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Bibliometric Study of Indian Open Access Social Science Literature

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Abstract: the purpose of this study is to trace out the growth and development social science literature in open access environment published from India. Total 1195 open access papers published and indexed in Scopus database in ten years have considered for the present study. Research publication from 2008 to 2017 have been analyzed based on literature growth, authorship pattern, activity index, prolific authors and institutions, publication type, channel and citation count have examined to provide a clear picture of Indian social science research. The study shows the dominance of shared authorship and sixty percentages of total articles have been cited. This original research paper described the research productivity of social science in open access context and will be helpful to the social scientist and library professional as a whole.

Key Words: Bibliometric study, Research Growth, Social Sciences, Open Access, Scopus, India

Introduction: Scholarly communications have been the primary source of creating and sharing knowledge by academics and researchers from the mid 1600s (Chan, Gray & Kahn, 2012). Henry Oldenberg was published first English-language periodical entitled Philosophical Transactions of The Royal Society of London in the year 1665 (Ratcliffe, 2015). In the year 2010 the scholarly communications cross over 50 million papers (Jinha, 2010) where as well known publisher Elsevier published more than 14 million papers from 1.8 million unique authors globally (Reller, 2016). At present time Scholarly communications includes a wide range of activates such as research articles, book publications, review, conference-seminar presentation, inform discussion, preprints, grey literature, and social media also (Sen, 2010; Ware & Mabe, 2015). The introduction of the concept of Open Access (2002) helps to increase the scholarly communication more wisely throughout the world with a rapid growth rate. (Laakso et al 2011).

First Indian scientific periodical was 'Asiatick Researches' published by the Asiatic Society in the year 1788 and within 1900, growth of the scientific periodicals of India increased with a progressive growth rate and reaches 725 (Sen, 2002). Presently India published a large number of journals and articles both in commercial and as well as open access mode. But higher education scenario in India showed that they delivered maximum fund to science & technology with the compare to social science. Whereas social science disciplines includes a large number of domains such as sociology, statistics, political science, economics and commerce, law, anthropology, education, public administration, customs and many more multi disciplinary areas.

Social science research has a very important role to enriching societies by generating scientific knowledge which helps to understanding the dynamics of human behavior and development (Thorat & Verma, 2017).

Present study tried to investigated growth and development of Indian open access social science literature with the help of bibliometrics analysis. Bibliometrics is a set of methods that quantitatively analyze scientific and technological literature (Bellis 2009). Bibliometric analysis has many applications for identifying research trends, authorship studies, content and citation analysis, publication sources, core journals, etc in any disciple.

Objectives: the objectives of this study are:

I. to trace out the growth and India's contribution in open access social science literature.
II. to analyze the type of authorship pattern and to measure the various research collaboration.
III. to find out the most productive sources, Institutes and their affiliated countries the field of social sciences, and.
IV. to find out the citation count of these articles.

Review of Related Literatures: Number of studies has carried out by researchers in different area of social science in Indian perspective. These works includes institutional context such as research productivity, funding and training of social scientists (Chatterjee, 2002), concerns and proposals (Balakrishnan, 2008), Capability (Venkataraman, 2016) of social science research. Social scientists of India have contributed many high quality papers in Social Science Citation Index (Goel & Garg, 1993; Goel, 2001, Tyagi & Johri, 2004) which reveals the high quality of Indian social science research. Comparative study with South Asia countries have shows that India contributes highest number of research output in respect to other countries (Gupta & Mahesh, 2013; Tiwari & Gupta, 2014; Dhawan, Gupta & Gupta, 2015). Gupta, Dhawan and Singh (2009) and Gupta and Kumbar (2014) examined a comparative study of India, China and Brazil during 1996 to 2007 in social science research output. Institutional productivity plays an important role in growth and development of any subject. Angadi and others (2006) studied a quantitative study of Tata Institute of Social Sciences and Sudhier and Abhila (2011) presented a bibliometric study of the scientists of Centre for Development Studies. Subramaniam (1999) studied on the doctoral work in social sciences in India. Arunachalam (2008) studied the social science research of South Asia based on Social Science Citation Index and SCImago indexed literature during the year 2000 to 2008. Papola (2010) described in his working paper the historical development and trend of Indian social science research and its impact of global level. Gupta, Kumbar and Gupta (2013) analyzed India's contribution in social science during 2001 to 2010. Rath (2015) presented a study on the 60 open access social science journals published from India and indexed in DOAJ and its implications for libraries. Vimala (2015) presented a bibliometric study of open access journals in social science during 2002 to 2014. Mundhial and Mohanty (2016) examined Indian doctoral works in social sciences during the period 2010-2012 with special references to library and information science. Bhattacharyya (2017) presented a

paper on open access publishing in 14 social science journals in the SAARC countries indexed in DOAJ. Kirtania (2018) studied on the open access journals in social sciences published in India.

Methodology:

Scope & coverage: This study covers open access research publications on "Social Sciences" published in India and indexed in Scopus database. This study covers 1195 research papers published from 2008 to December 2017.

Method Used: All research publications on social science, which is sub divided into five sub categories were identified by advanced searching mechanism through Scopus database. The retrieved results were further filtered by India and open access publications for the study. Then each publication was assessed for bibliographic data collection like year of publication, authorship pattern, affiliated institute and type of publication, etc. Scopus citation has been considered for checking the cited status of the papers. The raw data were collected, stored, organized and presented separately in MS-Excel which was followed by tabulation, analysis and interpretation. Several statistical methods such as Relation Growth Rate, Degree of Collaboration, Collaborative Coefficient, Collaborative Index, Activity Index and Correlation Coefficient were used for drawing the conclusion.

Data Analysis and Findings

Table 1: Year wise Distribution, Growth and Doubling Time of the Literatures

Year	No of papers	Percentage	W1	W2	RGR	[Dt (P)]
2008	5	0.41	----	1.61	----	----
2009	6	0.50	1.61	1.79	0.18	3.85
2010	32	2.68	1.79	3.47	1.68	0.41
2011	45	3.77	3.47	3.81	0.34	2.04
2012	75	6.28	3.81	4.32	0.51	1.36
2013	86	7.20	4.32	4.45	0.13	5.33
2014	145	12.13	4.45	4.98	0.53	1.31
2015	167	13.97	4.98	5.12	0.14	4.95
2016	352	29.46	5.12	5.86	0.74	0.94
2017	282	23.60	5.86	5.64	-0.21	-3.30
Total	**1195**	**100**	**----**	**----**	**Mean = 0.45**	**Mean = 1.88**

Table 1 describes the year wise distribution of annual output of papers and their relative growth rate. Total 1195 papers were published during the study time with almost 120 articles per year. Relative Growth Rate (RGR) means the increase in a number of publications/Pages per unit of time (Mahapatra, 1985). The RGR can be used to determine doubling time for publications, which tells how long it will take for a value to double. The equation of RGR discussed as: R (P) = $\frac{\log_e 2P - \log_e 1P}{2^T - 1^T}$, where R (P) = RGR of articles over the specific period of time, Log_e 1P = Log of Initial number of articles (W1), Log_e 2P = Log of final number of articles (W2), 2^T-1^T = The unit difference between the initial and the final times (Mahapatra, 1985). It could be detected from the discussion of Table 1 that there has a positive increased of research publications.

Doubling time of literature is directly associated to Relative Growth Rate. It is mainly the required time for articles or citations to becoming double from the existing volume of articles (Mahapatra, 2000). The formula of doubling time is

$$\text{Dt (p)} = \frac{Loge^2}{\bar{R}\,(p)} = \frac{0.693}{\bar{R}\,(p)}$$

The mean doubling time [Dt (P)] of articles during these ten years are 1.88

Table 2: Activity Index of the Publications

Year	Indian Publications	Global Publications	Activity Index
2008	5	622	31.71
2009	6	1017	23.27
2010	32	3294	38.32
2011	45	4519	39.28
2012	75	2144	138
2013	86	2210	153.51
2014	145	3751	152.49
2015	167	5657	116.46
2016	352	10167	129.05
2017	282	13760	80.85
Total	**1195**	**47141**	**Mean = 90.29**

Table 2 describes the distribution of India's Activity Index (AI) in open access social science research. Activity Index accounted as relative research effort of a particular country in any specific subject respect to global publications and explained as AI = {(Ii/Io) / (Wi/Wo)} x 100, whereas Ii = India's output in year i; Io = India's total output; Wi = World output in year I; Wo = Total output (Kakri & Garg, 1997). Mean of Indian Activity Index found here 90.29, which is quite good in terms of global research productivity.

Table 3: Most productive countries in open access social science research

Country	Total Publications	Rank
United Kingdom	7937	1
USA	7280	2
Spain	3339	3
China	3072	4
Germany	2956	5
Netherland	2837	6
Italy	2119	7
Turkey	1890	8
Australia	1774	9
Canada	1678	10
Iran	1655	11
Sweden	1418	12
France	1393	13
Brazil	1292	14
Japan	1224	15
India	1195	16

Table 3 describes the most productive countries contributed in the field of open access social science literature. United Kingdom has contributed highest number of papers followed by USA, Spain and China. India holds sixteenth position globally, second in Asia and top in Southeast Asia. This showed the potential and acceptance of Indian social science research in worldwide.

Table 4: Authorship pattern and Collaborative measures of the articles

Year	Authorship Pattern				Total	CC	CI	DC
	One	Two	Three	> three				
2008	0	3	1	1	5	0.58	2.60	1
2009	0	4	1	1	6	0.58	2.83	1
2010	10	8	7	7	32	0.45	2.94	0.69
2011	13	16	6	10	45	0.44	2.58	0.71
2012	14	22	28	21	75	0.54	3.20	0.81
2013	22	28	19	17	86	0.47	2.80	0.74
2014	33	37	34	41	145	0.52	3.21	0.77
2015	27	52	33	55	167	0.56	3.84	0.84
2016	43	107	89	113	352	0.58	3.42	0.88
2017	26	103	66	87	282	0.59	3.54	0.91
Total	**188**	**380**	**274**	**353**	**1195**	**0.55**	**3.37**	**0.84**

Table 4 describes the Authorship pattern, Collaborative Coefficient (CC), Collaborative Index (CI) and Degree of Collaboration (DC) of these publications. The authorship pattern revealed that maximum of the articles was contributed under shared or joint authorship pattern. Collaborative Coefficient (CC) and Collaborative Index (CI) measure the author collaborations mathematically. Collaborative Index is a measure of mean number of authors (Lawani, 1986) and Collaborative Coefficient is the mean number of authors per paper (Ajiferuke et al, 1988). The mathematical formula of CC & CI is mentioned as $CC= 1 - \frac{\sum_{j=1}^{k}\left(\frac{1}{j}\right) fj}{N}$ where *fj* is Number of *j* authored research papers, *N* is total number of research papers, *K* is greatest number of authors per paper and $CI= \frac{\sum_{j=1}^{k} j\ fj}{N}$

Results showed that that the average CC of total papers is 0.55 which clearly indicates the trend towards of joint authorship pattern among the authors for publishing articles. The averages CI of these articles were 2.42, which indicate the dominance of joint authorship. Degree of collaboration indicates the trend of collaborative authorship pattern among the authors for publishing outputs (Subramanyam, 1983). Degree of Collaboration is calculated by simple formula i.e. (DC) = $\frac{Nm}{Nm+Ns}$ [Nm = number of multi-authored papers and Ns = number of single authored papers]. The average DC is 0.84 which clearly revealed the slightly dominance of joint authors in the field of Social Science.

Table 5: Author Productivity

Year	Publications	No of authors	Average author per Paper	Productivity per author
2008	5	13	2.60	0.38
2009	6	17	2.83	0.35
2010	32	94	2.94	0.34
2011	45	116	2.58	0.39
2012	75	238	3.22	0.32
2013	86	242	2.81	0.36
2014	145	466	3.21	0.31
2015	167	641	3.84	0.26
2016	352	1204	3.42	0.29
2017	282	998	3.54	0.28
Total	**1195**	**4029**	**3.37**	**0.30**

Table 5 describes the year wise distribution of author productivity. Author productivity is defined as the number of papers an author has published within a given period of time. Total 4029 authors have contributed these 1195 research papers with 3.37 Average Author per Paper and 0.30 Productivity per Author. Mathematical formula of Author Productivity is discussed as: Average Author per Paper = $\frac{\textbf{No of Authors}}{\textbf{No of Papers}}$ and Productivity per Author = $\frac{\textbf{No of Papers}}{\textbf{No of Authors}}$

Here the trend of productivity of the authors is found to be similar with respect to different periods of time

Table 6: Most Productive Authors (at least six papers)

Author Name	No of Papers	Percentage
N B Kanagal	21	1.76
V Patel	12	1
R K Garg	8	0.67
M.V.L.R. Anjaneyulu	7	0.59
C N Khobragade	7	0.59
M Pal	7	0.59
B N Rekadwad	7	0.59
J P Tamang	7	0.59
K Krishan	6	0.50

Table 6 describes the distribution of most productive authors in the field. Professor N B Kanagal of IIM Bangalore has contributed highest number of publications followed by Professor Vikram Patel, London School of Hygiene and Tropical Medicine, United Kingdom.

Table 7: Publication type

Type of the Publication	No of Papers	Percentage
Article	926	77.49
Conference Paper	163	13.64
Review	58	4.85
Editorial	37	3.10
Letter	4	0.33
Note	3	0.25
Book Chapter	2	0.17
Erratum	2	0.17
Total	**1195**	**100**

Table 7 shows the distribution of publications according their type of publications. Results point out that maximum numbers of papers have published as primary research work, i.e. journal article (77.49%) followed by conference paper (13.64%). Along with the primary source of publications 58 reviewed papers and 37 editorials have been found as publication type.

Table 8: Most popular source of Publications

Publication source	No of papers	Percentage
IIMB Management Review	149	12.47
Transportation Research Procedia	110	9.21
Egyptian Journal Of Forensic Sciences	106	8.87
Fuzzy Information And Engineering	70	5.86
Egyptian Informatics Journal	61	5.10
Space And Culture India	50	4.18
Data In Brief	48	4.02
International Journal Of Sustainable Built Environment	45	3.77
Social Science And Medicine	23	1.92
Procedia Social And Behavioral Sciences	22	1.84

Table 8 describes the distribution of most popular source or channel of publication of Indian social science research. It is observe that 684 papers (57.24%) are contributed by 10 publications source. IIMB Management Review published the highest number of papers with 149 papers followed by Transportation Research Procedia and Egyptian Journal of Forensic Sciences. Top ten institutions have been contributed 57.24% of total publication in social science research.

Table 9: Most productive institutes

Institute Name	No of papers	Percentage
Indian Institute of Management Bangalore	55	4.60
Indian Institute of Technology Roorkee	36	3.01
University of Delhi	34	2.85
Indian Institute of Technology, Bombay	25	2.09
Indian Institute of Technology, Madras	23	1.92
Vidyasagar University	22	1.84
Punjabi University Patiala	21	1.76
Indian Institute of Technology, Kharagpur	21	1.76
London School of Hygiene & Tropical Medicine	20	1.67
Panjab University	19	1.59
National Institute of Technology Calicut	17	1.55
Indian Institute of Technology Delhi	17	1.55

Table 9 describes the distribution of most productive institutes. The list includes five Indian Institute of Technology, three Universities and other renowned institutes. Above table shows that one fourth of total publications has been produced by top ten affiliated institute in India.

Table 10: Top ten foreign countries

Country	No of papers	Percentage
United States of America	112	9.37
United Kingdom	94	7.87
Australia	31	2.59
Canada	31	2.59
Netherlands	28	2.34
Germany	20	1.67
China	18	1.51
South Africa	17	1.42
France	15	1.26
Nepal	15	1.26
Saudi Arabia	15	1.26

Table 10 describes the most productive countries along with the India. United States of America has contributed highest number of publications followed by United Kingdom, Australia and Canada. Publication collaborations with theses counties showed the quality as well as the future of Indian social science research.

Table 11: Cited count of these publications

Year	Total Papers	Cited Papers	Total citation	Average
2008	5	5	37	7.4
2009	6	6	70	11.67
2010	32	25	299	9.34
2011	45	34	461	10.24
2012	75	57	515	6.87
2013	86	67	688	8
2014	145	114	967	6.67
2015	167	132	1053	6.31
2016	352	188	708	2.01
2017	282	89	280	0.99
Total	**1195**	**717**	**5078**	**4.25**

Table 11 describes the year wise citation count of the articles. The above table finds that out of 1195 articles, 717 articles (60%) were cited in different times with 6078 total citation, which indicated the quality of Indian research output. Among individual year 2015 was received

highest number of citation i.e. 1053. Above table also finds the increasing pattern of citation count up to 2015.

Table 12: Correlation Coefficient of total and cited articles

Since the correlation coefficient is unaffected by change of origin (and also scale), let change the origins of X and Y to 145 and 67 respectively, i.e. write x=X- 145 and y=Y- 67 (Das, 1991).

Year	**X**	**Y**	**x= X- 145**	**y=Y- 67**	**x^2**	**y^2**	**xy**
2008	5	5	-140	-62	19600	3844	8680
2009	6	6	-139	-61	19321	3721	8479
2010	32	25	-113	-42	12769	1764	4746
2011	45	34	-100	-33	10000	1089	3300
2012	75	57	-70	-10	4900	100	700
2013	86	67	-59	0	3481	0	0
2014	145	114	0	47	0	2209	0
2015	167	132	22	65	484	4225	1430
2016	352	188	207	121	42849	14641	25047
2017	282	89	137	22	18769	484	3014
Total	**1195**	**717**	**-255**	**47**	**132173**	**32077**	**55396**

The equation of Correlation Coefficient describes as follows (Das, 1991).

$$\sigma_x^2 = \frac{\sum \boldsymbol{x^2}}{\boldsymbol{N}} - \left(\frac{\boldsymbol{x}}{\boldsymbol{N}}\right)^2 = \frac{\boldsymbol{132173}}{\boldsymbol{10}} - \left(\frac{\boldsymbol{-255}}{\boldsymbol{10}}\right)^2$$

$$\sigma_y^2 = \frac{\sum \boldsymbol{y^2}}{\boldsymbol{N}} - \left(\frac{\boldsymbol{y}}{\boldsymbol{N}}\right)^2 = \frac{\boldsymbol{32077}}{\boldsymbol{10}} - \left(\frac{\boldsymbol{47}}{\boldsymbol{10}}\right)^2$$

$$\text{Cov}(x, y) = \frac{\sum \boldsymbol{xy}}{\boldsymbol{N}} - \left(\frac{\sum \boldsymbol{x}}{\boldsymbol{N}}\right)\left(\frac{\sum \boldsymbol{y}}{\boldsymbol{N}}\right) = \frac{\boldsymbol{55395}}{\boldsymbol{10}} - \left(\frac{\boldsymbol{-255}}{\boldsymbol{10}}\right)\left(\frac{\boldsymbol{-47}}{\boldsymbol{10}}\right)$$

$$r_{xy} = \frac{\boldsymbol{Cov}\,(\boldsymbol{x},\ \boldsymbol{y})}{\boldsymbol{\sigma x\ \sigma y}} = \frac{\boldsymbol{5659.35}}{\boldsymbol{\sqrt{12567.05}\,\sqrt{3185.61}}} = 0.89$$

Therefore the obtained correlation coefficient value is $r_{xy} = 0.89$ (Positive). It may be concluded from the result that there is a positive sign in citation count of the publications.

Conclusion: Open access publishing, becoming a new trend in social sciences research in India over recent years, which increased the visibility of research output by Indian scholars. The study shows that during the study time, the growth rate of these publications and their citations have very much positive and increasing and the papers have published in several national and international levels Journal. Authorship patterns and other measurements showed the trend towards shared or collaborative model which clearly indicates the present of working research groups and publications have noticed at the international level via large number of foreign contribution. The study finds that out of 1195 articles, 717 articles (60%) have been cited in different times with 6078 total citation which is an evident of quality publication trend. India has encouraged as well as promoted the social science research through state of patronage and active role of ICSSR. Finally India has great prospective in sustaining the higher publication and research output growth in social sciences in the coming years.

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