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Research Article

Bibliometrics Research in India: A Scientometric Assessment of High-Cited Publications During 1994-2023

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ABSTRACT

The present study examines the current status, key focus areas and emerging trends of published bibliometric research in India. The study retrieved and identified high-cited-papers related to India's bibliometrics research from the Scopus database using a predefined search strategy covering the years 1994-2023. For each downloaded record, the data elements included publication type, citation count, author count, institutional affiliations, country of origin and funding sources. Microsoft Excel was then used to analyze the data and examine collaborative connections among organizations, authors and keywords. The world and India has published 49, 049 and 3776 publications in bibliometrics research, of which 5341 and 309 have received 30 or more citations during 1994-23. Although, India ranks at 4th position in global output, but ranks at 9th position in terms of high-cited papers receiving 30 and more citations. The 309 HCPs from India were published in 193 different journals, with contributions from 1,101 authors, 471 of whom were Indian. The 309 Indian HCPs received a total of 24,670 citations, averaging 79.84 citations per paper. India's annual publication output varied over time, with consistent 10-year growth from 17 publications (1994-2003) to 47 (2004-2013) to 245 (2014-2023). External funding supported 20.39% of India's research output, while international collaboration accounted for 56.63% share. The most productive organizations were the Malaviya National Institute of Technology, Jaipur and the National Institute of Science, Technology and Development Studies, New Delhi. The most impactful organizations were the Indian Institute of Technology, Kanpur and the Malaviya National Institute of Technology, Jaipur. The most prolific individual authors were S. Kumar and A. Pandey, with notable impact metrics. *Scientometrics* and the Journal of Business Research were the most productive, while the *Journal of Business Research* and the *Journal of Clinical Orthopaedics and Trauma* were the most impactful. These findings highlight India's significant contribution to high-cited publications, showcasing both productivity and impact in research output. This comprehensive bibliometric analysis provides an in-depth and enlightening overview of significant articles, journals, authors, institutions and themes in the field. Through this overview, by utilizing these valuable insights, researchers can swiftly grasp the present state, focal points and emerging patterns of bibliometric research in India during the throughout the last thirty years. To improve future studies, it is believed that To further enhance these discoveries, forthcoming studies the scientific community should strive to foster interdisciplinary and international cooperation among Indian scholars and organizations.

Keywords: Bibliometrics Research, India, High-Cited Publications, Citation, Collaboration.

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INTRODUCTION

Bibliometrics methods have been applied in various forms for more than a century (Hood and Wilson, 2001). The use and application of quantitative and qualitative methods in library and information science field have witnessed the terminological changes, such as bibliometrics, Scientometrics, Informetrics and webometrics over the years.

The term "bibliometrics" was first introduced by Pritchard (1969) in a paper published in 1969, titled "Statistical Bibliography or Bibliometrics? Who defined it as "the application of mathematical and statistical methods to books and other media of communication." Fairthorne (1969) expanded the definition scope of bibliometrics by defining it as the quantitative treatment of the properties of recorded discourse and behavior appertaining to it. Then, Broadus (1987) defined bibliometrics

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as the quantitative study of physically published units, or of bibliographic units, or of alternatives of either.

Bibliometrics, Scientometrics, Informetrics and webometrics differ in subject background but are the same in theories, methods, technologies and applications. These terms are used to describe similar and overlapping methodologies; however, their well-documented historical origins differ and they are not necessarily synonymous (Hood and Wilson, 2001). Since most of these terminological are overlapping, we decided to use bibliometrics research as the main topic for study and research in India.

Bibliometric methods are now widely used in scientific specialties, research evaluation and ranking institutions worldwide. Researchers from various disciplines, such as mathematics, computer science, sociology, psychology and management have contributed to interdisciplinary approaches in bibliometric studies, focusing on both informational and non-informational parameters of science (Mejia, 2022), leading to the evolution of bibliometrics as a distinct scientific discipline with specific research profiles and sub-fields (Gupta, 2014). Bibliometric methods are now integral part in research evaluation methodology, especially in scientific and applied fields (Thelwell, 2008).

Bibliometric analysis serves as a crucial quantitative tool for assessing the scientific outputs of various research entities, including papers, authors, keywords, journals, institutions and countries within a specific field or academic journal (Öztürk, Kocaman, Kanbach, 2024). This type of analysis, also known as performance analysis, involves the evaluation of both the quality and quantity of scientific outputs through a variety of bibliometric indicators derived from publication and citation data.

Bibliometric analysis is also a powerful tool used to examine the intellectual, social and conceptual structure of a research field over time (Cobo *et al.* 2011; Öztürk and Dil 2022). By analyzing the relationships and interactions between various research entities, such as authors, papers, journals, concepts, universities and citations, this approach provides a comprehensive understanding of the field's structure, evolution and focus areas (Donthu *et al.* 2021; van Eck and Waltman 2014; Block and Fisch 2020).

Science mapping techniques, including co-author, co-word, co-citation and bibliographic coupling analyses, are commonly employed to reveal the field's intellectual structure, identify research clusters, capture emerging trends and understand the connections between key concepts (Aria and Cuccurullo 2017; Mukherjee *et al.* 2022b; Kraus *et al.* 2024; Gutierrez-Salcedo *et al.*, 2018). These visualizations of collaboration networks and relationships between scientific actors enable a deeper understanding of the relevant literature.

Bibliometric analysis is an important tool to evaluate research performance and identify influential papers in specific fields. A number of global quantitative and qualitative studies have applied bibliometric methods to understand the field of bibliometrics, based on literature indexed in international databases, with a view to understand key players (authors, journals, institutions, countries, etc.,) or topical trends within the field. These global studies are well documented; however, assessment of such a literature has been limited in national context. However, India has a long tradition of undertaking bibliometric studies and these studies are assessed from time to time by various scholars. Basu and Garg (1996), Garg and Tripathi (2017), Garg and Tripathi (2018) and Gupta, Dhawan and Modin (2024) have conducted studies specifically focused on bibliometric research in India covering different periods. These studies have examined Indian bibliometric studies, their publication output, citation impact, author collaboration, authorship patterns and state-wise production. Most of these studies, except by B.M. Gupta *et al.* (2024), were not comprehensive enough in terms of literature coverage and a lack a proper methodology used in analysing bibliometric literature.

In recent years, there has been a growing interest in utilizing high-cited papers as indicators in research evaluations, reflecting an increased emphasis on scientific excellence (van Raan, 2000). The last two decades has increasingly put scientific excellence on the agenda in science policy and have witnessed an emerging interest towards using high-cited papers as indicators in research assessments (van Raan, 2000). In this context, high-cited papers have been regarded as potential candidates for identifying and monitoring "excellent" and "world-class" research (Tijssen *et al.*, 2002).

Given these trends in bibliometrics research, this study aims to analyze 309 high-cited papers on bibliometrics research by India. The data for the study has been from a huge body of global bibliometrics literature covering 30-year publication period between 1993-2023. The main objectives are to identify the characteristics of these highly cited papers, such as research output, citation data, key scholars and institutions, collaborative relationships, significant keywords and key communication channels.

METHODOLOGY

The Scopus database was used to source bibliographic data on the topic of 'bibliometric research in India' from 1944 to 2023, using a pre-defined search strategy. The search strategy combined five keywords-bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*"-to represent the full scope of bibliometric research, utilizing Boolean operators and applying the keywords to both the "Keywords" and "Journal title" tags. This search yielded 40049 documents, which were downloaded from the Scopus database and rearranged in descending order by citation count. From these, 309 records were identified as "high-cited papers" (having 30 or more citations) for a detailed

analysis. Key information was extracted, including that of author, institution, title, publication year, citation frequency, citation density (total citations divided by years since publication), journal name, impact factor and country/region. The publication data was then further organized in MS-Excel by organization, author, journal and keywords and documented, tabulated and analyzed accordingly.

(KEY (bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*") OR SRCTITLE (bibliomet* OR scientomet* OR informetr* OR webometric* OR "altmetri*")) AND PUBYEAR>1993 AND PUBYEAR<2024 AND (LIMIT-TO (AFFILCOUNTRY, "India"))

Publications Analysis

Overall Picture

During the period 1994-2023, the Scopus database indexed 40,049 global publications in the field of bibliometrics. Among these publications: 987 (2.01%) received 100 or more citations, 2,923 (5.76%) received 50 or more citations and 5,341 (10.89%) received 30 or more citations

The top 10 most productive countries in global bibliometrics research during 1994-23 were: China (*n*=9,866 and 20.11% share), USA (*n*=7,166 and 14.61% share), Spain (*n*=4,003 and 8.16% share), India (*n*=3,797 and 7.74% share), U.K. (*n*=3,132 and 6.39% share), Brazil (*n*=2,607 and 5.32% share), Germany (*n*=2,135 and 4.35% share), Italy (*n*=1,774 and 3.62% share), Australia (*n*=1,696 and3.44% share) and Canada (*n*=1,653 and 3.37% share). Among 5341 global high-cited papers in bibliometrics research with 30 or more citations, the top countries were: USA (*n*=1522), China (*n*=1087), U.K. (*n*=780), Spain (*n*=649), Australia (*n*=401), Italy (*n*=398), Germany (*n*=396), Canada (*n*=371), India (*n*=313) and Brazil (*n*=234). Based on the above, one can say that India ranks at 4th position (*n*=3797) globally in total publication output (7.74% share), but it ranks at 9th position in high-cited papers (*n*=309) with 30+ citations (5.78% share).

The present study makes an attempt to study 309 High-Cited Papers (HCPs) from India having received 30 or more citations per paper. India's publication output in bibliometrics research showed a slow and fluctuating growth from 1994 to 2021, before declining. This publication reached peak in year 2021 with 71 papers. However, the 10-year cumulative output increased steadily, from 17 publications (1994-2003) to 47 (2004-2013) to 245 (2014-2023) (Table 1). The 309 Indian HCPs received a total of 24,670 citations, averaging 79.84 citations per paper. Bibliometric analysis by document type revealed that the majority were articles (*n*=210), followed by reviews (*n*=93), conference papers (*n*=4%) and editorials/short surveys (*n*=1 each).

Of the 309 Indian HCPs in bibliometrics, 63 (20.39%) received external funding from both Indian and foreign agencies and received 4,375 citations, averaging 69.44 citations per paper-significantly less than the average of 79.84 citations per paper for all India's bibliometrics research. The key Indian funding agencies supporting bibliometrics research from India included the Department of Science and Technology, University Grants Commission, Council of Scientific and Industrial Research and Department of Biotechnology (4 papers each), as well as several others that funded 2-3 papers each. The foreign agencies that provided funding included the National Natural Science Foundation of China, Conselho Nacional de Desenvolvimento Científico e Tecnológico and several others that each funded 2 papers.

International Collaboration

Bibliometric research in India exhibits a significant level of international collaboration (175 papers and 56.63% share), with partnerships forged with researchers from 69 foreign countries. India's 175 International Collaborative Papers (ICPs) have collectively received 16,624 citations, averaging 94.99 citations per paper-significantly higher than the national average of 79.84 citations per paper.

Table 1: HCPs in India's Bibliometrics Research during 1994-2023: Distribution by Publication Year.

Year	TP	Year	TP	Year	TP
1994	1	2005	3	2016	4
1995	1	2006	2	2017	12
1996		2007	6	2018	11
1997		2008	1	2019	23
1998	2	2009	5	2020	46
1999	2	2010	9	2021	71
2000	2	2011	9	2022	54
2001	3	2012	1	2023	10
2002	2	2013	7	1994-2003	17
2003	4	2014	2	2004-13	47
2004	4	2015	12	2014-23	245

Table 2: India's Bibliometrics Research: Contribution of Leading Foreign Countries.

Sl. No.	Name of the foreign country	TP	TC	CPP	%TP
1	USA	69	9745	141.23	39.43
2	U.K.	40	3284	82.10	22.86
3	Australia	34	5378	158.18	19.43
4	Malaysia	28	5714	204.07	16.00
5	China	16	959	59.94	9.14
6	South Africa	16	1973	123.31	9.14
7	Italy	15	1019	67.93	8.57
8	France	15	1269	84.60	8.57
9	Germany	11	1315	119.55	6.29
10	Finland	9	1022	113.56	5.14
11	Chile	9	467	51.89	5.14
12	Brazil	8	1145	143.13	4.57
13	South Korea	7	563	80.43	4.00
14	Saudi Arabia	6	569	94.83	3.43
15	Norway	5	1022	204.40	2.86
	Total	175	24670	79.84	

TP=Total papers; TC=Total citations; CPP=Citations per paper.

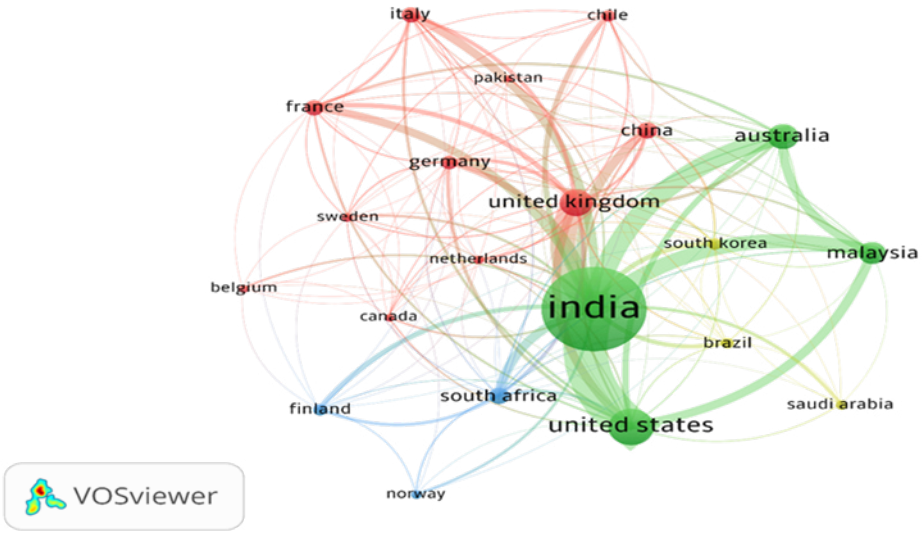

Figure 1: Depicts the VOSviewer network visualization map of 20 foreign countries (having 3 or more publications) in co-authorship with India.

Bibliometric research in India exhibits a significant level of international collaboration (175 papers and 56.63% share), with partnerships forged with researchers from 69 foreign countries during 1994-23. India's 175 International Collaborative Papers (ICPs) have collectively received 16,624 citations, averaging 94.99 citations per paper-significantly higher than the national average of 79.84 citations per paper.

Role of Foreign Countries

The USA emerged as the primary collaborator, contributing 39.43% share of the joint publications in this domain during the 2014-2023. The UK and Australia followed closely behind, accounting for 22.86% and 19.43% of collaborations, respectively. In terms of citation impact, the Brazil and USA maintained its leading position with an average of 143.13 and 141.23 citations per paper. The Australia (158.18 citations per paper) and South Africa (123.31 citations per paper) also exhibited strong citation

performance. Interestingly, Norway (204.70 CPP) and Malaysia (204.07 CPP) surpassed all other countries in this metric (Table 2).

Figure 1 depicts the VOSviewer network visualization map of 20 foreign countries (having 3 or more publications) in co-authorship with India in bibliometrics Research. The 21 foreign countries (including India) were classified into four clusters, establishing 145 links with a TLS of 650. Cluster 1 has 11 countries: Germany, France, Italy, Chile, Belgium and others. Cluster 2 consists of 7 countries: China, India, Japan and so on. Cluster 3 consists of 4 countries: Brazil, Mexico, Netherlands and Spain. Cluster 4 consists of 3 countries: Australia, Canada and Turkey. The visualization shows that China, the USA, Germany and France were the most collaborative and productive countries. These 25 countries are connected with 264 links and 5220 total link strengths.

Role of Foreign Organizations

A total of 329 foreign organizations collaborated with India in bibliometric research during 1994-2023. The top 30 foreign contributors accounted for 162 joint papers and over 30,000 citations, comprising 52.43% of India's total output in this field. Table 3 lists the top 30 foreign organizations collaborating with India in bibliometrics research

The top 5 most productive foreign partners were: Swinburne University of Malaysia (30 papers), Swinburne University Australia and Georgia State University USA (15 each), University of Chile (8) and American University USA (7). The most impactful in terms of citations per paper were: University of Akron USA (518.86 CPP), Swinburne Malaysia (309.9 CPP), Georgia State USA (284.13 CPP), Swinburne Australia (277.67 CPP) and University of Massachusetts Dartmouth USA (225.67 CPP).

The largest collaborative network was between Swinburne Malaysia and India's Malaviya National Institute of Technology Jaipur (23 papers), followed by Swinburne Australia-Malaviya (15), Georgia State-Malaviya (15), University of Chile-Palpara Vidyamandir (8), American University-Malaviya (7) and University of Akron-Malaviya (6).

Role of Foreign Authors

The 500 foreign authors collaborated with Indian researchers in the field of bibliometrics during 1994-2023. Table 4 lists the top 30 most productive foreign collaborators collaborating with Indian authors, ranked by their research output. These 30 authors contributed a total of 121 papers that received 19,364 citations, accounting for 39.16% of the total research productivity and 78.49% of the citations.

Table 3: Top 30 Foreign Organizations Contributing to India's Bibliometrics Research.

Sl. No.	Name of foreign organization	TP	TC	CPP	TLS
1	Swinburne University of Technology, School of Business, Sarawak Campus, Malaysia.	30	9297	309.90	80
2	Swinburne University of Technology, School of Business, Australia.	15	4165	277.67	28
3	Georgia State University, Department of Marketing, Atlanta, GA, United States.	15	4262	284.13	20
4	University of Chile, Department of Management Control and Information Systems, School of Economics and Business, Santiago, Chile.	8	396	49.50	22
5	American University, Kogod School of Business, Department of Finance and Real Estate, 4400 Massachusetts Avenue, NW, Washington, DC, 20016, United States.	7	589	84.14	8
6	University of Akron, College of Business, Department of Finance United States.	7	3632	518.86	9
7	NEOMA Business School, Mont-Saint-Aignan, France.	6	502	83.67	24
8	North-West University, South Africa.	5	647	129.40	22
9	North-West University, Optentia Research Focus Area, South Africa.	5	652	130.40	12
10	Montpelliar Business School, France.	4	280	70.00	17
11	University of Massachusetts Darmouth, Charlton College of Business, North Dartmouth, MA, USA.	3	677	225.67	2

Sl. No.	Name of foreign organization	TP	TC	CPP	TLS
12	University of Technology Sydney, School of Information, Systems and Modelling, Faculty of Engineering and Information Technology, NSW, Australia.	3	160	53.33	14
13	Newcastle Business School, University of Newcastle Australia, Ourimbah, NSW, Australia.	3	210	70.00	16
14	Australian Institute of Business, Department of Marketing Adelaide, SA, Australia.	3	270	90.00	12
15	University of Maryland, School of Public Policy, College Park, MD, United States.	3	112	37.33	8
16	Guildhall School of Business and Law, London Metropolitan University, London, United Kingdom.	3	171	57.00	7
17	King's College London, U.K.	3	199	66.33	7
18	London School of Hygiene and Public Health, U.K.	3	220	73.33	16
19	University of Strathclyde, Business School, Glasgow, United Kingdom	3	130	43.33	9
20	Plymouth Business School, Plymouth University, Plymouth, United Kingdom	3	529	176.33	12
21	Kent Business School, University of Kent, Chatham, United Kingdom.	3	534	178.00	11
22	University of Johannesburg, Department of Business Management, South Africa.	3	425	141.67	34
23	University of KwaZulu-Natal, School of Mathematics, Statistics and Computer Science, Pietermaritzburg, KwaZulu-Natal, South Africa.	3	209	69.67	11
24	University of Agder, Kristiansand, School of Business and Law, Department of Management, Norway.	3	350	116.67	16
25	Lappeenranta University of Technology, School of Business and Management, Lappeenranta, Finland.	3	562	187.33	27
26	University of Turku, School of Economics, Turku, Finland.	3	427	142.33	11
27	University of Aveiro, Department of Environment and Planning, Aveiro, Portugal.	3	114	38.00	11
28	University of Queensland, Institute for Molecular Biosciences, St Lucia, QLD, Australia.	3	119	39.67	7
29	University of South Australia Business School, Adelaide, Australia.	3	139	46.33	8
30	KU Leuvan, Belgium.	3	115	38.33	13
	Sum total of top 30 foreign organizations	162	30094	185.77	
	India's total	309	24670	79.84	
	Share of top 30 foreign organizations in India's total	52.43			

TP=Total papers; TC=Total citations; CPP=Citations per paper; TLS=Total link strength.

The top 5 most productive foreign authors were: Weng Marc Lim (18 papers), Naveen Donthu (15 papers), J.M. Merigo (7 papers) and A. Gunasekaran and H.K. Baker (5 papers each). The top 5 most impactful authors in terms of citations per paper were: D. Mukherjee (681.2 CPP), Naveen Donthu (286.67 CPP), Weng Marc Lim (266.83 CPP), S.J. Childe (199.0 CPP) and T. Papadopoulos (178.33 CPP).

The strongest collaborative linkages between Indian and foreign authors were between "W.M. Lim and S. Kumar" (18 papers), "N. Donthu and S. Kumar" (15 papers), "J.M. Merigo and N.M. Modak" (8 papers), "H.K. Baker and S. Kumar" (6 papers) and "V. Pereira and U. Bamel" (5 papers), among others.

Leading Organizations

Contribution of Top 23 Organizations

A total of 585 organizations (256 from India) participated in 309 HCPs on India's bibliometric research. The top 23 organizations contributed a significant portion of the national publications and

Table 4: Top 30 Foreign Authors Contributing to Bibliometrics Research.

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	TLS
1	Lim, Weng Marc	Swinburne University of Technology Swinburne Business School, Victoria, Australia.	18	4803	266.83	62
2	Donthu, Naveen	Georgia State University, Department of Marketing, Atlanta, USA.	15	4300	286.67	51
3	Merigo, J.M.	University of Chile, School of Economics and Business, Department of Business Administration, Santiago, Chile.	7	351	50.14	32
4	Gunasekaran, A	University of Massachusetts Dartmouth, North Dartmouth, Charlton College of Business, North Dartmouth, MA, USA.	6	630	105.00	21
5	Baker, H.K.	American University, Kogod School of Business, Department of Finance and Real Estate, Washington, DC, USA.	6	335	55.83	12
6	Dhir, A	Lappeenranta University of Technology, Finland.	5	650	130.00	17
7	Mukherjee, D	University of Akron, Department of Management, College of Business, Akron, USA.	5	3406	681.20	25
8	Khanra, S	Turku School of Economics, Finland.	4	494	123.50	12
9	Laengle, S	University of Chile, School of Economics and Business, Chile	4	170	42.50	12
10	Kraus, S	Free University of Bozen-Bolzano, Faculty of Economics and Management, Italy.	3	396	132.00	17
11	Blaskovich, MAT	University of Queensland, Institute for Molecular Bioscience, QLD, Australia.	3	119	39.67	16
12	Patel, V	London School of Hygiene and Tropical Medicine, U.K.	3	393	131.00	14
13	Kumar, A	London Metropolitan University, Guildhall School of Business and Law, U.K.	3	172	57.33	8
14	Devarazar, M	University of Aveiro, Department of Environment and Planning, Portugal.	3	114	38.00	22
15	Mostafaie, A	University of Aveiro, Department of Environment and Planning, Portugal.	3	114	38.00	22
16	Kamali, M	University of Aveiro, Department of Environment and Planning, Portugal.	3	114	38.00	22
17	Rasul, T	Australian Institute of Business, Department of Marketing, Adelaide, Australia.	3	271	90.33	19
18	Papadopoulos, T	University of Kent, Kent Business School, Kent, UK.	3	535	178.33	10
19	Oriani, ME	Universita Cattolica del Sacro Cuore, Department of Economics and Buisness, Italy.	2	80	40.00	6
20	Childe, S.J.	Plymouth University, Plymouth Business School, U.K.	2	398	199.00	9

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	TLS
21	Goodell, JW	University of Akron, College of Business, Akron, OH, USA.	2	216	108.00	7
22	Garza-Reyes, J.A.	University of Derby, Centre for Supply Chain Improvement, U.K.	2	135	67.50	8
23	Pecht, M.	University of Maryland, Center for Advanced Life Cycle Engineering (CALCE), College Park, MD, USA.	2	62	31.00	
24	Kostoff, R.N.	Office of Naval Research, Arlington, USA.	2	62	31.00	12
25	Sahasranamam, S	Univ. of Strathclyde, Strathclyde Business School, Glasgow, U.K.	2	85	42.50	6
26	Sigala, M.	University of South Australia Business School, Adelaide, Australia.	2	98	49.00	8
27	Agushaka, J.O.	University of KwaZulu-Natal, KwaZulu-Natal, School of Mathematics, Statistics and Computer Science, South Africa.	2	176	88.00	8
28	Ezugwu, A.E.	University of KwaZulu-Natal, KwaZulu-Natal, School of Mathematics, Statistics and Computer Science, South Africa.	2	176	88.00	8
29	Mäntymäki, M.a	Turku School of Economics, University of Turku, Finland.	2	299	149.50	4
30	Temouri, Y	Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates.	2	210	105.00	10
		Sum total of top 30 foreign authors.	121	19364	160.03	
		India's total.	309	24670	79.84	
		Share of top 30 foreign authors in India's total.	39.16	78.49		

TP=Total papers; TC=Total citations; CPP=Citations per paper; TLS=Total link strength.

citations, accounting for 61.81% and 73.30% share respectively. Table 5 lists the top 23 most productive Indian organizations, ranked by their research output.

These top 23 organizations produced an average of 8.30 paper each, with 5 organizations exceeding the group average: Malaviya NIT (51 papers), NISTADS and IIT New Delhi (12 papers each), NITIE Mumbai (11 papers) and South Asia University (10 papers). The top 23 organizations also demonstrated strong citation impact, averaging 94.68 citations per paper and a relative citation impact of 1.19. Five organizations surpassed the group's average citation impact: IIT-Kanpur (160.25 citations per paper, 2.01 relative impact), Malaviya NIT-Jaipur (147.33 and 1.85), BHU Varanasi (131.71 and 1.65), Woxsen University-Hyderabad (130.8 and 1.64) and LM Thapar School of Management-Patiala (111.2 and 1.39). The international collaborative publication share of the top 23 organizations varied widely, from 0.0% to 100.00%, with an average of 62.30%. Detailed profiles of the top 10 most productive and 10 most impactful organizations are provided in Table 6.

The Malaviya National Institute of Technology Jaipur (*n*=152) has the strongest total link strength (TLS) among the institutions analysed, followed by Woxsen University, Hyderabad (*n*=38), All India Institute of Medical Sciences, New Delhi (*n*=33), OP Jindal Global University, Sonepat (*n*=30), National Institute of Industrial Engineering, Mumbai (*n*=26), Palpara Vidyamandir, Chakdaha, West Bengal (*n*=24), Banaras Hindu University, Varanasi (*n*=21), Soniya College of Pharmacy, Dharwad (*n*=20), Indian Institute of Technology, New Delhi (*n*=19), International Management Institute, New Delhi (*n*=18), South Asia University, New Delhi (*n*=16) and NISTADS, New Delhi (*n*=14), among others.

In terms of organization-to-organization linkages, the strongest collaborations are between Malaviya National Institute of Technology Jaipur and National Institute of Industrial Engineering, Mumbai (*n*=4), as well as Malaviya National Institute of Technology Jaipur and OP Jindal Global University, Sonipat (*n*=4). This is followed by linkages between Malaviya National Institute of Technology Jaipur and Woxsen University, Hyderabad (*n*=3), Malaviya National Institute of Technology Jaipur and SP

Table 5: Top 23 Organizations from India in Bibliometrics Research.

Sl. No.	Name of the Organization	TP	TC	CPP	RCI	ICP	%ICP	TLS
1	Malaviya NIT, Dept. of Management Studies, Jaipur.	51	7514	147.33	1.85	43	84.31	152
2	NISTADS, New Delhi.	12	563	46.92	0.59	4	33.33	14
3	Indian Institute of Technology, Dept. of Management Studies, New Delhi.	12	786	65.5	0.82	5	41.67	19
4	National Institute of Industrial Engineering, Mumbai.	11	895	81.36	1.02	8	72.73	26
5	South Asia University, Dept. of Computer Science, New Delhi.	10	926	92.6	1.16	6	60.00	16
6	Thapar Institute of Engineering and Technology, Patiala.	8	708	88.5	1.11	3	37.50	8
7	Palpara Vidyamandir, Chakdaha, WB.	8	535	66.88	0.84	8	100.00	24
8	BHU, Varanasi.	7	922	131.71	1.65	4	57.14	21
9	OP Jindal Global University, Sonepat.	7	417	59.57	0.75	4	57.14	30
10	International Management Institute, New Delhi.	6	395	65.83	0.82	5	83.33	18
11	Symbiosis International Deemed University, Pune.	5	319	63.8	0.80	3	60.00	14
12	Aligarh Muslim University.	5	323	64.6	0.81	1	20.00	7
13	Indian Institute of Technology, Kharagpur.	5	186	37.2	0.47	2	40.00	4
14	Jamia Millia Islamia, New Delhi.	5	463	92.6	1.16	0	0.00	3
15	Woxsen University, Hyderabad.	5	654	130.8	1.64	4	80.00	38
16	Institute of Management and Technology, Ghaziabad.	5	255	51	0.64	1	20.00	9
17	Thapar Institute of Engineering and Technology, LM Thapar School of Management, Dera Bassi, Dist. Mohali, Punjab.	5	556	111.2	1.39	4	80.00	9
18	All India Institute of Medical Science, New Delhi.	4	207	51.75	0.65	4	100.00	33
19	National Institute of Science Communication and Information Resources, New Delhi.	4	144	36	0.45	0	0.00	1
20	Indian Institute of Technology, Roorkee	4	361	90.25	1.13	2	50.00	2
21	Indian Institute of Technology, Department of Industrial and Management Engineering, Kanpur.	4	641	160.25	2.01	4	100.00	10
22	Soniya College of Pharmacy, Pharmaceutical Engineering Dharwad, India.	4	147	36.75	0.46	4	100.00	20
23	Shri Mata Vaishnoo Devi University, School of Business, Facult of Management, Katra.	4	166	41.5	0.52	0	0.00	4

Sl. No.	Name of the Organization	TP	TC	CPP	RCI	ICP	%ICP	TLS
24	Total of top 23 Indian organizations.	191	18083	94.68	1.19	119	62.30	
25	India's total.	309	24670	79.84	1.00			
26	Share of top 23 Indian organizations in India's total.	61.81	73.30					

TP=Total papers; TC=Total citations; CPP=Citations per paper; ICP=International collaborative papers; RCI=Relative citation index; TLS=Total link strength.

Table 6: Profile of Top 10 Most Productive and Top 10 Most Impactful Organizations.

Sl. No.	Name of the organizations	TP	TC	CPP	RCI	ICP	%ICP
	Top 10 Most Productive Organizations						
1	Malaviya NIT, Department of Management Studies, Jaipur.	51	7514	147.33	1.85	43	84.31
2	NISTADS, New Delhi.	12	563	46.92	0.59	4	33.33
3	Indian Institute of Technology, Department of Management Studies, New Delhi.	12	786	65.5	0.82	5	41.67
4	National Institute of Industrial Engineering, Mumbai.	11	895	81.36	1.02	8	72.73
5	South Asia University, Department of Computer Science, New Delhi.	10	926	92.6	1.16	6	60.00
6	Thapar Institute of Engineering and Technology, Patiala.	8	708	88.5	1.11	3	37.50
7	Palpara Vidyamandir, Chakdaha, WB.	8	535	66.88	0.84	8	100.00
8	BHU, Varanasi.	7	922	131.71	1.65	4	57.14
9	OP Jindal Global University, Sonepat.	7	417	59.57	0.75	4	57.14
10	International Management Institute, New Delhi.	6	395	65.83	0.82	5	83.33
	Top 10 Most Impactful Organizations						
1	IIT, Department of Industrial and Management Engineering, Kanpur.	4	641	160.25	2.01	4	100.00
2	Malaviya NIT, department of Management Studies, Jaipur.	51	7514	147.33	1.85	43	84.31
3	BHU, Varanasi.	7	922	131.71	1.65	4	57.14
4	Woxsen University, Hyderabad.	5	654	130.8	1.64	4	80.00
5	LM Thapar School of Management, Thapar Institute of Engineering and Technology, (Deemed to be University), Dera Bassi, District Mohali, 140507, Punjab, India.	5	556	111.2	1.39	4	80.00
6	South Asia University, Department of Computer Science, New Delhi.	10	926	92.6	1.16	6	60.00
7	Jamia Millia Islamia, New Delhi.	5	463	92.6	1.16	0	0.00
8	IIT, Roorkee	4	361	90.25	1.13	2	50.00
9	Thapar Institute of Engineering and Technology, Patiala.	8	708	88.5	1.11	3	37.50
10	National Institute of Industrial Engineering, Mumbai.	11	895	81.36	1.02	8	72.73

Jain Institute of Management and Research, Mumbai, Malaviya National Institute of Technology Jaipur and Jaipuria Institute of Management, Jaipur, Malaviya National Institute of Technology Jaipur and Shree Mata Vaishno Devi University, Katra (n=2 each), Banaras Hindu University, Varanasi and South Asia University, New Delhi, Banaras Hindu University, Varanasi and PGDAV College, New Delhi, Banaras Hindu University, Varanasi and Central Scientific Instrument Organization, Chandigarh and Banaras Hindu University, Varanasi and BHU-IT, Varanasi (n=2 each).

The collaborative networks of the top 28 organizations resulting in 40 links and Total Link Strength (TLS) of 49 and were then categorized into twenty-five distinct clusters. Network analysis revealed that these focal organizations maintained a range of collaborative links, varying from 1 to 10, as depicted in Figure 2. The central hub of collaboration was among renowned institutions such as Malaviya National Institute of Technology (NIT), Jaipur, which had 10 links and a TLS of 17; the National Institute of Industrial Engineering (NITIE), Mumbai, with 7 links and a TLS of 9; and O. P. Jindal Global University, Sonipat, with 5 links and a TLS of 7 (Cluster 1, red). This was followed by Cluster 2, which included the Indian Institute of Technology (IIT), New Delhi, with 6 links and a TLS of 8 and The University of Queensland, Indian Institute of Technology Delhi Academy of Research (UQIDAR), with 2 links and a TLS of 4. The remaining twenty-three clusters consisted of one organization each, underscoring the broad yet varied landscape of collaborative efforts in bibliometric research across Indian institutions.

Leading Authors from India

A total of 1,005 authors, including 505 from India, contributed to 309 highly cited scholarly works on India's bibliometric research. The top 23 authors were the most prolific, individually producing 4 to 45 papers that collectively accounted for 174 papers and 20,731 citations-56.31% and 84.03% of the national output, respectively. Table 7 lists the top 23 most productive Indian authors collaborating, ranked by their research output.

The average productivity of these top 23 authors was 7.56 papers per author, with only 4 exceeding this group average: S. Kumar (45 papers), A. Pandey (15 papers), D. Pattnaik (12 papers) and N.M. Modak (9 papers). The top 23 authors also had a strong citation impact, averaging 119.14 citations per paper and a relative citation index of 1.49 (Table 8). Six authors surpassed the group's average citation impact: A. Pandey (265.2 citations per paper, 3.32 RCI), S. Kumar (162.89, 2.04), D. Mishra (160.25, 2.01), V.K. Singh (154.4, 1.93), P.K. Muhuri (145.75, 1.83) and A.K. Shukla (129.0, 1.62). The share of international collaborations among the top 23 authors' publications ranged from 0% to 100%, averaging 59.77%. Profiles of the top 10 most prolific and top 10 most impactful authors are provided in Table 8.

The author with the highest Total Link Strength (TLS) is S. Kumar (*n*=136), followed by A. Pandey (*n*=40), D. Pattnaik (*n*=33), N.M. Modak (*n*=32), M. Aminbhavi (*n*=29), S. Bhattacharya and A.K. Shukla (*n*=18 each), U. Bamel (*n*=15), D. Mishra and R. Surekha (*n*=13 each), S. Dhir (*n*=12), P.K. Muhuri and V.K. Singh (*n*=11 each), K.C. Garg (*n*=9), A. Basu and S. Kumar (*n*=8 each) and S. Verma (*n*=7), B.M. Gupta, A. Haleem and M. Javaid (*n*=6 each).

The largest author-to-author collaboration is between S. Kumar and N. Pandey (*n*=15), followed by S. Kumar and D. Pattnaik (*n*=12), S. Kumar and R. Surekha (*n*=5), S. Kumar and S. Sahoo, S. Dhir and S. Singh, A. Haleem and M. Javaid and P.K. Muhuri and A.K Shukla (*n*=3 each). Other notable collaborations include S. Kumar with A. Sharma, Y. Joshi, P. Gupta, A. Haldar, N. Pandey and S. Mangla (*n*=2 each), as well as A.K. Shukla and M. Janmaijaya, V.K. Singh and A. Uddin, N. Pandey and A. Haldar, N. Pandey and N. Pandey, K.C. Garg and S. Kumar, P. Nedungadi and R. Rama, P. Nedungadi and V.K. Nair and R. Rama and V.K. Nair (*n*=2 each).

The author collaboration was studied and visualized among the top 45 authors, each with two or more documents, using VOSviewer software. The collaboration network divided these top authors into 36 clusters with 44 links, resulting in Total Link Strength (TLS) of 93. In Figure 3, thicker lines represent more

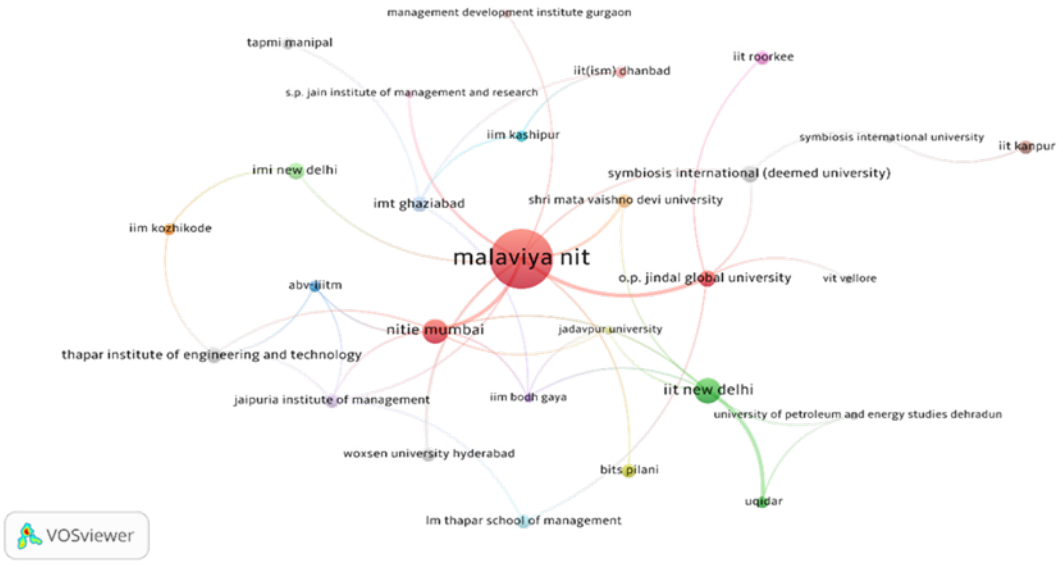

Figure 2: Network collaboration map among top 28 Indian organizations in Bibliometrics Research.

Table 7: Top 23 Authors from India in Bibliometrics Research 1994-2023.

Sl. No.	Name	Affiliation	TP	TC	CPP	RCI	ICP	%i ICP	TLS
1	S. Kumar	Malaviya NIT, Department of Management Studies, Jaipur.	45	7330	162.89	2.04	41	91.11	136
2	Pandey, A	Malaviya NIT, Department of Management Studies, Jaipur.	15	3978	265.20	3.32	14	93.33	40
3	Pattnaik, D	Malaviya NIT, Department of Management Studies, Jaipur.	12	1205	100.42	1.26	10	83.33	33
4	Modak, N.M.	Palpara Vidyamandir, Chakdaha, WB.	9	577	64.11	0.80	9	100.00	32
5	Bhattacharya, S	NISTADS, New Delhi.	7	339	48.43	0.61	4	57.14	18
6	Garg, K.C.	NISTADS, New Delhi.	6	328	54.67	0.68	0	0.00	9
7	Basu, A	NISTADS, New Delhi South Asia University, ND.	6	254	42.33	0.53	1	16.67	8
8	Surekha, R	Malaviya NIT, Department of Management Studies, Jaipur.	5	250	50.00	0.63	4	80.00	13
9	Dhir, S	IIT, Department of Management Studies, New Delhi.	5	335	67.00	0.84		0.00	12
10	Verma, S	National Institute of Industrial Engineering, Mumbai.	5	587	117.40	1.47	3	60.00	7
11	Bamel, U	International Management Institute, New Delhi	5	362	72.40	0.91		0.00	15
12	Shukla, A.K	South Asia University, New Delhi.	5	645	129.00	1.62		0.00	18
13	Haleem, A	Jamia MIllia Islamia, Department of Mechanical Engineering, New Delhi.	5	463	92.60	1.16	0	0.00	6(
14	Javaid, M	Jamia MIllia Islamia, Department of Mechanical Engineering, New Delhi.	5	463	92.60	1.16	0	0.00	6

Sl. No.	Name	Affiliation	TP	TC	CPP	RCI	ICP	%i ICP	TLS
15	Pratap, G	NISCAIR, New Delhi.	5	327	65.40	0.82	0	0.00	0
16	Verma, S	National Institute of Industrial Engineering, Mumbai.	5	587	117.40	1.47	3	60.00	7
17	Singh, VK	BHU, Department of Computer Science, Varanasi.	5	772	154.40	1.93	2	40.00	11
18	Gupta, B.M.	NISTADS, New Delhi	4	149	37.25	0.47	0	0.00	6
19	Mangla, S.K.	Jindal Global Business School, Jindal Global University, Sonipat.	4	254	63.50	0.80	3	75.00	10
20	Kumar, Suresh	NISTADS, New Delhi.	4	155	38.75	0.49	0	0.00	8
21	Mishra, D	IIT, Department of Industrial Management, Kanpur.	4	641	160.25	2.01	3	75.00	13
22	Aminbhavi, M	Soniya College of Pharmacy, Dharwad.	4	147	36.75	0.46	4	100.00	29
23	Muhuri, P.K.	South Asia University, Department of Computer Science, New Delhi.	4	583	145.75	1.83	3	75.00	11
24		Total of top 23 Indian authors.	174	20731	119.14	1.49	104	59.77	
25		India's total.	309	24670	79.84	1.00			
26		Share of top 23 Indian authors in India's total.	56.31	84.03					

TP=Total papers; TC=Total citations; CPP=Citations per paper; ICP=International collaborative papers; RCI=Relative citation index; TLS=Total link strength.

significant collaborations, highlighting the intricate connections and 36 distinct clusters within the network.

Cluster 1 comprises 6 authors: P. Singh, V.K. Singh, S.K. Mangla, P. Verma and A. Uddin *et al.*;

Cluster 2 includes 5 authors: R. Sureka, A. Vashishtha, P. Goyal, D. Kumar and T. Chakraborty;

Cluster 3 consists of 4 authors: S. Kumar, D. Pattnaik, Neeraj Pandey and K. Goyal;

Clusters 4 include 3 authors: Suresh Kumar, K.C. Garg and B.M. Gupta;

Clusters 5 include 3 authors: V.K. Nair, P. Nedungadi and R Raman;

Clusters 6 include 3 authors: P.K. Muhuri, A.K. Shukla and A. Basu;

Clusters 7 to 11 each consist of 2 authors: (S. Dhir and S. Singh); (N. Pandey and A. Haldar); (A. Haleem and M. Javaid; (S. Sahoo and U. Bamel); (S. Verma and M. Pant); Clusters 12 to 22 each contain 1 author.

These collaborative efforts are essential for advancing knowledge, fostering interdisciplinary perspectives and addressing complex challenges in the specialized area of bibliometric research.

Leading journals

India's 309 HCP publications in bibliometric research appeared across 179 journals. Of those journals, 137 published just 1 paper

Table 8: Profile of Top 10 Most Prolific and Top 10 Most Impactful Authors.

Sl. No.	Name of the author	Affiliation of the author	TP	TC	CPP	RCI	ICP	%ICP
Top 10 Most Productive Authors								
1	S. Kumar	Malaviya NIT, Department of Management Studies, Jaipur.	45	7330	162.89	2.04	41	91.11
2	Pandey, A	Malaviya NIT, Department of Management Studies, Jaipur.	15	3978	265.2	3.32	14	93.33
3	Pattnaik, D	Malaviya NIT, Department of Management Studies, Jaipur.	12	1205	100.42	1.26	10	83.33
4	Modak, N.M.	Palpara Vidyamandir, Chakdaha, WB.	9	577	64.11	0.8	9	100
5	Bhattacharya, S	NISTADS, New Delhi.	7	339	48.43	0.61	4	57.14
6	Garg, K.C.	NISTADS, New Delhi.	6	328	54.67	0.68	0	0
7	Basu, A	NISTADS, New Delhi South Asia University, ND.	6	254	42.33	0.53	1	16.67
8	Surekha, R	Malaviya NIT, Department of Management Studies, Jaipur.	5	250	50	0.63	4	80
9	Dhir, S	IIT, Department of Management Studies, New Delhi.	5	335	67	0.84		0
10	Verma, S	National Institute of Industrial Engineering, Mumbai.	5	587	117.4	1.47	3	60
Top 10 Most Impactful Authors								
1	Modak, N.M.	Palpara Vidyamandir, Chakdaha, WB.	9	577	64.11	0.8	9	100
2	Aminbhavi, M	Soniya College of Pharmacy, Dharwad.	4	147	36.75	0.46	4	100
3	Pandey, A	Malaviya NIT, Department of Management Studies, Jaipur.	15	3978	265.2	3.32	14	93.33
4	S. Kumar	Malaviya NIT, Department of Management Studies, Jaipur.	45	7330	162.89	2.04	41	91.11
5	Pattnaik, D	Malaviya NIT, Department of Management Studies, Jaipur.	12	1205	100.42	1.26	10	83.33
6	Surekha, R	Malaviya NIT, Department of Management Studies, Jaipur.	5	250	50	0.63	4	80
7	Mishra, D	IIT, Department of Industrial Management, Kanpur.	4	641	160.25	2.01	3	75
8	Muhuri, P.K.	South Asia University, Department of Computer Science, New Delhi.	4	583	145.75	1.83	3	75
9	Mangla, S.K.	Jindal Global Business School, Jindal Global University, Sonipat.	4	254	63.5	0.8	3	75
10	Verma, S	National Institute of Industrial Engineering, Mumbai.	5	587	117.4	1.47	3	60

each, 25 published 2 papers each, 10 published 3 papers each and 1 journal published between 4 to 45 papers. Table 9 lists the top 17 most productive journals, ranked by their research output.

The top 17 most productive journals accounted for 39.48% of India's total publications and 46.88% of its citations. These top 17 journals published a combined total of 122 papers and received 11,566 citations. The 5 most productive journals were *Scientometrics* (*n*=45), *Journal of Business Research* (*n*=15), *Technological Forecasting and Social Change* (*n*=9), *Journal of Cleaner Production* (*n*=8) and *Benchmarking* (*n*=6).

The 5 journals that received the most total citations were *Journal of Business Research* (4,664 citations), *Scientometrics* (2,911 citations), *Technological Forecasting and Social Change* (635 citations), *Journal of Cleaner Production* (594 citations) and *Journal of Clinical Orthopaedics and Trauma* (331 citations). The 5 journals with the highest citation impact per paper were *Journal*

Table 9: Top 17 Most Productive Journal Titles in Bibliometrics Research.

Sl. No.	Source	Documents	Citations	CPP	IF
1	Scientometrics	45	2911	64.69	3.71
2	Journal of Business Research.	15	4664	310.93	13.44
3	Technological Forecasting and Social Change.	9	635	70.56	13.63
4	Journal of Cleaner Production.	8	594	74.25	11.1
5	Benchmarking	6	279	46.50	7.97
6	Science of the Total Environment.	5	242	48.40	10.75
7	International Journal of Production Research.	4	329	82.25	9.2
8	Besource Technology	3	125	41.67	11.4
9	Business Strategy and the Environment.	3	200	66.67	14.88
10	DESIDOC Journal of Library and Information Technology.	3	102	34.00	0.97
11	IEEE Access	3	310	103.33	4.82
12	International Journal of Environmental Research and Public Health.	3	104	34.67	4.614
13	International Journal of Hydrogen Energy.	3	152	50.67	7.139
14	International Journal of Information Management Data Insights.	3	285	95.00	18.85
15	Journal of Clinical Orthopaedics and Trauma.	3	331	110.33	1.74
16	Plos One	3	136	45.33	3.7
17	Research in International Business and Finance.	3	167	55.67	6.5
18	Total of top 17 journals	122	11566		
19	India's total.	309	24670		
20	Share of top 17 journals in India's total.	39.48	46.88		

TP=Total papers; TC=Total citations; CPP=Citations per paper; IF=Impact factor.

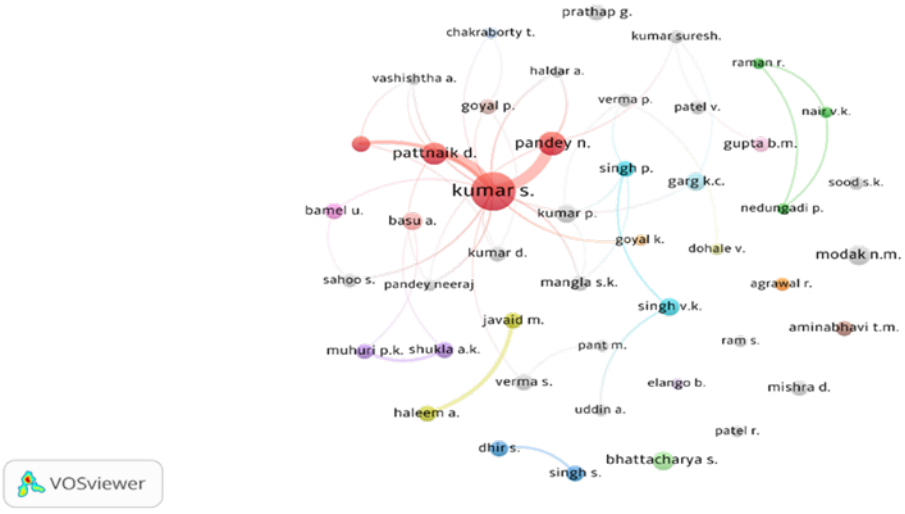

Figure 3: Collaboration network map among top 45 author's from India I Bibliometrics Research.

of Business Research (310.93 CPP), *Journal of Clinical Orthopaedics and Trauma* (110.33 CPP), *IEEE Access* (103.33 CPP), *International Journal of Information Management Data Insights* (95.0 CPP) and *International Journal of Production Research* (82.25 CPP). The 5 journals with the highest impact factors were *International Journal of Information Management Data Insights* (IF=18.85),

Business Strategy and the Environment (IF=14.88), *Technological Forecasting and Social Change* (IF=13.63), *Journal of Business Research* (IF=13.44) and *Bioresource Technology* (IF=11.4).

Keywords Analysis

In the 309 HCPs from India, 2450 keywords related to bibliometrics research were identified having frequency of appearance from 1 to 131. From these, 131 keywords were selected and found useful and need further analysis.

The 131 selected keywords may be further classified in three broad divisions: (i) 70 keywords were related to subject field's studies; (ii) 27 keywords were focused on particular geographical region; and (iii) 74 keywords were related to bibliometrics research.

Among the 131 keywords, 70 were related to subject fields, the leading were: Sustainability (*n*=31), Sustainable Development (*n*=24), Medical Research (*n*=15), Management (*n*=17), Medical Research and Finance (*n*=15 each), Marketing (*n*=13), Wastewater Treatment, Business and Supply Chain Management (*n*=11 each), Artificial Intelligence (*n*=10), Water pollution, Manufacturing and Biomedical Research (*n*=9 each), Machine Learning, Economics and Covid-19 (*n*=8 each), Wastewater, Circular Economy and Heavy Metals (*n*=7 each), Nanotechnology, Climate Change and Industry 4.0 (*n*=6 each), Blockchain, Waste Management, Industrial Research, Entrepreneurship, Tourism and Knowledge Management (*n*=5 each), Health Risks, Health Hazards, Innovations, Internet of Things, Data Mining, Environmental Economics and Environmental Impact (*n*=4 each).

Among the 131 keywords, 27 had a geographical focus. The most frequently occurring keywords were India (21 times), followed by United States (15 times), China (15 times), United Kingdom (2 times), Australia and Canada (3 times each), Germany (2 times) and several other countries like Bangladesh, Egypt, Iran, Italy, Japan, Singapore, Spain, South Africa, South Korea, Switzerland, Taiwan and Thailand (1 time each). Additionally, the analysis identified keywords related to developing countries (1 time), developed countries (1 time), Europe (1 time), South Asia (1 time), Middle East (1 time), Asia (1 time) and North America (1 time).

Among the 131 keywords, 74 were focussed on different features of bibliometrics research. The most frequently occurring keywords were: Bibliometric Analysis (*n*=131), Bibliometrics (*n*=112), Scopus (32 times), Citation Analysis (*n*=30), Web of Science (29 times), Scientometrics (*n*=27), Bibliographical Coupling (*n*=24) Network Analysis (*n*=18), Co-Citation Analysis and Medline (*n*=16 each), (*n*=16), Scientometric Analysis (*n*=10) Cluster Analysis and Gephi (*n*=8 each), Mapping (*n*=7), Science Mapping (*n*=6), Webometrics, VOSviewer, Co-Occurrence Analysis and CiteSpace (*n*=5 each), Co-Word Analysis, Biblioshiny and Bibliographical Database (*n*=4 each), Altmetrics and Thematic Analysis (*n*=3).

Figure 4 presents the network visualization illustrates the co-occurrence among the top 70 keywords related to subject fields studied. The predominant clusters, namely Cluster 1, Cluster 2 and Cluster 3, each comprise 5 keywords, followed by Cluster 4 with 4 keywords. Subsequent clusters ranging from Cluster

Figure 4: Network Visualization of Co-occurrence of subject fields from top 70 Keywords in bibliometric research.

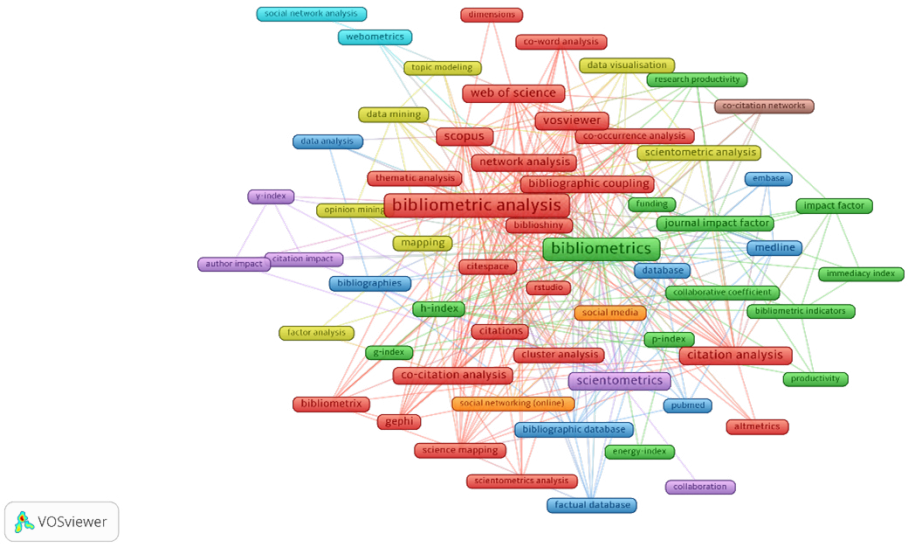

Figure 5: Network Visualization of Co-occurrence of top 60 Keywords in Bibliometric Research.

5 to Cluster 12 consist of 2 keywords each, while clusters from Cluster 13 to Cluster 48 feature a single keyword each. Through the co-occurrence network analysis of these 70 keywords, a spectrum of collaborative links is revealed, with frequencies varying between 0 and 35. Furthermore, the total link strength demonstrates significant diversity, ranging from 0 to 60, with individual keyword occurrences ranging from 1 to 24.

Figure 5 presents a keyword co-occurrence map for 60 keywords related to different features of bibliometrics research out of 74, generated using VOSviewer. These were classified into eight clusters with 299 links and total link strength of 703. The largest cluster, Cluster 1 (red), contains 22 keywords, followed by Cluster 2 (green) with 13 keywords, Cluster 3 (blue) with 8 keywords, Cluster 4 (yellow) with 7 keywords, Cluster 5 (purple) with 5 keywords, Clusters 6 and 7 (aqua and orange) with 2 keywords each and Cluster 8 (brown) with one keyword. The color assignment for clusters reflects the density of relationships between the constituent keywords. Co-occurrence network analysis of the 60 keywords revealed a range of collaborative links, varying from 1 to 48. Additionally, the total link strength exhibited significant variation, ranging from 1 to 202, with the occurrence of keywords ranging from 1 to 131.

High-Cited Papers Profile

India contributed 43 High-Cited Papers (HCPs) in bibliometrics that received 100 to 2480 citations each during 2014-2023. These 43 HCPs accumulated a total of 9,652 citations, averaging 224.46 citations per paper. The citation distribution was skewed, with 10 papers receiving 209 to 2480 citations and the remaining 33 papers receiving 100-199 citations each.

The 43 HCPs, comprising 35 articles and 8 reviews, involved collaboration across institutions and countries. Four papers had single-institution authorship, while the remaining 39 involved national (5 papers) or international (34 papers) collaboration. The United States was the most common collaborating country, participating in 19 papers, followed by Malaysia (13), Australia (9), South Africa (8), UK (6), Finland (5), France (4), Brazil, Italy, Germany and Norway (2 each). In total, 90 authors from 37 institutions/organizations contributed to the 43 HCPs.

The top foreign organizations contributing to the 43 HCPs were Swinburne University of Technology Sarawak Campus, Malaysia (12 papers), Swinburne University of Technology, Australia (8 papers), Georgia State University, USA (5 papers) and University of Akron, USA (4 papers). The top foreign authors were W.M. Lim from Swinburne University of Technology Sarawak Campus (20 papers), N. Donthu from Georgia State University (5 papers) and D. Mukherjee from University of Akron (3 papers).

The top 11 Indian organizations participating in the 43 HCPs were Malaviya National Institute of Technology Jaipur (14 papers), Indian Institute of Technology Kanpur (4 papers), Banaras Hindu University Varanasi (3 papers), South Asia University New Delhi (3 papers), Woxsen University Hyderabad (3 papers), National Institute of Industrial Engineering Mumbai (3 papers), Banaras Hindu University Institute of Technology Varanasi (2 papers), International Management Institute New Delhi (2 papers), Jamia Millia Islamia New Delhi (2 papers), SASTRA University Thanjavur (2 papers) and Symbiosis International Deemed University (2 papers). The top 10 Indian authors were S. Kumar (15 papers), N. Pandey (5 papers), D. Mishra (3 papers) and 8 others with 2 papers each.

The 43 HCPs were distributed across various subject categories, with the majority (26 papers) in Business, Management and Accounting, followed by Computer Science (10), Engineering (9), Decision Science, Social Science and Medicine (7 each),

Economics, Econometrics and Finance (6) and Environmental Science (5). The journals that published the most HCPs were Journal of Business Research (10 papers), Annals of Operations Research, International Journal of Consumer Studies, Journal of Cleaner Production, Scientometrics and Technological Forecasting and Social Change (2 papers each) and 21 other journals with 1 paper each.

The most highly cited HCP was "How to conduct a bibliometric analysis: An overview and guidelines" by N. Donthu, S. Kumar, *et al.* (2021) in the Journal of Business Research, with 2,480 citations. The second most cited HCP was "The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis" by V.K. Singh, P. Singh, *et al.* (2021) in Scientometrics, with 460 citations. The 15th most cited HCP was "Artificial intelligence and machine learning in finance: Identifying foundations, themes and research clusters from bibliometric analysis" by J.W. Goodell, S. Kumar, *et al.* (2021) in the Journal of Behavioral and Experimental Finance, with 184 citations.

Out of 3,412 papers examined in India's bibliometric research, only 15 (0.44%) were identified as High-Cited Papers (HCPs) through co-citation analysis. These 15 top-cited papers had a total citation count ranging from 184 to 2,480.

RESULTS AND FINDINGS

Bibliometric analysis is a valuable tool for understanding the status and performance of a country's research in the field relative to other countries. This study has analyzed the high-cited papers by India in the area of bibliometrics research between 1994-2023, The aim is to provide an insight into the state of bibliometrics research in India using quantitative and qualitative indicators based on publications and citations data. High-cited papers papers are considered as indicators of quality, impact and influence in the given research area of study. This study has also identified key productive organizations and highly cited authors, their network linkages and the leading journals publishing India's bibliometrics research. This study also provides a detailed analysis of top 15 high-cited papers in the field.

Of the global bibliometrics research output from 1994-2023 (40,049 publications), 5,341 (13.34%) were High-Cited Papers (HCPs) with 30 or more citations. Of these global HCPs, India contributed 309 papers, accounting for 5.78% share of the global total. The USA led with the most high-cited papers registering 28.5% share, followed by China (20.35% share) and the U.K (14.6% share). India is ranked at 9th position in global HCPs receiving 30 or more citations.

Approximately 20% of India's 309 HCPs, 63 received funding from external funding agencies. These funded papers received an average of 69.44 citations per paper, lower than the overall average of 79.84 citations per paper for India's HCPs in bibliometrics research.

International collaboration has been found to be a single most important factor in contributing to quality of bibliometrics research from India. Over 56% (175) of India's 309 HCPs involved researchers from more than 25 foreign countries, resulting in an average of 94.99 citations per paper-significantly higher than the national average.

The top 30 foreign organizations from the UK, Australia, USA, South Africa and other countries contributed 162 papers (52.43% of the total 309) and received 30,094 citations. The strongest collaborative linkage was between Swinburne University of Technology Sarawak Campus, Malaysia and Malaviya National Institute of Technology Jaipur. The top 30 foreign organizations are spread across nine leading countries. Of these, 17 organizations were from just three countries, the USA, UK and Australia and the remaining 13 from six European and Middle East countries. The predominance of the USA in bibliometrics research in India has been very significant.

The top 30 foreign authors from the USA, UK, Australia and other countries contributed 121 papers, accounting for 39.16% of the total productivity and received 19,364 citations, which is 78.49% of the total citations. The most prolific collaborative pair was "W.M. Lim and S. Kumar" with 18 co-authored papers.

India's output of HCPs has seen impressive growth over the last three decades. The 10-year cumulative output has increased steadily, from 17 HCPs (1994-03) to 47 (2004-13) to 245 (2014-23). In its annual growth, India's output of HCPs reached its peak in in 2021 with 71 papers. The top five most productive organizations from India have been identified as Malaviya NIT, Department of Management Studies, Jaipur (51 papers), NISTADS and IIT Department of Management Studies, New Delhi (12 papers each), National Institute of Industrial Engineering, Mumbai (11 papers) and South Asia University, Department of Computer Science, New Delhi (10 papers). The top five organizations from India in terms of citation impact were IIT Department of Industrial and Management Engineering, Kanpur (160.25 citations per paper, 2.01 citations per author), Malaviya NIT Department of Management Studies, Jaipur (147.33, 1.85), BHU Varanasi (131.71, 1.65), Woxsen University, Hyderabad (130.8, 1.64) and LM Thapar School of Management, Thapar Institute of Engineering and Technology, Dera Bassi, Punjab (111.2, 1.39).

The strongest collaborative linkages were identified between Malaviya National Institute of Technology Jaipur and National Institute of Industrial Engineering, Mumbai, as well as between Malaviya National Institute of Technology Jaipur and OP Jindal Global University, Sonipat, each with 4 co-authored papers.

CONCLUSION

The United States is the leader in the productivity of high-cited papers in the field of bibliometrics research (1994-2023), with the United Kingdom, China and other countries following closely

behind. India holds the 9th spot in the global ranking in HCPs with 30 or more citations. The country contributed most publications (245 HCPs) between 2014-23, showcasing India's current potential to lead the country in global bibliometrics research. The research study also highlights the role and importance that international collaboration has come to have played in leveraging high-quality bibliometrics research. The study also noted that scholars employed in particular by management institutes and management departments of engineering and technology institutes, are showing immense interest in bibliometrics research. Their performance in the productivity in bibliometrics research papers is rated as high. To enable India to emerge as a global player, the country needs to establish policies and initiatives that promote extensive research in collaboration with leading nations in bibliometrics research such as the USA, UK, Malaysia and Australia.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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