

Original Research

Faculty Profile Management System Using IRINS for the Analysis of Research Performance in the Field of Science and Technology

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Abstract

Academic institutes and Research and Development organizations collect, curate, and organize research-related activities from various sources. The Faculty Profile System or Research Information Management System plays a crucial role in academic institutions organizing scholarly communication data. The research-related metadata collected through the Faculty Profile System could be used for various purposes, including research assessment of faculty and department, decision-making on allocating funding, and ranking of the institute. The study aims to develop a faculty profile management system using the Indian Research Information Network System (IRINS) for seven Indian Institute of Technology (IIT) and analyze the faculty members' research contributions through bibliometric indicators. The study attempted to analyze seven IITs' research performance based on the publications and citations from 2010-2019. This study emphasized evaluating the faculty and organization's research performance through quantity, impact, quality, and importance. Quantity refers to the number of publications; quality refers to the number of papers published in a highly impacted journal; impact refers to measuring the researcher's influence and evaluation by the number of citations received by the faculty or organization. This paper examines the analysis of research performance in the field of Science and Technology.

Keywords: Ranking Framework, Faculty Profile System, Indian Research Information Network System (IRINS), Publication, Citation, h-index, Indian Institute of Technology (IITs), Science and Technology.

Introduction

The Research Information Management System (RIM) is an integrated system that systematically organizes its scholarly communication activities to support the organizational unit for strategic research planning, funding, and decision-making. Research information systems store data on research activities, such as scientific and research publications of researchers, research budgets, projects, research institutions involved, and research funding applications (Science Europe, 2016). The RIM supports the organization in aggregating and curating the scholarly artifact. It provides vital information for distributing research funds to the organizational units and acting as a decision-making tool for science, technology, and innovation. The Research Information System has different terminology in various countries.

However, its functional use and features are the same. In European countries, it is called a Current Research Information System, whereas, in Canada and the USA, it is termed a Research Networking System (RINS), Research Profiling System (RPS), Faculty Profile System (FPS), or Faculty Activity Reporting. The principal objective of RIM is to consolidate the entire research artifact for various analyses (Bryant et al., 2017). The Scientometric analysis has received enough attention, and it has been broadly applied to appraise the research performance of the researchers and the progress of different subject areas of the science domain (Thanuskodi & Subramanian, 2013); (Alagu & Thanuskodi, 2019).

Statement of the Problem

Setting up a Research Information Management System (RIM) or Faculty Profile Management System (FPMS) is becoming vital for academic institutions as the scholarly communication ecosystem becomes more competitive, multi-faceted, and globalized. Simultaneously, educational institutes look forward to identifying strengths, showcasing engagement, and measuring the influence of research output (Bryant et al., 2017). National-level assessment systems, ranking systems, and funding agencies indirectly force the institutes to set up a research information management system and showcase the faculty and department's research contributions to the academic community. The growth of literature has been multi-fold in the recent past. Due to the invention of information technology, their research is made publically available through various non-profile projects such as Microsoft Academic Search Graph, Open Academic Graph, Crossref, Open Citation, CORE, etc. (Sinha et al., 2015). Commercial citation databases such as Scopus, Web of Science, Dimension, and Altmetric have provided limited metadata through public API. The revolutionary information technology made it possible to retrieve bibliographic information from various sources and analyze the research's impact through various bibliometric indicators such as annual growth rate of publications, citations, average citations, h-index, i-10 index, collaboration pattern, etc. In the present study, "Development of Faculty Profile Management System Using IRINS for the Analysis of Research Performance in the field of Science and Technology," the researcher intended to develop the faculty profile management system using IRINS for the selected IITs and analyze the performance of the IITs through various bibliometric parameters.

Need for the Study

The country's knowledge economy and global competitiveness are often assessed from the country's research outputs. India was the source of significant research and development production before 1980 and ranked third among developing countries in the world. The changing global science and technology landscape has reduced much research output in the last four decades. Various bibliometric studies reveal India's loss of competitiveness in the Research and Development sector (Department of Science Technology, 2012). There has been a remarkable rise in the system for comparing research and ranking universities in recent decades. National-level ranking received more attention than international-level ranking (Taylor & Braddock, 2007). The National Institutional Ranking Framework (NIRF) (NIRF, 2016) was the Ministry of Human Resources Development initiative, Govt. of India, executed by the National Board of Accreditation (NBA) and formally launched on 29th September 2015. The framework defined the methodology to rank the higher education institutions across the country.

The NIRF first released the first version of India Ranking 2016 on 4th April 2016. India Ranking 2020 report reveals that 3771 unique institutes participated in the 2020 ranking, and the overall category is 70.21 percent of papers published by the top 100 institutes. In the management category, 89% of the paper published by the top 100 institutes (Ministry of Education, 2020). The NIRF and other ranking frameworks reveal the higher education institutions' strengths and weaknesses in various parameters such as faculty and student ratio, publication and citation, diverse student community, etc. The bibliometric studies provide new insight into the institutes' research contributions, collaboration patterns, citation patterns, h-index, citation per paper, and research focus areas (Thanuskodi, 2012). The research publication analysis provides the necessary information to the research administrator, funding agencies, and policymakers to know the current research trend and support the strategic decision on funding. Several bibliometric studies have been undertaken in various periods to analyze the research performance of the Indian Institute of Technology (Ghosh, 2020). The present research study aims to explore the research contributions of the old seven IITs in terms of quality and quantity. It is expected to provide new insights into the growth of publications, citations, collaboration patterns, research focus areas, social media metrics, etc.

Benefits of IRINS

India's scholarly publication contribution is 2.39 million, and it is positioned as number four with 1.97 lakh publications in 2019 (Elsevier, 2016). Only 15.8 percent of total publications are featured in the top 10 journals globally. 1.41 million faculty members are involved in teaching and research in India's higher education institutions AISHE (Ministry of Human Resource Development, 2019). There is no standard system to archive Indian research output and support for national-level research assessment. The faculty members, scholars, and research administrators find it challenging to locate mentors for their research work and collaborators for interdisciplinary research work. The benefits to the stakeholders are given below;

- **Scholars:** The IRINS supports research scholars and students in finding the desired faculty members in their respective areas of interest for research work and higher studies.
- **Faculty Members:** The IRINS facilitates faculty members' sharing of research contributions to the academic community and brings more visibility to their research work. It also supports faculty members in doing collaborative research in their respective areas of expertise and increasing national and international funding opportunities.
- **Research administrators:** IRINS supports policymakers by providing experts for project review and other national-level collaborative projects. It supports the research administrator at the institute level in assessing the faculty members and their research performance. It provides new insights to the research administrator to monitor and compare the organizational unit's research progress; the research data supports fund allocation and other policy-level decisions in the institute. It provides data to the national and international level assessment system and ranking framework, increasing its reputation (Kannan, 2021).

Literature Review

The research output analysis of IIT Delhi between 2001 and 2010. The study used various bibliometric measures to help understand various aspects of the research. They have collected data from the web of science for analysis and have done multiple analyses. These analyses will

help understand the growth, impact, and contribution of research carried by the respective organization's faculty (Chaurasia & Chavan, 2014)-the performance of educational institutes from India which are research-intensive. For the longitudinal performance analysis of quality and quantity from 2003 to 2011, datasets from 2013 and SIR world reports are used. Together, these institutes contribute most of India's research output. The study observed that the quantity of the output is growing at an acceptable rate. Still, the quality of the Institutes of National Importance outputs has a slower growth rate than the other institutes (Gangan & Gupta, 2009).

The top five IITs are based on publications indexed in Web of Science in five years, i.e., from 2009-2013. For analysis, 215,019 publications have been retrieved from India, which is 2.72% of the world's publications. The top 5 IITs have contributed 9.32% of total publications in India. The study performed proved that there is a rapid increase in the research output count. IIT Kharagpur is listed as the most productive institute among the 5 IITS with 5271 articles, and IIT Madras with 3983. Hadimani, Mulla, and Kumar (2015) have done a bibliographic analysis of scholarly outputs from the Indian Institute of Science Education and Research, Thiruvananthapuram, for 2008-2013. During this period, the respective institute has published 157 research publications in 76 journals. It particularly examines journal-wise distribution, year-wise distribution, document type-wise distribution, the researchers' productivity, etc. The study observed an average annual growth rate of 111%, with 13.58 citations per paper and an h-index of 18. There are 2717 co-authors, with an average of 17.31 authors per paper. Among the 157 outputs, there are 28 contributions from the United States of America and 20 from Germany, respectively (Van Raan, 1999).

Bid (2016) performed a scientometric study on the research outputs of IIT Kharagpur during the period 2000 to 2015 from the Scopus database. This article analyzed the growth in developing research activities at IIT Kharagpur. IIT Kharagpur has contributed 18927 publications in the last 15 years, with an average annual rate of 1182.93 papers. All the publications have received 187332 citations with an average of 9.89 per paper and an h-index of 119. It was found that the number of publications doubled in 9 years and tripled in the next three years. Reddy, Xie, and Tang (2016) conducted a case study comparing higher education, world university rankings, and high impact research between India and China. The paper has been divided into (i) Higher Education and govt. Schemes for academic research. (ii) How do academic scholarships impact high-impact research and world university rankings? (iii) Discussed the potential roadblocks in Indian University Education and suggested guidelines for improving performance.

NSTMIS (2016) studied the research performance comparison of India with the rest of the world. The study was done from 2009 to 2013 and found that India contributed to 4.4% of the world's scholarly outputs in 2013. The compound annual growth rate for 2009-2013 is also found to be 13.9%, whereas the world has 4.1%. Chemistry and Pharmacology are in the spotlight with higher relative emphasis, followed by Engineering. From this, it is clear that India is progressing rapidly in Science and Technology compared to any other country (Suresh & Thanuskodi, 2019).

Marisha, Banshal, and Singh (2017) have conducted a research performance of 39 Central universities in India. They have used publication data indexed in Web of Science from 1990-2014 for analysis. The following are computationally analyzed from the dataset: (i) author productivity. (ii) Productivity per one crore (obtained through research funding). (iii) citation impact (iv) collaboration factor. (v) Discipline-wise excellence of universities. The

performance of 36 central universities is compared with top-ranking institutes, namely Stanford University and Cambridge. The performance of older universities like Banaras Hindu University and the University of Delhi is impressive. Some smaller universities, like the University of Hyderabad, are also doing well. Compared with top-ranking universities globally, the combined research performance of 39 universities cannot compete with them.

Objectives of the Study

To develop a faculty profile management system using the Indian Research Information Network System;

Collect related research artifacts from the selected IITs, curate and retrieve scholarly communication activities and their metrics from external sources;

To analyze the growth of literature output and growth rate in seven selected IITs for the period of 2010-2019;

To examine the subject-wise research productivity, share, and average citation, h-index of publication;

To analyze the publication venue and its share in closed access, green open access, gold open access, brown open access, etc.;

To identify the highly cited papers and their share in most cited papers (Top 10%, Top 5%, and Top 1%) within seven IITs;

To analyze the subject-wise citation, citation per paper, and h-index in the various subject categories.

Materials and Methods

This study aims to demonstrate the quantitative publication growth of seven IITs for 2010-2019. This chapter discusses data sources, bibliometric and scientometric indicators, statistical tools, and other formulas used to compare and analyze the research data. Indian Research Information Network System (IRINS) is an open-source Research Information Management (RIM) system / Faculty Profile System developed by the Information and Library Network Centre under the National Mission on Education through ICT-II. It supports academic and R&D organizations in collecting research-related artifacts and showcasing their contributions to the academic community. The system has been integrated with most academic identities such as ORCID, SCOPUS, Google Scholar ID, Microsoft Academic ID, and CrossRef for retrieving publication metadata through API (Kannan, 2017). Two hundred sixty-eight institutes participated, and an instance has been created, including IITs, NITs, IIMs, Central Universities, State Universities, and R&D organizations. The system interconnected over 5000 faculty members nationwide and accumulated 9.17 lakhs of publication metadata through various sources (IRINS, 2021). For this study, 94805 papers of current faculty members of seven IITs were extracted from the database for the period 2010-2019.

Results

This section presents the analysis and interpretation of 94,805 papers retrieved from the Indian Research Information Network System (IRINS) for the period 2010-2019 of seven IITs. The data has been analyzed quantitatively using various scientometrics, bibliometrics indicators, and other statistical techniques. The data analysis and interpretations are presented in the following major categories: Growth of Publication, Citation Metrics, Author Productivity, Journal Metrics, Altmetric Analysis, Collaboration Network, and Ranking of

Institute.

Publication output, share, and annual growth

The data gives information regarding allocating data of seven IITs for a decade. Regarding the number of faculties, IIT Bombay (Indian Institute of Technology Bombay) has the most (692). In contrast, IIT Guwahati (Indian Institute of Technology Guwahati) has the least faculties, around 407. There is a similar pattern in the number of publication counts; it is inversely proportional to the number of faculties. The more faculty there are, the more publications there are. However, the trend varies while the average number of publications per faculty varies. IIT Kharagpur, Bombay, Kanpur, Roorkee, and IIT Madras, Guwahati are roughly stable, fluctuating around 24.50 and 26.70. In IIT Delhi, however, the average number of publications per faculty is 28.01.

The share of publications within seven IITs goes hand in hand with the number of faculties. More the number of faculties is the share of publications within the IITs. The average annual growth rate remains almost the same in IIT Bombay, Madras, Kanpur, Roorkee, and Delhi, fluctuating around 10.5. Meanwhile, the average yearly growth rate in IIT Kharagpur is minimal, and IIT Guwahati is maximal. In summary, the Number of Faculty Members, Publication count, and Share of Publication within seven IITs are directly proportional. Still, the Average number of publications per faculty and Average Annual Growth Rate follow a different trend (Table 1).

Table 1

Publication output share and average annual growth rate of seven IITs for 2010-2019

Name of Institute	Faculty Members	Publications	Average number of publications per faculty	Share of publication	Average annual growth rate 2011-2019
Seven IITs	3868	94805	24.51	100.00	10.05
IIT Kharagpur	678	16676	24.60	17.59	7.66
IIT Bombay	692	16986	24.55	17.92	10.38
IIT Madras	617	16505	26.75	17.41	10.19
IIT Kanpur	451	11240	24.92	11.86	10.49
IIT Delhi	574	16078	28.01	16.96	10.11
IIT Guwahati	407	10866	26.70	11.46	14.76
IIT Roorkee	449	10977	24.45	11.58	10.69

Annual publication output and compound annual growth

Table 2 gives data on annual publication output and compound growth rate for a decade. Regarding the Annual Publication Output, IITB, IITK, IITD, IITG, IITM, and total varsities in India follow a similar trend, and the number of books published steadily increased over the years. Meanwhile, IITKGP and IITR gradually decreased in 2011 and 2013. There is a similar pattern for the Compound Growth Rate, where IITB, IITM, IITK, IITR and Universities in India fluctuate around 10.5 and IITGP and IITD around 7.5 and 9.90 respectively. However, there is

a sudden spike in IITG around 14.53, making it an exceptional case. Overall, the Annual Publication Output increases gradually, and the Compound Growth Rate remains constant in all the IITs and Higher educational institutions in India, except IITG.

Table 2

Annual publication output of seven IITs for 2010-2019 and compound annual growth rate for 2010-2019

Name of institute	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	CAGR
India	81101	98564	109267	117603	132842	144064	155442	157058	180634	197889	10.42
Seven IITs	5894	6569	7063	7731	8792	9454	10394	11999	12992	13917	10.02
IIT Kharagpur	1,228	1,206	1,290	1,393	1,515	1,643	1,769	2,057	2,206	2,369	7.57
IIT Bombay	1,016	1,188	1,260	1,491	1,627	1,725	1,819	2,077	2,333	2,450	10.27
IIT Madras	1,067	1,221	1,208	1,301	1,560	1,685	1,757	1,998	2,187	2,521	10.02
IIT Kanpur	670	795	807	905	1,049	1,143	1,283	1,473	1,491	1,624	10.34
IIT Delhi	1,027	1,062	1,186	1,282	1,468	1,530	1,703	2,158	2,260	2,402	9.90
IIT Guwahati	529	699	768	858	947	1,015	1,254	1,416	1,587	1,793	14.53
IIT Roorkee	627	731	912	856	988	1,073	1,250	1,436	1,597	1,507	10.23

Fractionalized publications, growth and percentage increase during 2010-19

Table 3 illustrates the Number of Fractionalized publications and their growth in a decade, respectively. In 2010, IITKGP published the most copies, up to 1228; IITG had the least, around 529. From 2010-14, the IITs followed a similar pattern as 2010, where IITG still publishes the least number of copies up to 3801. But here, IITB produces the most number, around 6,582. Considering the 2015 to 2019 tenure, IITB remains at the top, publishing over 10,404 copies. However, IITK publishes around 7,014 copies. Regarding AAGR 2011-19, IITG is the maximum over 14.76, and IITGP is the minimum up to 7.66. Meanwhile, regarding the percentage of output from 2015 to 19, IITG has the highest rate, at 65.02%, and IITGP has the lowest at around 60.23%. However, the remaining IITs fluctuate around 62%. Coming to a Percentage Increase in publications, IITG grabs the top spot with 238.94% and IITGB at the bottom of the list with around 92.92%.

In conclusion, IITKGP published the maximum amount of Fractionalized Research work, and IITG published the minimum in 2010. Five years later, IITB led the journal issues. Concerning AAGR for a period of nine years, IITG had the most, with IITGP the least, but the trend in terms of percentage product is different.

Table 3

Number of fractionalized publications, growth, and percent increase for 2010-2019 in seven IITs

Name of Institute	Publications 2010	Publications 2010-2014	Publications 2015-2019	Publications 2019	Average annual growth rate 2011-2019	Percent of Publication 2015-2019	Percent increase 2010-2019
Seven IITs	6,164	37,737	61,591	13917	10.05	64.97%	125.78
IIT Kharagpur	1,228	6,632	10,044	2,369	7.66	60.23%	92.92
IIT Bombay	1,016	6,582	10,404	2,450	10.38	61.25%	141.14
IIT Madras	1,067	6,357	10,148	2,521	10.19	61.48%	136.27
IIT Kanpur	670	4226	7,014	1,624	10.49	62.40%	142.39
IIT Delhi	1,027	6,025	10,053	2,402	10.11	62.53%	133.89
IIT Guwahati	529	3801	7,065	1,793	14.76	65.02%	238.94
IIT Roorkee	627	4114	6,863	1,507	10.69	62.52%	140.35

Publication and their distribution in different publication venues

Table 4 represents scientific efficiency through the publication setting of chosen IITs between 2010-2019. Seven IITs were picked, and access to the research publications was considered. IITKGP has a significant closed-access scientific paper. IITK has an overwhelming Green Open Access to the research articles. But the least in terms of Gold Open Access. IIT Bangalore has a substantial Bronze Open Access and other publications. It is clear from the data that the Closed Access of Seven IITs amongst those 70600 were in IITKGP, with the maximum being 13351 and IITK the lowest at 8348. The Green Open Access and The Gold Open Access various research publications in the Seven IITs, as observed from the chart, are 5495 and 4583, respectively. Regarding Green Open Access, IITK has a maximum of 1080, and IITR has just 367. However, IITB has a marginally high Bronze Open Access of 427 scientific works, and IITG with the least of 201.

In Summary, IITKGP seems to have the majority of Closed-Access publications, while the rest of the Open-Access (Green, Gold, and Bronze) fluctuates between other IITK, IITM, and IITB.

Table 4

Publication and their distribution in different publication venues of seven IITs for the period 2010-2019

Name of institute	Closed Access	Green open access	Gold open access	Bronze open access	Others
Seven IITs	70600	5495	4583	2224	11903
IIT Kharagpur	13351	839	736	394	1350
IIT Bombay	10516	1054	781	427	4199
IIT Madras	12163	1042	851	413	2017

IIT Kanpur	8348	1080	521	376	908
IIT Delhi	12272	786	702	322	1985
IIT Guwahati	8609	650	625	201	775
IIT Roorkee	8826	367	562	252	952

Publication and their share in different publication venues

Table 5 shows the share of papers in publications venue of seven IITs over a decade. Regarding Closed Access, IITR has the maximum publication share at 80.54, and IITB has the least with 61.94. However, the other IITs fluctuate between 74.50. In Green Open Access, IITK has the highest, with over 9.6,1, and IITR has the lowest, around 3.35. Whereas in Gold Open Access, IITG has the highest share of publications and IITD with the least up to 4.37. Meanwhile, IITG has the lowest for Bronze Open Access, and IITK has the highest, with 1.85 and 3.35, respectively. In contrast, the remaining IITs fluctuate around 3.30. Considering Others, IITB has a maximum share of 24.73, and IITG with a minimum of around 7.14.

Table 5

Publication shares in publication venue of seven IITs for the period 2010-2019, within each institute

Name of Institute	Closed Access	Green OA	Gold OA	Bronze OA	Others
Seven IITs	74.47	5.80	4.83	2.35	12.56
IIT Kharagpur	80.09	5.03	4.42	2.36	8.10
IIT Bombay	61.94	6.21	4.60	2.52	24.73
IIT Madras	73.78	6.32	5.16	2.51	12.23
IIT Kanpur	74.32	9.61	4.64	3.35	8.08
IIT Delhi	76.38	4.89	4.37	2.00	12.35
IIT Guwahati	79.27	5.99	5.76	1.85	7.14
IIT Roorkee	80.54	3.35	5.13	2.30	8.69

Table 6 gives the year-wise Publication distribution and its share in Publication Venue of seven IITs for 2010-2019. The table shows that Close Access had the highest publication and equivalent share from 2010 to 2019. However, Green Open Access, Brown Open Access, and others had higher publications in 2019 than in 2010; they had a relatively lower share in 2019 compared to 2010. Gold open access was the only exception that saw a rise in the publication and its equivalent share in 2019 compared to 2010. It had the highest percent (762.77) increase in publication when compared to other accesses. Its equivalent share also spiked from 1.59 in 2010 to 5.83 in 2019. Also, it could be inferred that only Gold open access had a steady increase in publication and its equivalent share year after year. For other venues, the values kept fluctuating. Thus, it is evident that publication distribution and its share were not relative to the years from 2010 to 2019.

Table 6

Annual share of publication output in different publication venues, growth of seven IIT for 2010-2019, and percent increase from 2010-2019

Publication Venue	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Percent increase 2010-2019
Close access	75.64	74.09	76.2	75.15	74.83	74.52	74.04	75.29	73.33	73.31	128.85
Green OA	6.21	5.45	5.72	5.87	6.11	5.19	5.68	6.04	5.81	5.86	122.68
Gold OA	1.59	1.74	2.78	3.01	4.12	5.68	6.15	6.33	6.45	5.83	762.77
BronzeOA	2.29	2.59	2.68	2.55	2	2.39	2.77	2.17	2.36	1.99	105.19
Others	14.27	16.14	12.6	13.41	12.92	12.15	11.35	10	11.98	12.78	111.41

Scholarly citation and their share

Table 7 gives the collective study of publications and citations of seven IITs from 2010 to 2019. From the table, one could observe that the number of faculty was directly proportional to the publications from 2010 to 2019; for instance, IIT Bombay, with 692 faculty, topped with 16986 publications, whereas IIT Guwahati, with 407 faculty, had only 10866 publications. The trend almost remained the same regarding the number of citations for all the IITs except IIT Bombay and IIT Guwahati. The same pattern could be gauged from the % share of citations other than IIT Kanpur, which had a more significant number of faculty than IIT Guwahati but still had a lower percentage than the same.

Publication with 0 citations and its corresponding % revealed the same proportionality rule, with IIT Madras surpassing IIT Bombay with a maximum number of faculty and IIT Kharagpur falling short of IIT Madras, respectively. Conversely, the data suggested that the number of faculty is inversely proportional to citations per paper. IIT Guwahati, IIT Roorkee, and IIT Delhi had the highest citations per paper compared to other IITs with higher faculties. However, IIT Kanpur is an exception, with 10.90 citations per paper for 451 faculty. The exact inference could be drawn from citations per faculty. Overall, it was evident that except for citation per paper and citation per faculty, there was a significant increase in publications and citations with the rise in the number of faculties in seven IITs from 2010 to 2019.

Table 7

Scholarly citation count, share, and citation per paper in seven IITs for the period 2010-2019, within seven IITs

Name of Institute	Number of faculty	Publications	Citations	Citations per paper	Share of citation (%)	Citation per faculty	publications with '0' citation	Share of paper with 0 citation
IIT Kharagpur	678	16676	203653	12.21	18.41	300.37	2494	2.63
IIT Bombay	692	16986	194157	11.43	17.55	280.57	3140	3.31
IIT Madras	617	16505	182816	11.08	16.53	296.30	3201	3.38
IIT Kanpur	451	11240	122490	10.90	11.07	271.60	2073	2.19

IIT Delhi	574	16078	202184	12.58	18.28	352.24	2847	3.00
IIT Guwahati	407	10866	133470	12.28	12.07	327.94	1744	1.84
IIT Roorkee	449	10977	136027	12.39	12.30	302.96	1817	1.92

Discussion

This is the first study to examine the research performance of leading IITs using the Indian Research Information Network System. We identified the top 7 IITs in terms of year of establishment are similar to those of previous studies, such as Chaurasia and Chavan (2014) and Gangan and Gupta (2009). While these studies used Web of Science data, they used more specific document types and a much smaller number of journals.

The results showed that the average annual growth rate varied widely across IITs and specialties and depended on several key factors. These were the institution population, and the types of journals that authors tend to publish in. In terms of population size, IIT Guwahati was the most productive, whereas IIT Kharagpur was the least productive. Regarding total publication output, it was unsurprising that IIT Delhi was the most dominant in producing articles, accounting for 28.01 of all articles published by the & IITs. Compared with other IITs, the IIT Bombay was more productive in making articles, consistent with the findings that IIT Kharagpur is listed as the most productive institute. The findings of this study support the study of Hadimani et al. (2015), as the number of articles published increased along with the average annual growth rate. In addition, the total research output of IITs can be calculated by considering the institutes' research grant expenditure. Compared to most other IITs, the IIT Bombay and IIT Kanpur were more productive when their research grant spending was considered.

IIT Guwahati's high publication productivity was primarily due to publications in prolific rather than prestigious journals. IIT Guwahati authors also published relatively few journal articles in more reputable journals. Generally, authors from IIT Guwahati in most specialties tended to publish in prolific journals. In contrast, authors from IIT Kanpur, IIT Bombay, and IIT Roorkee, in most specialties, tended to publish in more prestigious journals. These IITs also published a moderate number of journal articles in prolific journals.

In contrast, IIT Kharagpur showed more distinct preferences regarding journal type. Unlike in 2000 and 2015, these IITs were published more in prolific rather than prestigious journals. Journals' strict editorial standards pose a particular challenge for authors from other collaborative institutes (Bid, 2016; Reddy et al., 2016). This may be one of the reasons why researchers from IIT Kanpur lag behind IIT Delhi in publishing in more prestigious journals.

To compare the output of the specialties across the top 7 IITs in terms of citations, we formulated the total citations received by all the seven IITs together was 11,06,235. It is observed that IIT Kharagpur received the highest number of citations, 2,03,653, with 18.41 percent share, followed by IIT Delhi received 2,02,184, and IIT Kanpur received the lowest citation with 11.07 percent share. The IIT Delhi received the highest citation per paper, with 12.58, followed by IIT Guwahati with 12.28 citations per paper. From this, it is clear that India is progressing rapidly in Science and Technology compared to any other country (NSTMIS, 2016; Marisha et al., 2017).

Conclusion

A different type of measurement is used to measure the faculty member and organization's research performance. The growth of science and social science based on data emphasizes three standard measures: publication count, citation count, and peer-colleague ratings. This study evaluated the faculty and organization's research performance through four essential measures: quantity, impact, quality, and importance. Quantity refers to the number of publications; quality refers to the number of papers published in a highly impacted journal; impact refers to measuring the researcher's influence and evaluation by the number of citations received by the faculty or organization.

This study aimed to examine the faculty profile management system and its impact on the higher education system. The system showcases faculty members' research contributions to the peer group and analyzes the selected institute's research performance based on publications, citations, and impact. The faculty profile system was created using the Indian Research Information Network System for seven IITs, and the data retrieved was analyzed using various bibliographic indicators.

Suggestions

The present study discusses the development of the faculty profile management system and analyses the seven IITs' research performance. In the recent past, universities and private agencies ranked the institutes based on publications, quality of the publication, and its impacts, such as the National Taiwan University Ranking, I-UGR Ranking, Global Research Benchmarking System (GRBS), and University Ranking by Academic Performance (URAP). The stakeholder may consider the following suggestions for the betterment of research performance;

- Ministry of Education and other Funding Agencies consider Faculty Profile Systems and Research Information Management Systems as mandatory practice in all higher education and R&D institutes;
- Publication with international collaboration attracts higher citations compared with national and institutional collaboration, encourages and promotes international collaborative projects and research at the institute level;
- Encourage multi-disciplinary collaborative research, and it leads to high-impact papers.
- Research activities related to data such as publications, patents, research projects, and citations are retrieved from the national-level research information network system (E.g., IRINS) for ranking and accreditation through policy decisions.
- Based on IRINS data, the research could compare all the centrally funded institutes' research performance regarding publications, citations, and impact.

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