A Scientometric Study of Research Productivity of the National Institute of Technology, Hamirpur (2013-2017)

Vimesh Patel

Research Scholar
Department of Library & Information Science
Central University of Himachal Pradesh
TAB, Sahpur, Dharmshala, District Kangra.
vimleshp72@gmail.com

I.V. Malhan

Professor
Department of Library & Information Science
Central University of Himachal Pradesh
TAB, Sahpur, Dharmshala, District Kangra.
imalhan_47@rediffmail.com

Abstract

Institutions are concerned with their research output, because of its importance and contribution to their ranking and standing. They often keep track of their research productivity, measure and evaluate it because whatever can be measured and assessed can also be improved. This paper analyses the publications output of the National Institute of Technology, Hamirpur taking it as the basis for research productivity of this institute. The data pertains to the publications covered in the Web of Science database and is related to the period 2013 to 2017. Data on 859 publications covered under the said period was downloaded, analyzed, interpreted and is presented in this paper. The analysis shows that NIT, Hamirpur publications output is continuously increasing except a little slow down in 2017. The analysis indicates a high rate of collaborative work at this Institute, as the largest number of papers published comprise of two authors followed by three authors and four authors. The data analysis reveals that the collaborative work is not only confined within the NIT but also with institutions across the nation particularly with IITs and institutes of other countries such as South Korea, Japan, Germany, Singapore, the USA, Malaysia, etc. The data analysis indicates that majority of the publications are research papers, followed by papers published in conference proceedings. The analysis of publications reveals that there is a huge gap in the productivity of researchers at the NIT, Hamirpur as few researchers are responsible for majority of the publications. This study reflects the most productive authors and presents research area wise analysis of publications. The trend in the preferred journals and conference proceedings for research publication was also analysed and a list of top ten preferred journals/ conference proceedings is given.

Keywords: Research productivity; Scientometric analysis, National Institute of Technology

1 Introduction

The National Institute of Technology (NIT), Hamirpur is an Autonomous Institute under the Ministry of Human Resource Development (MHRD) Government of India. This institute was established in 1986 as Regional Engineering College (REC), Hamirpur.. It was awarded the status of deemed university in the year 2002. As a result of conversion of REC into NITs and Promulgation of the NIT Act, 2007 w.e.f. 15th August 2007, the NIT Hamirpur awarded the status of Institute of national importance. This institute offers programs in undergraduate, and graduate studies and doctoral research program in several disciplines of engineering, pure sciences and humanities. Institutions are concerned with their research output because of its contribution to their ranking and standing and NIT is no exception to this. Institutions thus often keep track of their research output, measure and evaluate it because whatever can be measured and correctly assessed, can also be improved. "As per report of National Institutional Ranking Framework (NIRF), MHRD, Government of India published in 2016, the NIT, Hamirpur ranked 51th in the top hundred engineering institutions but slipped to the 59th position in the NIRF report of 2017". The publications output of the NIT also came down from 190 in the year 2016 to 164 in 2017. As in financial year 2016-17, there were 167 faculty members at NIT, Hamirpur that included 24 Professors 36 Associate Professors, 62 Assistant Professors and 45 Lecturer/Assistant Professors (Contractual) and the no. of regular faculty decreased as 22 Professor 34 Assistant Professor and 60 Assistant Professor in the financial year 2017-18. It shows that there was a little decline in the publication productivity of the NIT, Hamirpur for the publications indexed in the web of science. A financial year wise strength of faculty of NIT, Hamirpur from 2013-2017 is given in the Table-1.1.

Table1.1 Financial Year wise strength of faculty

Financial Year wise faculty	Professor	Associate Professor	Assistant Professor	Assistant Professor/Lecturer (Contractual)	Total faculty
2013-14	22	30	58	37	147
2014-15	27	28	53	40	148
2015-16	26	35	45	45	151
2016-17	24	36	62	45	167
2017-18	22	34	60	95	211
				Average	**164.8**

Data Source: Data Source: FY: 2013-14 to 2016-17 data taken from Annual reports of NIT, Hamirpur and data for the FY: 2017-18 has been collected from Administration Branch of NIT, Hamirpur.

2 Review of literature

Few quantitative studies have been carried in the past analysing the research output of institutions of India. Singh (2015) undertook the scientometric analysis of research publications of the Pondicherry University for the period of 1990 to 2014 for publications indexed in Web of Science (WoS). This study analysed the collaboration at different levels such as authors, institutions along with the status of collaboration at international level. The major research areas of publications are also analysed. Malhan and Gupta (2011) did analysis of publication output of the University of Jammu and analysed the standing of faculty besides assessing research output of the University. Jan et. Al (2015) studied the publication output of the University of Kashmir, As per this analysis the University has shown a promising publication growth expect for some years in 1990s. The highest contributing authors are from the disciplines of Science, Majority of papers are published in Indian sources. Articles have remained a prime document type for publishing by the authors from University of Kashmir. Future emphasis on joint research, international collaboration, and publishing in indexed journals is needed. Banshal,et al (2017) analysed the research performance of 16 older Indian Institutes of Technology of India, which shows that there is a substantial difference in research performance levels of old IITs vis-à-vis the new IITs. Hasan (2015) evaluated the trend of research output of five top ranking Indian Institutes of Technology (IITs) based on research papers/articles indexed in Web of Science online database for the five years' period of 2009-13. A total of 215,019 records were retrieved for India which are 2.72% of the global records for the period 2009-13. Singh (2015) analysed the Research output of Indian Institute of Technology, Mandi (IIT Mandi) focusing on the collaboration at different levels such as author, institution and status of collaboration at National/international level. Bid (2016) did analysis of publications of Indian Institute of Technology, Kharagpur for the period 2000 to 2015 and studied the growth and development of research activity of this institution. Jeevan et.al. (2002) analysed the performance and impact of research produced in each department, and the comparison of the impact of research in various departments. Arif, (2015) analysed the research productivity of Indian Institutes of Technology, including faculty members of computer science engineering

departments of four IITs. This Study depicted that there are much differences in research productivity in terms of number of publications, per capita productivity, etc. The IIT Madras has outperformed amongst all of them". Patel and Thakur (2018) analyzed the growth and development of research activity of National Environmental Engineering Research Institute, Nagpur from 2012-2016 and studied various parameters like highly productive subject areas and found that environmental sciences and ecology are the most favoured areas of research among the contributors with 34.34% of total productivity. Patel (2017) did analysis of publications of National Institute of Technology, Kurukshetra (NIT Kurukshetra) from 2012 to 2016 as reflected in Web of Science database. This study presented the year wise growth of publications, presented the analysis by publication types, and also mirrored the top institutions collaborating with National Institute of Technology, Kurukshetra for research and publication.

3 Objectives of the study

1. To analyse year wise publications productivity of the NIT, Hamirpur.
2. To find out the most productive/highly prolific authors and authorship patterns.
3. To identify the research area-wise distribution of publications.
4. To find out the top collaborative institutions.
5. To ascertain the research papers collaboratively published with authors of other countries.
6. To find out the type of publications preferred by researchers to report their research findings.
7. To find out specific titles of journal and conference volumes preferred for publications by the authors of NIT, Hamirpur.

4 Scope and methodology

Web of Science (WoS) a bibliographic and citation database that covers select scholarly publications, was used for collection of publication data. The data was collected for the period 2013-2017. The five years period is a good period to study research productivity. The publication data was collected in the month of February 2018. The full records were downloaded in the excel format i.e. article, proceedings paper, editorial material, titles, author records, affiliation of authors, etc. For Scientometric study of publications data of NIT Hamirpur, analysis of various parameters like year wise growth rate of papers, highly

prolific authors**,** collaboration in publications beyond NIT, Hamirpur, authorship pattern, was undertaken. The top productive authors were found out and their performances were analysed based on their publications productivity. The most collaborating institutions and countries have been recognized using extraction of information from the affiliations text. Finally, the major research areas were identified by mapping the data into major areas of research.

5 Data analysis and interpretation

5.1 *Publications growth*

The year wise research growth in terms of total publications is given in figure 1 and table 5.1. It shows that number of publication output is continuously increasing except little decline in 2017. The data reflects that highest number of 190 (22.12%) publications published in 2016 were indexed in the WoS and lowest number of 146 (17.00%) publications were indexed in 2013. However, the number of faculty members also increased at NIT,
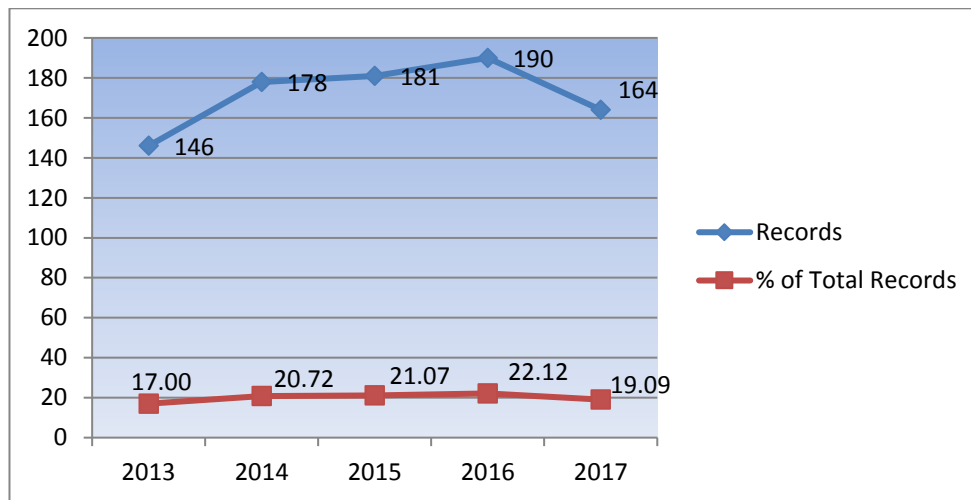

Figure 1: Year Wise Growth of Publications

Hamirpur from 147 in 2013 to 211 in 2017 that also contributed to growth of publications. The year wise growth of publications is given in the Table 5.1

Table 5.1
Year wise growth of publications

Publication Years	No. of Publications	% of Total Publications
2013	146	17.00
2014	178	20.72
2015	181	21.07
2016	190	22.12
2017	164	19.09
5 Years Total	**859**	**100.00**

5.2 Authorship pattern of publications

The largest number of publications i. e. 334 (38.88 %) comprised of two authors, followed by three authors 310 (36.09%), four authors 119 (13.85%), five authors 44 (5.12%), and so on. The authorship pattern of 859 publications is given in Table 5.2.

Table 5.2
Authorship pattern of publications

Year	One Author	Two Authors	Three Authors	Four Authors	Five Authors	Six Authors	Seven Authors	Eight = >	Total
2013	2	47	52	24	8	3	6	4	146
2014	6	79	47	22	12	6	3	3	178
2015	2	78	65	21	10	3	0	2	181
2016	4	69	72	33	7	3	0	2	190
2017	2	61	74	19	7	0	1	0	164
5 years Total	**16**	**334**	**310**	**119**	**44**	**15**	**10**	**11**	**859**
%	**1.86**	**38.88**	**36.09**	**13.85**	**5.12**	**1.75**	**1.16**	**1.28**	**100.00**

Data analysis reveals that most of the authors like to publish publications in collaboration with others and most preferred publication pattern is collaborative work of two authors. Independent publications comprising of single author are lowest in number and just two each were published in the years 2013, 2015 and 2017.

5.3 Productivity of Authors

Table 5.3 shows a list of most productive/ prolific authors of NIT Hamirpur. It is interesting to note that Kumar, Ravi, published highest numbers of papers, i.e. 64 (7.45%) followed by Varun who published 36 (4.19%) papers with second position, Chandel, S.S. with 33 (3.84%) papers is at third position others among top ten authors are given in Table 5.3.

Table 5.3

Top 10 Productive Authors and Number of their Publications

S. No.	Productive/Highly Prolific Author	No. of Publications	% of 859
1	Kumar, Ravi	64	7.45
2	Varun	36	4.19
3	Chandel, S.S.	33	3.84
4	Singha, A.S.	31	3.61
5	Chandel, Rajeevan	30	3.49
6	Sharma, Veena	25	2.91
7	Chauhan, S.R.	24	2.79
8	Chand, Subhash	23	2.68
9	Sood, Yog Raj	23	2.68
10	Chandel, Ashwani Kumar	22	2.56

5.4 Type of Publications

Figure -2 and Table 5.4 shows that distribution of publications according to their types. It shows that research articles comprised of the highest number of publications i.e 552 (64.26%) followed by proceedings papers 252 (29.34%), review papers 51(5.94%) and correction 04 (0.47%) (The term "correction" is found in web of science for the papers which contain any mistake and for that Erratum published by particular journals).
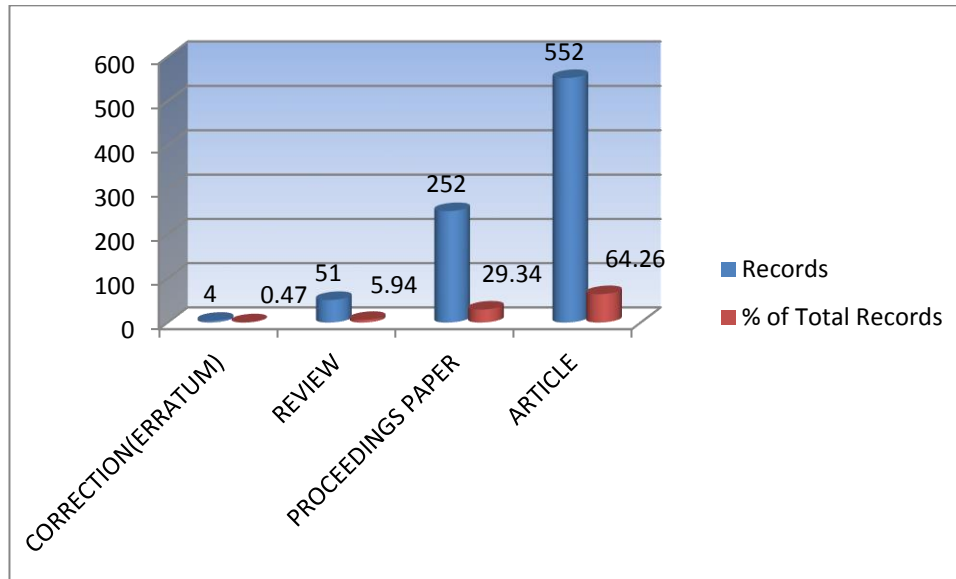
Figure 2: Distribution of publications according to type

Table 5.4

Distributions of publications according to type

Document Types	No. of Publications	% of Total No. of Publications
Correction(Erratum)	4	0.47
Review	51	5.94
Proceedings Paper	252	29.34
Article	552	64.26
Total	**859**	**100.00**

5.3 Research area-wise Distribution of Publications

The Research areas as reflected in Web of Sciences categories shows the list of top subjects for which the authors of NIT Hamirpur, mostly contributed publications reveals that electrical and electronic engineering is the most productive area of research among the contributors with 25.73% of publications, followed by energy fuel with 15.13%, material science with 11.76%, physics applied 8.50%, telecommunications with 8.38% and others are given in figures 3.
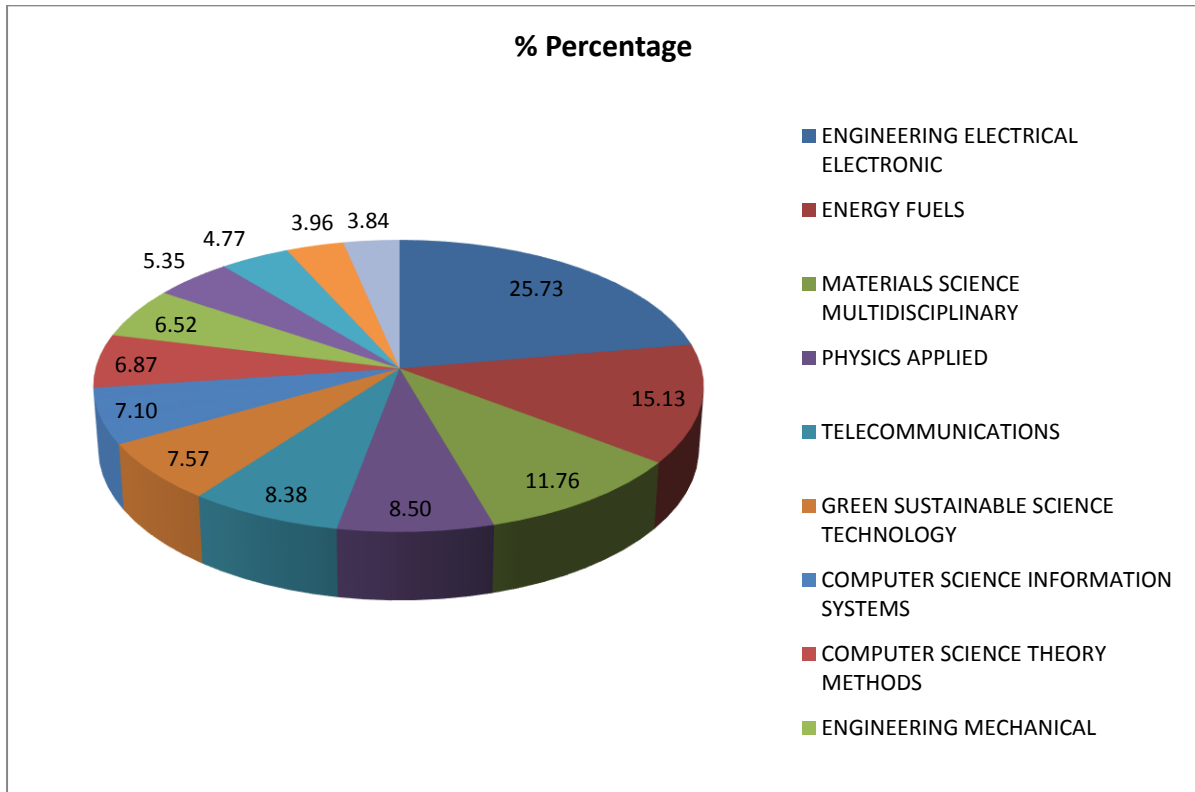
Figure 3: Research area -wise Distribution of Publications (WoS Categories)

5.4 Collaboration of Research Publications with other countries

Table-5.6 shows the collaboration of the NIT, Hamirpur in research and publishing with other countries authors. It reflects that South Korea is at the top with 20 (2.33%) publications followed by Japan with 14 (1.63%) which is at second position and Germany with 12 (1.40%) publications at the third position and collaborations with others countries are given in Table 5.6

Table-5.6

Collaboration of Research Publications with other countries

S.No.	Countries/Regions	No. of Publications	% of 859
1	South Korea	20	2.33
2	Japan	14	1.63
3	Germany	12	1.40
4	Singapore	6	0.70

5	USA	5	0.58
6	Malaysia	4	0.47
7	Turkey	4	0.47
8	Ireland	3	0.35
9	Brazil	2	0.23
10	England	2	0.23
11	Italy	2	0.23
12	Norway	2	0.23
13	Romania	2	0.23
14	Slovakia	2	0.23
15	Taiwan	2	0.23
16	France	1	0.12
17	Indonesia	1	0.12
18	Macedonia	1	0.12
19	Mexico	1	0.12
20	Oman	1	0.12
21	Saudi Arabia	1	0.12
22	Serbia	1	0.12
23	South Africa	1	0.12

Collaboration with authors of 23 countries fairly reflects the global reach of the NIT, Hamirpur and exposure and visibility of its faculty. Of the 859 publications, 90 involved collaboration of foreign authors, which comprises of a little more than ten percent of publications.

5.5 Top Collaborative Institutions/Organizations

The Table- 5.7 includes the top twenty institutions/organizations involved in the collaborative work with the NIT, Hamirpur. The analysis of top collaborative institutions/organization with NIT, Hamirpur, indicates that the Indian Institute of Technology, Roorkee is the first choice of the NIT researchers for collaborations as they collaborated for 27 (3.14%) publications.

Table- 5.7

Top institutions/organizations involved in the collaborative work

S.No.	Organizations-Enhanced	No. of Publications	% of 859
1	Indian Institute of Technology Roorkee	27	3.14
2	CSIR-National Physical Laboratory, New Delhi	20	2.33
3	Dr B R Ambedkar National Institute of Technology, Jalandhar	16	1.86
4	Malaviya National Institute of Technology, Jaipur	16	1.86
5	Indian Institute of Technology, Delhi	16	1.86
6	Beant College of Engineering & Technology, Gurdaspur	15	1.75
7	Bhabha Atomic Research Center, Trombay, Mumbai	15	1.75
8	Aligarh Muslim University, Aligarh	13	1.51
9	Shinshu University,Matsumoto, Japan	12	1.40
10	Guru Nanak Dev University, Amritsar	11	1.28
11	Thapar University, Patiala	11	1.28
12	Shoolini University, Solan	10	1.16
13	Indian Institute of Technology, Mumbai	9	1.05
14	Pohang University of Sci & Technology, Pohang, South Korea	9	1.05
15	UGC-DAE Consortium for Scientific Research, Indore	9	1.05
16	Himachal Pradesh University, Shimla	8	0.93
17	Kurukshetra University, Kurukshetra	8	0.93
18	Indian Institute of Technology, Mandi	7	0.82
19	Moradabad Institute Technology, Moradabad	7	0.82
20	Amity University , Noida	6	0.70

5.6 Preferred Publications sources

Table 5.8: shows the top ten journal titles and conference proceedings preferred by contributors of NIT, Hamirpur for Publication (2013-2017). It was found that Renewable & Sustainable Energy Reviews published the highest number of 36 publications followed by OPTIKA that published 19 and other top 10 preferred sources are given in Table 5.8

Table 5.8

Top 10 sources preferred for publication

S. No.	Name of Journals/Conference Proceedings	No. of publications	Percentages % of 859
1	Renewable & Sustainable Energy Reviews	36	4.19
2	OPTIKA	19	2.21
3	Proceeding of International Conference on Recent Trends in Applied Physics & Material Science (RAM 2013)	14	1.63
4	Renewable Energy	12	1.40
5	International Journal of Polymer Analysis and Characterization	12	1.40
6	Arabian Journal for Science and Engineering	10	1.16
7	Proceedings of the First IEEE International Conference on Power Electronics, Intelligent Control And Energy Systems (2016)	9	1.05
8	Journal of Applied Physics	9	1.05
9	Journal of Alloys and Compounds	9	1.05
10	Journal of Renewable and Sustainable Energy	8	0.93

6. Findings and Conclusion

The NIT, Hamirpur has contributed 859 papers from 2013 to 2017 and it published the maximum number of 190 publications in 2016 and had lowest output of 146 publications in 2013. The authorship pattern indicates that maximum number of 334 (38.88 %) publications had joint publications of two authors followed by joint 310 (36.09%) publications of three authors, four authors 119 (13.85%), which shows that contributors of NIT Hamirpur have tendency to publish their work with two or more authors. This indicates the multi-author pattern and shows that the contributors are collaborative in nature. There is wide variation in the productivity level of authors with one author publishing 64 (7.45%) publications and another author publishing 36 (4.19%) publications and still another publishing 33 (3.84%) publications.

This is matter of serious thinking for developing a policy for funding of research and recognition and reward system of researchers. Most researchers i.e. 552 (64.26%) prefer to publish their research as research articles. The subject wise distribution of publications reveals that electrical and electronic engineering is the most productive area of research among the researchers with 25.73% of publications pertaining to this area, followed by energy fuel with 15.13%, material science with 11.76%, physics applied 8.50%, telecommunications with 8.38% of publications share. As far as collaboration of research of other countries with the researchers of the NIT Hamirpur is concerned, a good collaborative effort at global level was noticed. Analysis of collaboration with researchers of other countries reveals that South Korea is at the top with 20 (2.33%), publications followed by Japan with 14 (1.63%) publications, and Germany with 12 (1.40%) publication is in third position. The analysis of top colloborative institutions/organization with NIT Hamirpur shows that IITs are prefered institutions for collaborative work and Indian Institute of Technology, Roorkee is the first choice of researchers for collaborations as 27 (3.14%) of publications are published in collaboration of researchers of this institute. The sources (i.e. Journals/Conference proceedings) A study of specific journals preferred by contributors of NIT Hamirpur for Publications (2013-2017) shows that Renewable & Sustainable Energy Reviews published the highest number of 36 publications.

References

Banshal, S. K. (2017). Research Performance of Indian Institutes of Technology. Current Science, 112, 923-932.

Bid, S. (2016). Indian Institute of Technology, Kharagpur, a Scientometric study of Research Output. International Journal of Library Information Network and Knowledge, 1, 1-15.

Jan, A. et. al. (2015). Mapping the Research Output of University of Kashmir. International Journal of Knowledge Management and Practices, 3(2), 12-18.

Jeevan, V. K. J. and Gupta, B. M. (2002). A scientometric Analysis of Research Output from Indian Institute of Technology, Kharagpur. Scientometrics, Short communication 53, 165-168.

Hasan, N. and Singh, M. (2015). Research Output of Indian Institutes of Technology, a Scientometric Study. Qualitative and Quantitative Methods in Libraries, 4, 293-305.

http://nith.ac.in/nith/

https://www.nirfindia.org/EngineeringRanking.html

Malhan, I. V. and Gupta B. M. (2011). A Scientometric Assessment of Growth and Impact of Research output of the University of Jammu, a case study. Journal of Library and Information Science, 3(1-4), 30-45.

Patel, V. (2017). A Scientometrics Analysis of Research Productivity, a Case Study of National Institute of Technology Kurukshetra. International Journal of Information Studies and Libraries, 2(2), 24-30.

Patel, V. and Thakur, N. S. (2018). A Scientometrics Analysis of Research Productivity, a Case Study of National Environmental Engineering Research Institute, Nagpur. International Journal of Library Network and Knowledge, 3 (1), 43-53.

Singh, V. K. (2015). A Scientometric Analysis of Research Output of Indian Institute of Technology Mandi. Indian Journal of Scientific Research, 11, 193-196.

Singh, V. K. (2015). A Scientometric Mapping of Research Output of Pondicherry University. Indian Journal of Scientific Research, 11 (2), 141-144.

Tasleem, A. (2015). Analyzing Research Productivity of Indian Institutes of Technology. Communications on Applied Electronics, 1, 9-11.