to calculate the correlation coefficient for the three universities;
- To identify the most productive authors of the three universities; and
- To examine the citation distribution of the published output and to identify most cited papers of the three universities;

METHODOLOGY

The source of data for the present bibliometric study is Scopus database produced by Elsevier. It covers nearly 22,000 titles from over 5,000 publishers, of which 20,000 are peer-reviewed journals in the scientific, technical, medical, and social sciences (including arts and humanities). Scopus has various search options based on bibliometric attributes of a publication. Publications can be identified from different states and provinces by searching the 'address' field provided in the search interface of Scopus. The data for the study was downloaded on 20/10/2016, by giving 'Odisha or Orissa' for 2010-2015. To be sure that no records missed variations of these searched words such as 'Odisha and Orissa' were also searched. The search resulted in a total of 2245 records for the three State Universities.

DATA ANALYSIS AND DISCUSSION

Type of documents used for publishing research results

Scientists publish their research results in different type of document sources like journals, conference papers, book chapters, patents and reports etc. Table-1 reveals the different type of document sources used by the scholars of by the three universities of Odisha. It is observed that like other Indian scientists the scholars from the three universities also preferred journals to publish their research results. Among all the universities, Utkal University has published highest 875 (85.6%) number of articles followed by Sambalpur University with 512(80.4%) articles. Among the three universities, Berhampur University published minimum 414(70.6%) number of articles. Berhampur University presented a significant number of papers at conferences as compared to the other universities.

Table-1: Document Types Used For Publishing Research Results

DOC. TYPE	Utkal University		Sambalpur University		Berhampur University	
	No. Of DOC.	%	No. Of DOC.	%	No. Of DOC.	%
Articles	875	85.62	512	80.38	414	70.65
Reviews	30	2.94	17	2.67	16	2.73
Letters	2	0.20	2	0.31	5	0.85
Notes	2	0.20	1	0.16	1	0.17
Conf papers	87	8.51	88	13.81	122	20.82
Book Chapter	17	1.66	8	1.26	16	2.73
Erratum	3	0.29	3	0.47	2	0.34
Article in Press	3	0.29	1	0.16	4	0.68
Editorial	2	0.20	3	0.47	4	0.68
Note	2	0.20	1	0.16	1	0.17
Book	1	0.10	1	0.16		0.00
Short Survey	0	0.00	1	0.16	2	0.34
Total	1022	100	637	100	586	100.00

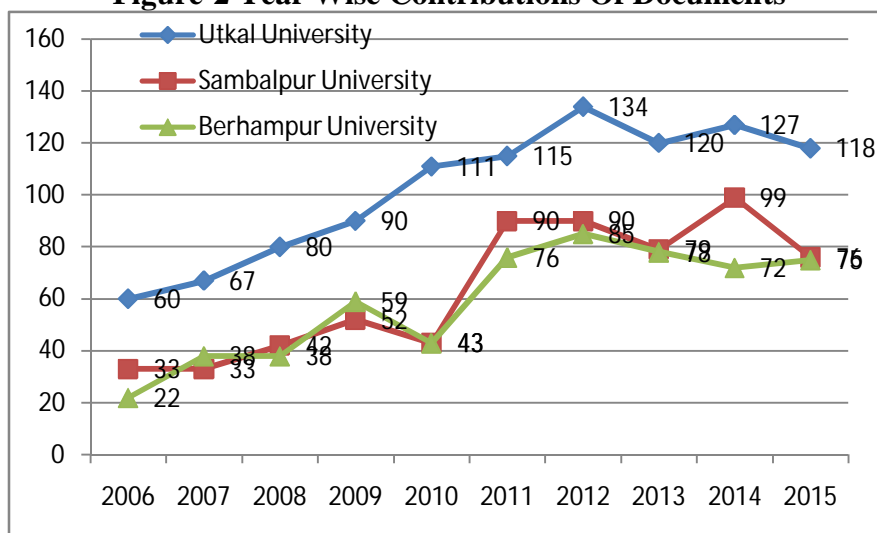
Distribution of Documents by Year

Table-2 depicts the data on the pattern of output by years for the period 2006-2015 of three State Universities of Odisha. The highest number of documents was contributed by Utkal University followed by Sambalpur University and least by Berhampur University. Graphical representation of data in Figure 1 indicates that highest number of articles was published by different universities in different years. For instance, Utkal University published highest (134) number of documents in the year 2012, while Sambalpur University (99) in the Year 2014 and Berhampur University (85) in the Year 2012. It is observed from Table 2 that during 2006 to 2010, the output has been low, but the output of all universities is increasing after 2011 onwards. However, the pattern of growth is inconsistent.

Table-2: DISTRIBUTION OF OUTPUT BY YEARS

Sl. No.	Year	Utkal University	%	Sambalpur University	%	Berhampur University	%
1	2006	60	5.87%	33	5.18%	22	3.75%
2	2007	67	6.56%	33	5.18%	38	6.48%
3	2008	80	7.83%	42	6.59%	38	6.48%
4	2009	90	8.81%	52	8.16%	59	10.07%
5	2010	111	10.86%	43	6.75%	43	7.34%
6	2011	115	11.25%	90	14.13%	76	12.97%
7	2012	134	13.11%	90	14.13%	85	14.51%
8	2013	120	11.74%	79	12.40%	78	13.31%
9	2014	127	12.43%	99	15.54%	72	12.29%
10	2015	118	11.55%	76	11.93%	75	12.80%
Total		1022	100%	637	100%	586	100%

Figure-2 Year Wise Contributions Of Documents



Distribution of Output by Sub-Disciplines and Their Activity Index (AI)

Table-3 depicts data on the sub-disciplines of three universities along with their Activity Index (AI). AI normalizes the data for the size of the university as well as the size of the sub-disciplines. Data presented in Table 3 indicates that the medicine was the sub-discipline of highest activity followed by pharmacology, toxicology and pharmaceuticals. Material science, chemistry and physics and astronomy were the priority areas of Sambalpur University. Engineering and technology followed by earth and planetary sciences was the most preferred area of activity for Berhampur University. Thus, all the three universities emphasised on different areas of research.

Table 3: Distribution of Output By Sub-Disciplines and Their Activity Index

Sl. No.	Sub-disciplines of research	Utkal University		Sambalpur University		Berhampur University		Total
		#	AI	#	AI	#	AI	
1.	PTP	176	123	54	54	92	116	322
2.	Physics and Astronomy	171	86	198	141	82	74	451
3.	BGM	137	113	82	97	54	80	273
4.	Environmental Science	137	123	41	53	73	118	251
5.	Chemistry	130	95	138	144	41	54	309
6.	Earth and Planetary Sciences	112	110	47	66	70	124	229
7.	Engineering	112	80	103	104	102	131	317
8.	Agricultural and Biological Sciences	110	113	61	90	48	89	219
9.	Medicine	110	137	27	48	44	99	181
10.	Material Science	69	71	125	184	25	46	219
11.	Computer Science	75	69	66	87	103	172	244
12.	Mathematics	85	96	58	93	57	116	200
13.	Total	1424		1000		791		3215

PTP:pharmacology, toxicology and pharmaceuticals,
BGM: Biochemistry, Genetics and Molecular Biology

Distribution of Output by Publishing Country of Journals

Analysis of data on papers published by scholars of the three universities indicates that there are a total number of 1196 document titles published from 12 countries including India. It indicates that the scholars of the three universities preferred to publish their papers in domestic journals. However, the proportion of papers differed for different universities. The share of papers published in journals published from abroad is very low. This indicates a low connectivity of the output of the three universities to the mainstream science. Table 5 lists most preferred journals used for publishing research results by the scholars of the three universities.

Table 4: Distribution Of Output Of Three Universities By Journal Publishing Countries

Sl. No.	Publishing country	Utkal Univ.		Sambalpur Univ.		Berhampur Univ.	
		Number of Papers	% of Papers	Number of Papers	% of Papers	Number of Papers	% of Papers
1.	India	1,025	85.70	801	92.06	593	93.68
2.	USA	0	0	35	4.02	0	0
3.	UK	51	4.26	8	0.91	23	3.63
4.	Italy	29	2.42	5	0.57	0	0
5.	Germany	24	2.00	0	0	7	1.10
6.	South Korea	17	1.42	0	0	0	0
7.	Japan	15	1.25	13	1.49	0	0
8.	Saudi Arabia	14	1.17	0	0	3	0.47
9.	France	11	0.91	0	0	0	0
10.	Taiwan	10	0.83	0	0	0	0
11.	Australia	0	0	4	0.45	3	0.47
12.	Singapore	0	0	4	0.45	4	0.63
	Total	1,196	100	870	100	633	100

Table 5: Most Preferred Journals Used For Publishing Research Results Utkal University

Sl. No.	Listed Journals	Number of papers	Number of citations	Citation per paper	H-index
1.	International Journal of Earth Sciences and Engineering	25	41	1.64	4
2.	Asian Journal of Chemistry	17	26	1.53	3
3.	Indian Journal of Physics	16	92	5.75	6
4.	Journal of the Indian Chemical Society	15	40	2.67	5
5.	Physical Review D Particles Fields Gravitation and Cosmology	14	154	11.00	5

Sambalpur University

Sl. No.	Listed Journals	Number of Papers	Number of Citations	Citation per Paper	H-Index
1.	Astrophysics and Space Science	22	229	10.41	9
2.	AIP Conference Proceedings	21	5	0.24	1
3.	Journal of the Indian Chemical Society	20	23	1.15	2
4.	Indian Journal of Chemistry Section A Inorganic Physical Theoretical and Analytical Chemistry	13	34	2.62	4
5.	Journal of Materials Science Materials in Electronics	10	36	3.60	4

Berhampur University

Sl. No.	Listed Journals	Number of Papers	Number of Citations	Citation per Paper	H-Index
1.	Indian Journal of Geo Marine Sciences	16	36	2.25	2
2.	ACM International Conference Proceeding Series	14	18	1.29	2
3.	Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics	12	29	2.42	3
4.	International Journal of Pharmacy and Pharmaceutical Sciences	11	15	1.36	2
5.	Asian Journal Of Chemistry	10	9	0.90	2

Pattern of Authorship

Table-6 presents the pattern of authorship of the three universities. The pattern of authorship varied from one university to another. However, the value of collaborative coefficient indicates that these are almost the same for all the universities. Table 7 lists most productive authors from the three universities.

Table-6: Authorship Pattern

University	Authorship Pattern							CC
	Single author	Two authors	3 authors	4authors	5 authors	6 authors	7 or more authors	
Utkal University	61 (5.97%)	219 (21.43%)	303 (29.65%)	170 (16.63%)		64 (6.26%)	85 (8.32%)	0.65

Sambalpur University	24 (3.77%)	135 (21.19%)	191 (29.98%)	137 (21.51%)	66 (10.36%)	32 (5.02%)	52 (8.16%)	0.66
Berhampur University	30 (5.12%)	138 (23.55%)	201 (34.30%)	116 (19.80%)	48 (8.19%)	27 (4.61%)	26 (4.44%)	0.64

Table-7 reveals the top five cited documents of three universities under study. Among the three Universities, the documents from Utkal University have got highest numbers of citations followed by Sambalpur University and Berhampur University.

Table 7: Frequency of Citations

Range of Citations	Number of Papers	% of Papers	Cumulative % of Papers	Total Number of Citations
0	320	20.6	20.6	0
1	209	13.4	34.0	209
2	165	10.6	44.6	330
3	102	6.6	51.2	306
4	77	4.9	56.1	308
5	78	5.0	61.1	390
6	69	4.4	65.6	414
7	46	3.0	68.5	322
8	45	2.9	71.4	360
9	31	2.0	73.4	279
10	31	2.0	75.4	310
11-20	201	13.0	88.4	2942
21-50	129	8.2	96.6	3920
51-100	38	2.4	99.0	2595
>100	15	1.0	100.0	2544
Total	1556	100.0		15229

CONCLUSIONS AND FINDINGS

The research output of the three state Universities of Odisha under study during the period found that:

- Highest number of publication contributions among three universities is:Utkal University in the year 2012 with number of documents 134(13.11%),Sambalpur University in the year 2014 with number of documents 99(15.54%), and Berhampur University in the year 2012 with number of documents 85(14.51%).
- UtkalUniversityis the most productive university among the three state universities of the study with 1022(46%) numbers of publications.
- As per the numbers of publications, the most preferred subject area of Utkal University is “Pharmacology, Toxicology and Pharmaceutics”with numbers of documents 176(17.22%), Sambalpur University is “Physics and Astronomy” with numbers of documents 198(31.08%), Berhampur University is “Computer Science” with numbers of documents 103(17.57%).
- It is found that Sambalpur University has the highest number contributions in the subject “Physics & Astronomy” and “Chemistry” as compared toUtkal University & Berhampur University.
- Article is the most preferred document type of all the three Universities under study. The contributions of article of three universities are: UtkalUniversitywith875(85.62%), Sambalpur University with 512(80.38%), Berhampur University with 414(70.65%).

- The most productive authors in terms of publications of Utkal University is Mishra, N.C. with contribution of 54(5.28%) documents. The most productive authors in terms of publications of Sambalpur University is Mishra, B.K. with contribution of 62(9.27%) documents and the most productive authors in terms of publications of Berhampur University is Patra, M.R. with a contribution of 62(10.58) documents,
- The most productive journal in terms of publications of Utkal University is “International Journal of Earth Sciences and Engineering” with 25 numbers of documents. The most productive journal in terms of publications of Sambalpur University is “Astrophysics and Space Science” with 22 numbers of documents & the most productive journal in terms of publications of Berhampur University is “Indian Journal of Geo Marine Sciences” with 16 numbers of documents.
- The article is the most productive source for publication of research outputs with approximately 80% of total publications. The reason behind the same may be due to the academic pressure in getting more marks in API (Academic Performance Indicator) and article publication has more score than other sources.
- The contribution of single author (5%) is too less than multiple authors (95%). The ratio of single author and multiple authors of three Universities are: Utkal University (01:15.8), Sambalpur University (01:25.5), & Berhampur University (01:18.5).
- The degree of collaboration of three state universities under study reveals that Sambalpur University has the highest degree of collaboration followed by Berhampur University and Utkal University.
- The top cited article among the three University under study is from Utkal University entitled “Geochemical Speciation and Risk Assessment of Heavy Metals in the River Estuarine Sediments-A Case Study: Mahanadi Basin, India” which is cited by 184 documents in the year 2011.

REFERENCES

1. Baskaran, C (2013). Research Productivity of Alagappa University during 1999-2011: A bibliometric study. *DESIDOC Journal of Library & Information Technology*, 33(3), 236-242.
2. Garg, K.C. & Kumar, S. (2016). Scientometric profile of an Indian state: The case study of Odisha. *COLLNET Journal of Scientometrics and Information Management*, 10(1), 141-153.
3. Gautam, Vinod Kumar & Mishra, Rajani (2015). Scholarly Research Trend of Banaras Hindu University During 2004-2013: A Scientometric Study Based on Indian Citation Index. *DESIDOC Journal of Library & Information Technology*, 35(2), 75-81.
4. Hadagali, Gururaj S. (2014). Scientific Productivity of Karnataka State during 1999-2011. *Journal of Advances in Library and Information Science*, 3(1), 72-84.
5. Hanumappa, A., Desai, A., & Dora, M. (2015). A Bibliometrics Profile of Gujarat University, Ahmedabad during 2004-2013. *DESIDOC Journal of Library & Information Technology*, 35(1), 9-16.
6. Kumbar, Mallinath; Gupta, B. M. and Dhawan, S. M. (2008). Growth and Impact of Research Output of University of Mysore, 1996-2006: A Case Study. *Annals of Library and Information Studies*, 55(3): 185-195.
7. Maharana, R. K., & Sethi, B. B. (2013). A Bibliometric Analysis of the Research Output of Sambalpur University's Publication in ISI Web of Science During 2007-2011. *Library Philosophy and Practice (e-Journal)*, Paper 926.

8. Maharana, R. K., & Das, P. (2013). Research Publication Trend of Utkal University's Researchers Indexed in Scopus During 2008 to 2012: A Bibliometric Analysis. *Library Philosophy and Practice (e-Journal)*, Paper 999.
9. Navaneethakrishnan, Subramanian (2014). Authorship Patterns and Degree of Collaboration of Sri Lankan Scientific Publications in Social sciences and Humanities – A Picture from SCOPUS, *Library Philosophy and Practice (e-journal)*, Paper 1153.
10. Singh, Vivek Kumar. Mapping Research Output of Indian Institute of Technology Bhubaneswar. *Indian J.Sci.Res.*, 2015, 11 (2), 065-068.
11. Siwach, A. K. & Kumar, S. (2015). Bibliometric Analysis of Research Publications of Maharshi Dayanand University (Rohtak) During 2000-2013. *DESIDOC Journal of Library & Information Technology*, 35(1), 17-24.
12. Swain, D.K.; Routaray, B. and Swain, C. (2013). Scientometric Dimension of Research Productivity of a Leading Private University in India. *Library Philosophy and Practice (e-journal)*. Paper 933.
13. Scopus: <https://www.scopus.com>

