

Bibliometrics of social science and humanities research in India

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The present study is an attempt to highlight the research output generated in India in the field of social sciences and humanities (SSH) during the period 2005–2014. This study is based on secondary data, extracted from the Social Science Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI), which are integral components of the Web of Science. Descriptive and inferential statistical techniques were applied in the study. There were 9525 articles by Indian scholars in SSH during 2005–2014; they preferred to publish in Indian journals. The research contributions were in the form of research articles and book reviews with a consistent drop in the number of book reviews with time. Co-authorship was the norm in SSH disciplines with a steady increase in the number of multi-author papers in recent years. The study shows that multi-authored research papers received more citations than single-authored papers.

Keywords: Authorship, bibliometrics, citations, social sciences and humanities.

BIBLIOMETRICS is an essential area of study in library and information science. It entails the application of statistical methods and quantitative analysis to describe trends of publication in a particular field. It is also used to evaluate and highlight the impact of researchers, journals and institutions in a specific area.

Bibliometrics highlight quantity and quality of published research in terms of number of different types of published documents, number of authors in individual papers, number of citations and references, language, journals, etc. These parameters of bibliometrics help in identifying core research areas, frequently read and cited authors, institutions producing high-quality research, core journals, main working groups and collaborating countries in different disciplines. The bibliometric indicators also reveal emerging research areas which need to be addressed to resolve numerous social, psychological, environmental, and economic, problems and issues. The bibliometric tools are regularly used to evaluate quality of institutions by agencies involved in ranking and releasing grants. Universities across the globe have constituted Bibliometric Working Group (BWG)^{1,2} to highlight and evaluate research outputs of individual researchers, departments and laboratories. The relevance of bibliometrics makes it a valuable research area for scholars in library and information science. The bibliometric analyses expedite research in different disciplines. The cohort

analysis of bibliometrics helps in understanding evolution and trends in various disciplines, identifying emerging areas and gaps and enabling forecasting of research landscape and innovation. Bibliometrics benefits all the stakeholders in academic libraries in making informed decisions supported by evidence on volume and quality of research publications.

Most of the research studies on bibliometric analyses in India^{3–9} have focussed on research outputs in science and technology disciplines. The published literature has not highlighted the research output of India in SSH with the help of bibliometric tools, though there are some research papers^{10,11} which highlight the core journals in SSH discipline using bibliometric analyses, policymakers and administrators in higher education may understand research landscape in SSH discipline in a scientific manner.

A few social science institutions in India, Bangladesh, Srilanka and Pakistan did not do well because of lack of funds and support from governments^{10,11}. The studies suggested that social science education and research should be strengthened by expanding resources and institutional structure. It was observed that lack of action on the part of governments, institutions and professional associations prevented growth of social sciences in Pakistan and Nepal^{12,13}. These studies were communicated in 2002 and did not use bibliometric tools to highlight the research output in social sciences. This issue can be addressed by publishing scientific analysis of bibliometrics in SSH discipline.

Hammerfelt¹⁴ used bibliometric methods for analysing research output in humanities and highlighted organizational, epistemological differences and distinct research

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practices in the field of humanities. He observed that interdisciplinarity and indigenous themes of subjects in humanities impact the use of bibliometrics in highlighting the research output. Further, he suggested that clear indicators be developed for analysing research output in humanities. Gumpenberger *et al.*¹⁵ studied the longitudinal research output of the University of Vienna during 2007–2012. They reported that faculty members in social sciences published more in peer-reviewed journals indexed in AHCI and SSCI. The number of publications with DOI or gold open access was less in humanities than in social sciences. Nwagwu and Egbon¹⁶ analysed the SSH publications of Nigeria published in 2002–2007, and indexed in AHCI and SSCI to highlight the international perspective of publication dynamics in SSH. There were 716 publications which received 1371 citations and English was the primary language of research communication.

Prins *et al.*¹⁷ evaluated humanities and social science programmes offered in the Netherlands by comparing the research output of SSH as reflected by Google Scholar and Web of Science (WoS). They suggested that Google Scholar be used to highlight the research output in subject areas inadequately covered by WoS.

Tang *et al.*¹⁸ used bibliometric methods to highlight the intellectual cohesion in digital humanities during 26 years between 1989 and 2014. They reported that research has grown in digital humanities and has become more diverse and cohesive. Collaborative endeavours are limited by language and geographic factors.

The present study investigates evolution and trends in research output in SSH disciplines produced by higher educational institutions in India during 2005–2014 with the support of bibliometric tools. This study would help and guide in formulating of research policies and funding in SSH. Research also leads to the extension of boundaries of knowledge as researchers reinterpret, re-analyse and add new perspectives to the already existing cultural and social knowledge on the basis of emerging trends in SSH. The present data was collected from WoS and the method of study was based on descriptive and inferential research approach.

Objectives

The objectives of the study were: (a) to highlight published research of Indian scholars in SSH in the time period, 2005–2014; (b) to explain pattern of authorship in SSH research; (c) to understand association between the number of authors and number of citations for individual publications; (d) to identify core journals preferred by Indian researchers for publishing research in SSH; (e) to highlight number of citations and average number of references per publication; (f) to identify prime research areas in SSH and (g) to identify prime languages in which the researchers published.

Null hypotheses

H_{01} : Number of contributions under different types of publications (articles, proceedings paper, book review, poetry and review) was not consistent in the ten-year period.

H_{02} : Number of authors per publication did not grow during the ten-year period (i.e. no trend for multi-author publications).

H_{03} : Multi-authored research publications do not have large number of citations.

Method of study

This study was based on secondary data. The data was extracted from SSCI and AHCI, which are integral components of WoS, an online bibliographic and citation indexing service maintained and published by the Institute for Scientific Information. At present it is maintained by Clarivate Analytics.

In basic search web page on citation index portal of WoS, '2005–2014' was entered in 'year published' field and 'AHCI, SSCI' in the 'setting' column to get data for the study. All records searched and indexed by AHCI and SSCI against this query were further refined by country (India). The authors got 9525 records, which were analysed in this study. These records were downloaded in batches of 500 (a maximum of 500 records can be downloaded at one time from WoS) and saved as MS-Excel file. The WoS core collection indexes 41 different types of documents¹⁹. Documents considered were articles, proceedings, book reviews, reviews and poetry. We used MS-Excel and SPSS package for further quantitative analysis. Descriptive statistics techniques were used to quantify research output of higher education institutions in India in SSH on the following parameters: number of publications and their types (articles, proceedings, book reviews, reviews and poetry) annually; number of authors in individual papers; average number of authors per article during the last ten years; cited reference counts, average number of references per article; core SSH journals in which Indian researchers frequently published; and language of publications of Indian researchers in SSH.

Inferential statistical techniques were applied to test null hypotheses. The cohort analysis of these parameters explained trends in research publications in SSH disciplines in the ten-year period. The data was collected in September 2016.

Number of publications

SSCI and AHCI show that researchers contributed 9525 publications during the period of study, i.e. 2005–2014 (Table 1).

Articles in journals were the major research contributions of Indian scholars in SSH for the period under

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Table 1. Publications of Indian researchers in SSH discipline in the ten-year period (2005–2014)

Year of publication	Articles		Proceedings papers		Book reviews		Poetry		Reviews		Total no.	%	Cumulative %
	No.	%	No.	%	No.	%	No.	%	No.	%			
2005	307	62.1	25	5.1	154	31.2	0	0.0	8	1.4	494	5.2	5.2
2006	396	67.5	24	4.1	157	26.7	0		10	1.5	587	6.2	11.4
2007	452	70.4	32	5.0	147	22.9	0		11	1.7	642	6.7	18.1
2008	592	74.8	30	3.8	159	20.1	0		10	1.3	791	8.3	26.4
2009	765	75.7	27	2.7	181	17.9	21	2.1	17	1.7	1011	10.6	37.0
2010	857	82.8	9	0.9	153	14.8	0		16	1.5	1035	10.9	47.9
2011	1267	80.5	5	0.3	266	16.9	7	0.4	29	1.8	1574	16.5	64.4
2012	858	82.7	6	0.6	154	14.8	1	0.1	19	1.8	1038	10.9	75.3
2013	938	84.0	1	0.1	163	14.6	2	0.2	13	1.1	1117	11.7	87.0
2014	1012	81.9	4	0.3	198	16.0	4	0.3	18	1.5	1236	13.0	100.0
Total	7444	78.1	163	1.7	1732	18.2	35	0.4	151	1.5	9525		

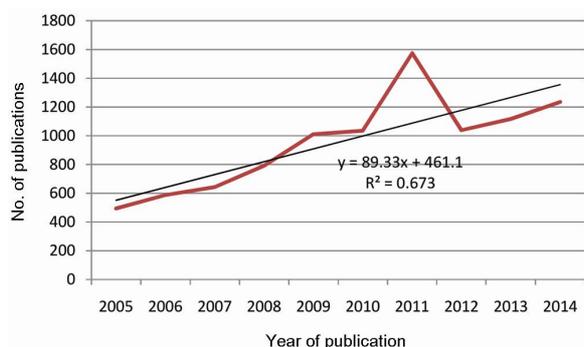


Figure 1. Growth in research publications by Indian scholars in social sciences and humanities.

study; 78.1% of published research work was in the form of articles. Another major research contribution was in the form of book reviews (18.2%). However, there was consistent drop in publications of book reviews and increase in the publications of articles during the ten-year period.

Regress equation: $y = 89.33x + 461.1$ with $R^2 = 0.673$.

The regression equation indicates 67% increase in number of research publications over 10 years (Figure 1).

Null hypothesis – Number of contributions under different types of publications (articles, proceedings paper, book review, poetry and review) was not consistent during the study period.

Table 1 reflects volume of different types of research publications with year of publication and their growth. The change in nature of research publications with time was statistically examined with the χ^2 test (Table 2). Contributions in the form of poetry was very low in most of the years hence ‘poetry’ was dropped before applying the χ^2 test to ensure high reliability of test.

The significance of Pearson χ^2 test expresses significant change in nature of publications with time, thus null hypothesis was rejected.

Pattern of authorship

Collaborative research approach can resolve issues of scarcity of resources/experts and research grants. Col-

laboration ensures timely completion of research and also boosts the quality of research. Literature review shows high citations for co-authored publications. Such research is more visible, recognized and impactful^{20,21}. Multi-authorship research approach also supports and fosters interdisciplinary research, which in turn can diminish gaps between scholars in social sciences and sciences and facilitate collaborative research endeavours. Information and Communication Technologies (ICTs) act as catalyst in facilitating collaborative research by connecting researchers/scholars from different disciplines across the globe. ICT facilitates collaboration irrespective of geography, culture, language and time zone. The study of authorship pattern is imperative to explain researchers’ willingness for collaboration across disciplines and political boundaries to share data and work together to generate new findings and knowledge.

Willingness for co-authorship of research publication differs with disciplines. Co-authorship is more prevalent in science disciplines and researchers in social sciences prefer to work individually. The literature highlights that the trend for single authorship was the norm in science disciplines during the 1900s to 1920s. Subsequently, collaborative studies started appearing. Single authorship drastically went down in 1950s and almost completely vanished in 1980s (ref. 22). The trend of co-authorship has been rising among social scientists^{23,24}. It has also been observed that research publications based on quantitative research approach and statistical methods attract multi-authorship. Among the 22,809 Indian authors who published 9526 articles in SSH during 2005–2014, there were 12,170 unique authors.

Table 3 indicates that 45.5% of publications in SSH were single-authored and 23.1% were produced by two authors; only 6.1% had more than five authors. Hence, single authorship was the norm for SSH publications in India during the ten-year period. The same is reflected in Figure 2.

Table 4 reflects cohort of authorship in SSH disciplines in India in the ten-year period, 2005–2014.

Table 4 reflects that trend for multi-author papers had consistently grown over the years. The mean number of

authors per research publication grew from 1.89 in 2005 to 2.4 in 2014. The trend in authorship has been visualized in Figure 3.

Null hypothesis: The number of authors in individual research publications does not increase with year. The null hypothesis was examined with the Kendall's Tau-c test. 'Year of publication' parameter is on interval scale and number of authors is treated as ordinal data.

The significance level of Kendall's Tau-c test value proves association between number of authors for individual papers and year of publication, shown in Table 5. The positive value of Kendall's Tau-c test indicates that number of authors in individual papers grew with time (year of publication). Hence null hypothesis is rejected.

Figure 3 indicates that increase in the number of authors for individual papers was not consistent across the years; a minor drop in number of research publications with multi-authors was noted in 2008 and 2011. Further analysis identified specific years of publications having high number of multi-author papers. The analysis of variance (ANOVA) and post-hoc tests were applied to identify years of publications with large number of authors in individual research papers.

Table 2. Association in number of publications under different categories and year

Parameter	Value	df	Asymp. sig. (2-sided)
Pearson χ^2	332.91	27	0.000
Likelihood ratio	321.76	27	0.000
No of valid cases	9490		

Table 3. Authorship in SSH disciplines in India

Number of authors	Number of papers	Percentage of total papers
1	4330	45.5
2	2203	23.1
3	1439	15.1
4	665	7.0
5	308	3.2
More than five	580	6.1
Total	9525	

Table 4. Trends in multi-author papers in SSH discipline in India

Year	Mean number of authors	Numbers of papers	Standard deviation
2005	1.89	494	1.502
2006	1.88	587	1.447
2007	2.08	642	1.701
2008	1.97	791	1.469
2009	2.12	1011	1.551
2010	2.28	1035	1.688
2011	2.19	1574	1.599
2012	2.40	1038	1.818
2013	2.51	1117	1.862
2014	2.40	1236	1.804
2005–14	2.22	9525	1.683

The significance level of Levene test indicates that publications every year were not homogeneous in terms of number of authors per publication, shown in Table 6.

The significance level of *F* test proves that the number of authors per publication differs with years of publication (Table 7). The Games–Howell test is the most appropriate *post hoc* technique to identify specific years with large number of multi-author papers when there are unequal variances in number of authors and unequal numbers of research publication in each year. Table 8 reflects the results of the *post hoc* test and confined to rows having significant gap in numbers of authors in individual papers.

The level of significance column in Table 8 highlights the years with remarkable difference in number of authors per research publication; hence the null hypothesis was rejected.

Multi-author papers and their citations

The papers written in collaboration receive more citations than papers written by solo Authors²⁵. This trend

Numbers of authors in individual paper

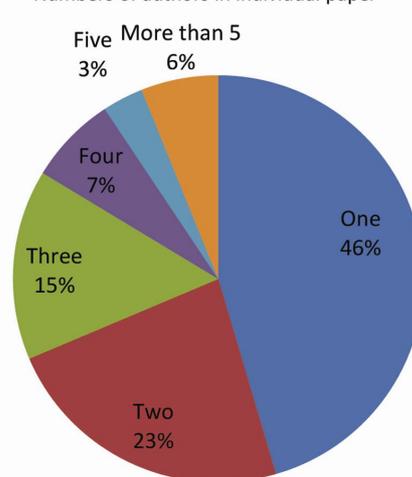


Figure 2. Pattern of authorship.

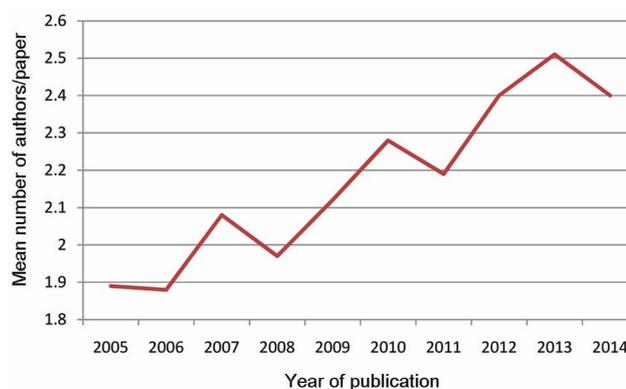


Figure 3. Trends in authorship in research publications in SSH disciplines in India in the ten-year period.

has been observed across science, engineering, social sciences, arts and humanities. It implies that collaborative research is more impactful in generating knowledge. This study examines whether papers written in collaboration in SSH disciplines in India attracted more citations.

Table 9 reflects descriptive statistical analysis of number of authors per paper and the number of times that paper is cited in SSH disciplines in the ten-year period. This table is confined to reflect citations of research papers written by up to nine authors as number of publications with more than nine authors was less than 50.

Table 9 also indicates that the number of citations has improved with number of authors per research publication in SSH disciplines in the ten years. The same trend is visualized with line graph in Figure 4.

Null hypothesis: Multi-authored research publications do not have high number of citations. The association in the number of authors in individual papers and the number of citations has been shown with the Pearson Correlation test.

The significance of Pearson correlation value between the number of authors per paper and the number of citations falsifies null hypothesis (Table 10). A low positive value of Pearson correlation indicates minor growth in the number of citations with rise/decrease in the number of authors for research publications in SSH.

Table 5. Association in number of authors in publications and year of publication

Value of Kendall's Tau-c test	Asymp. standard error(a)	Approximate T(b)	Approximate significance
0.087	0.007	12.083	0.00

Table 6. Test for homogeneity of variances in numbers of authors in individual papers across year of publication

Levene statistic	df ₁	df ₂	Significance
4.01	9	9515	0.00

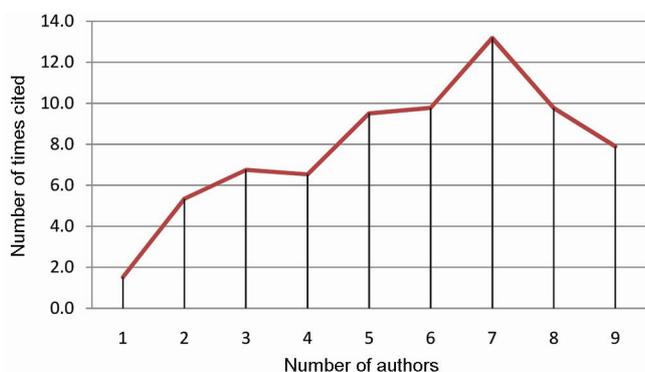


Figure 4. Association in numbers of authors and numbers of citations.

Core journals in which the SSH researchers of India frequently published

There were 1603 unique journals which published a total of 9525 research publications of Indian scholars in SSH disciplines in the ten-year period. Table 11 shows journals popular among Indian researchers for publishing their research findings.

There were eight journals equivalent to 0.5% of the total number of unique journals which published 1505 papers or 15.8% of the total research outputs in SSH from India in the period 2005–2014. Each of these journals published more than one hundred research publications, i.e. an average of more than ten research publications every year. There were 1184 journals or 73.9% of the total number of unique journals, which published only 22.5% of the total research outputs. Each of these journals published less than five research papers in ten years. Thus SSH researchers preferred to publish their research in selected journals.

Core journals which frequently published research findings of Indian scholars in SSH disciplines are given in Table 12.

Journals like *Contributions to Indian Sociology*, *Indian Journal of Social Work* and *Indian Journal of Gender Studies* were the main journals focusing on research done in India. All journals listed in Table 12 are published from India. Research works in SSH are highly contextual and culture-specific, so papers addressing local contexts, culture and language get priority for publication in Indian journals. Research communication in SSH does not follow the same trends and practices prevalent in the sciences²⁵. Researchers may focus on social or cultural topics which may have tremendous relevance for the local population and may prefer to publish their work in regional or national journals.

The Bradford Law of scattering explains distribution of literature in journals in various disciplines. This law states that most of the research in specific disciplines is confined to a few core journals.

From this law, a formula has been derived to explain the distribution of research papers in journals. This rule distributes journals in zones of equal numbers of research papers. Researchers will decide the number of zones. The mathematical formula for numbers of journals in each zone is

$$r_0 = \frac{T(k-1)}{(k^p - 1)},$$

r_0 is the number of research papers in the first and core group of journals, T the number of total journals and P indicates numbers of zones.

$$k = (e^y \times Y_m)^{1/p}.$$

where y is Euler's number having a value 0.57772. Y_m is the number of articles published in the top ranked journals and P is the Bradford group or numbers of zones,

Table 7. Analysis of variance (ANOVA) test for change in number of authors with year of publication

Parameter	Sum of squares	df	Mean square	F	Significance
Between groups	585.799	9	65.089	5.446	0.00
Within groups	111,584.5	9515	11.95079		
Total	112,170.3	9524			

Table 8. Post-hoc test to identify years with high numbers of multi author papers

Year of publication (i)	Year of publication (j)	Mean difference (I-J)	Standard error	Significance	95% confidential limit	
					Lower bound	Upper bound
2005	2010	-0.450	0.100	0.000	-0.767	-0.134
	2011	-0.420	0.095	0.000	-0.722	-0.118
	2013	-0.779	0.125	0.000	-1.174	-0.383
	2014	-0.695	0.107	0.000	-1.033	-0.357
	2012	0.823	0.222	0.008	0.120	1.525
2007	2010	-0.315	0.094	0.029	-0.614	-0.016
	2011	-0.285	0.089	0.047	-0.568	-0.002
	2013	-0.643	0.120	0.000	-1.025	-0.262
	2014	-0.560	0.101	0.000	-0.881	-0.239
2008	2013	-0.605	0.140	0.001	-1.049	-0.161
	2014	-0.521	0.124	0.001	-0.915	-0.128

Table 9. Numbers of citations of research papers controlled by numbers of authors

Number of authors per paper	Mean numbers of time cited	No. of research papers	Standard deviation
1	1.5	4201	9.707
2	5.3	2170	15.894
3	6.8	1426	13.581
4	6.5	663	10.561
5	9.5	308	22.721
6	9.8	217	19.576
7	13.2	86	19.713
8	9.8	73	16.568
9	7.9	59	9.015
More than 9 authors	12.9	322	

Table 10. Pearson regression in number of authors and number of times cited

Pearson correlation value	No. of cases	Sig. (2-tailed)
0.144	9525	0.00

i.e. $p = 3$. core zone $r_0 = r_0 \times 1 = 2$, first zone $r_1 = r_0 \times k = 2$, second zone $r_2 = r_0 \times k^2$. The Bradford scatterness rule is applied in this study.

The study noted minor drift in scatteredness of research papers of Indian scholars in SSH from the Bradford rule of scatteredness in journals. It is shown in Table 13.

Citations received

High citations of scholarly work imply that scholarly work has been well received, read, referred and used by

researchers. The number of citations is a vital parameter to scale scholarly value of research publications and this parameter is frequently referred by universities and funding agencies to assess and rank the quality of published research. Table 14 summarizes citations received by research publications of Indian authors in SSH during 2005–2014.

There were 5136 research publications which received 39,787 citations in total; whereas 4390 publications did not receive any citations. There were 23 publications which accrued over 100 citations each. In total, these 23 research publications received 4007 citations out of total citation 39,787, an average of over 174 citations per article.

The article entitled ‘green supply-chain management: A state-of-the-art literature review’ published in *International Journal of Management Reviews*, received 502 citations.

Number of uses and number of citations

It is assumed that the research papers which are accessed frequently are also cited frequently. The present study examined the number of times research papers were accessed since 2013 and the number of citations they received by using regression analysis for both the parameters. There is significant association between the number of times publications were accessed and the number of citations. Research papers with high access also had high number of citations. The value of ‘ R^2 ’, in Table 15 indicates that only 18.5% of citations can be statistically explained by the number of access since 2013.

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Table 11. Core journals which published research of Indian scholars in SSH from 2005 to 2014

Range of numbers of published research papers	Numbers of journals	Per cent	Numbers of papers	Per cent
More than 100	8	0.5	1505	15.8
51–100	16	1.0	1131	11.9
50–30	28	1.7	1099	11.5
20–29	30	1.9	709	7.4
10–19	120	7.5	1565	16.4
9–5	217	13.5	1377	14.5
Less than 5	1180	73.8	2139	22.5
Total	1599	100.0	9525	100.0

Table 12. Core journals which published over one hundred research papers of Indian researchers in SSH in 10 years

Journal	Numbers of papers	Mean number of time cited	Usage since 2013
<i>Contributions to Indian Sociology</i>	314	0.3	1.6
<i>Indian Journal of Social Work</i>	215	0.1	2.3
<i>Indian Journal of Gender Studies</i>	213	0.6	3.4
<i>Indian Economic and Social History Review</i>	170	0.3	1.5
<i>Anthropologist</i>	158	0.6	2.9
<i>Journal of Dharma</i>	156	0.0	0.9
<i>Journal of Intellectual Property Rights</i>	150	0.5	3.2
<i>Man in India</i>	129	0.1	2.1

Table 13. Validation of Bradford scatterdness of research papers in journals

Extent of coverage of research paper	Number of journals	% of total journals	Idea; numbers of journal by applying Bradford Law	% of total journals	Gap in Bradford Law of scattered and actual scattered
One third of research papers	9	0.56	21	1.30	12
New one third of papers	234	14.66	170	10.68	64
Rest of one third research papers	1356	84.77	1405	88.02	52
Total	1599		1596		

Table 14. Citations of research in SSH disciplines

No. of times cited	No. of papers	Total citations	CPP
0	4390	0	0
1	1261	1261	1
2	807	1614	2
3	518	1554	3
4	406	1624	4
5	327	1635	5
6–10	846	6425	7.6
11–20	586	8478	14.5
21–30	190	4765	25.1
31–40	72	9530	132.4
41–50	38	1702	44.8
51–100	61	4189	68.7
101–200	19	2539	133.6
>200	04	1546	386.5

Number of references and subject categories

Out of 9525 research publications, 178 did not have any references. Creative writing, stories and poems in humanities need not be substantiated with references; such

publications do not have references. There were 9347 publications with 271,054 references in total.

According to the subject categories of WoS, researchers contributed across 37 categories, of which the multi-disciplinary category had 42.87% of the total papers followed by 'Business and Economics' with 13.52% of total output.

Language of publication

English is the international language in which Indian researchers predominantly published their research work. About 99.7% of articles were published in the English language during the ten-year period. Eleven (0.12%) research papers were published in French language and 10 (0.10) papers in the German language. The rest of the languages, Portuguese (0.04%), Russian (0.03%), Spanish (0.03%) and Croatian (0.01%) as medium of publication had less than twelve research publications during the period under study. It is important to mention here that WoS does not index Indian journals published in vernacular languages of the country.

Table 15. Regression analysis on number of times publications were accessed since 2013 and number of citations they accrued

R	R ²	Adjusted R ²	Standard error of the estimate	Change statistics				
				R ² change	F Change	df ₁	df ₂	Sig. F change
0.430	0.185	0.185	12.267	0.185	2118.433	1	9524	0.000

Conclusion

The present study has outlined the profile and trends of research output of Indian scholars in SSH for the ten year period 2005–2014. Research contributions are mainly in the form of research articles and book reviews; 62.1% of research output in 2005 was in the form of research articles; it grew to 81.9% of total research output in 2014. The number of book reviews decreased over the ten-year period. Collaborative research was the norm in SSH. The analysis also showed that collaborative research received more citations during the period of study.

The WoS does not index Indian journals published in Indian vernacular languages. Substantial part of research works in SSH is published in regional languages. There is need for an inclusive approach by considering research articles published in regional or local languages to showcase research output of Indian researchers in SSH. It is advocated that WoS should be used in conjunction with other databases like Scopus, Indian Citation Index and Google Scholar for analysing and highlighting research output generated in social sciences and humanities in the country.

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